UNIVERSITÀ DEGLI STUDI DI NAPOLI

"L'ORIENTALE"

Dipartimento di Scienze Umane e Sociali

PhD in Studi Internazionali: XXXVI ciclo

The User and the used: platform mediation, labour and pragmatics in the gig economy

Dottorando:

Biscossi Edoardo

Tutor:

Prof. Tiziana Terranova

Prof. Stamatia Portanova

Coordinatore:

Prof. Raffaele Nocera

Anno Accademico 2022/2023

The User and the *used*: platform mediation, labour and pragmatics in the gig economy

Table of Contents

Introduction: the platform mediation of labour

The aim of this project is to study platform labour by critically addressing its technological mediation, in order to intervene in the growing field of research on the relation between labour and digital technology within contemporary capitalist production. The various forms and types of platform labour, as well as the multi-faceted concept of mediation, will be discussed in more detail within the literature review that follows this introduction. For now, my object of study can be defined as the labour that is mobilised through the digital infrastructures of platform companies, which «draw on a large and scalable freelance workforce and use automated management systems for organizing and controlling that labor» (Jarrett 2022). Over the last two decades, the socio-technical infrastructures of post-digital economies have evolved into an «accidental megastructure» (Bratton 2016), a planetary computational architecture which mediates and modulates heterogeneous forms of labour and subjectivation. Significantly, with the emergence of what has been defined as «platform capitalism» (Srnicek 2016), the communication networks of the internet as known at the turn of the millennium, have progressively been re-structured under the oligopolistic power of a «Corporate Platform Complex» (Terranova 2022), shifting from a simple networked topology to a pervasive baroque articulation, an operational mesh of: individual user profiles, interfaces, wireless transmission, affective flows of desire, all seemingly entangled in a material computational continuum. The increasing embeddedness of media and computational forms within the socio-economic milieu calls a critical understanding of the power relations they play into.

These social and technical transformations have enabled the emergence of economic practices by which labour and networked social cooperation are mobilised under seemingly new forms of exploitation and corporate appropriation. Despite the promises of automation accompanying AI and platform services, these technological developments are not emancipating social cooperation from undesirable labour, but rather facilitating more sophisticated forms of management over a social division of labour which multiplies and re-articulates its precarious and vulnerable forms. This is highlighted all across a wide body of scholarship on the labour of delivery riders, click-workers, care workers, content creators as well as other types of freelancers. The uncanny re-branding of precarity and vulnerability as supposedly desirable entrepreneurial freedom highlights a continuum within the forms of

flexible labour, from the gig economy to zero-hours service work, from outsourced cognitive workers to academic staff. In a recent and comprehensive analysis of digital labour, Kylie Jarrett notes how «the digital media industries, and the labor they rely on, arguably epitomize contemporary economic logic so this type of work and its management also exemplify general trends within the economy. Labor within the digital media industries and the experience of its workers are thus important to understand not only because the sector is economically significant – although that is certainly relevant. It is also important to analyze for what it can reveal about the broader workings of contemporary capitalism; exploring digital labor becomes a lens to look at contemporary labor relations» (Jarrett 2022).

Situating my research within the diverse and prolific literature on the subject, I believe that critically addressing the technological mediation of labour adds a crucial dimension to the theoretical and political understanding of platform labour, its complications and impasses. On the one hand, this project draws from a lineage of critical theory which, understanding labour as inherently processual and collective, interrogates its concrete arrangements to understand how it shapes the forms of capitalist production. This means situating digital labour within longer histories of vulnerable modes of work, most notably the precarious, gendered and racialised labour which despite its historical marginalisation has consistently been taken as a critical site for understanding the core operations of capitalism, beyond the moment of direct commodity production, in the unfixed processes of subjectivation within everyday life. At the same time, technology also needs to be critically considered beyond the superficial reading of its use in the moment of direct production. In fact, especially in their increasing sophistication, technologies function as bearers and activators of social relations which can nonetheless appear displaced if these objects are considered exclusively in their instrumental dimension. My research seeks to specifically problematise and move beyond this reading of technology in relation to labour. However, limitations of perspective can work both ways. On one hand, a critical study of labour needs to avoid the risk of a certain humanist determinism which overemphasises the autonomy of the human from the technical, and even sees technology as a mere capitalist tool and expression of instrumental rationality. On the other, there is also a risk of leaning into forms of technological determinism which look at the relation between machines and labour from an overly mechanistic perspective.

To move past this impasse, my research first and foremost tries to understand technological forms as emerging through a relation between the social and the technical, as well as expressing a mode of functioning that is specific to the object in itself, but which is still not reducible to engineering principles, and thus needs to be understood as an inseparable socio-

technical. This understanding points to the fact that the social and the technical do not unidirectionally determine one another, and that technologies function at the same time as technical objects, metaphorical constructs and expressions of certain social and cultural relations. These aspects, although somewhat analytically separable, are so entangled in practice that they can only be studied in their relation. This is a crucial point which is important to succinctly make at the beginning the thesis, but this line of argument will be more accurately thematised throughout the literature review and at different points across the thesis — by mobilising the work of Gilbert Simondon (2017) and multiple other scholars who have worked on technology and media. Because the social conditions through which technologies emerge persist in the material unconscious of their everyday use, a critical understanding of technical objects needs to address their constitutive social and conceptual fabric, as well as the relation between their functioning and the milieu in which their operations are integrated — both of which can be done through a variety of methods that will be later discussed.

I believe that bringing this perspective at the core of a critique of platform labour represents an important contribution to the field. Instead of rejecting or rigidly opposing the increasing embeddedness of technological mediation within labour relations, a critical understanding of this relation could be useful to individuate its constitutive components and potentially suggest different arrangements of cooperation and production. The broader scope of my project is oriented toward understanding platform mediation in relation to critical thought on class, race and gender, in order to foreground some potential for difference and liberation. As I will argue in the thesis, a servo-instrumental model of our relation with technology is fundamental to maintaining social cooperation subjugated to corporate accumulation. Thinking beyond instrumentality might enable us to consider technological mediation not as an inherently exploitative force, or a master's tool to reclaim, but rather as a mode of socio-technical individuation. In order to critique and overcome this model, it will be useful to problematise some of the humanist traits usually associated with labour and with the figure of the Worker, which in platform labour interestingly overlaps with the historical subject of media technologies: the User — master of the technological instrument. If platform mediation appears to subject labour to increased vulnerability and outer determination, figuring workers as instrumental extensions of the platform, a critical assessment of the anxieties associated with this proximity to machines and loss of self-determination could be helpful to understand this condition not as some ultimate capitulation of labour's political agency, but rather as a destabilisation of the Worker-User paradigm. I will try to explore this destabilisation by proposing the "used" as an emergent form of subjectivation across platform

labour, and the framework of "platform pragmatics" as the self-reflexive sensibility through which platform control is experienced.

Research questions and methods

In short, the project aims to problematise the notion of platform labour through a critique of its technological model. I will do this by looking at the specific cases of on demand delivery work — the main site of study — and micro-work, as well as by addressing their continuities with other forms of platform-mediated labour, like that of content creators. Throughout the thesis, the discussion will revolve around different objects, case studies and methods, broadly addressing the following research questions.

How can we understand the emergence of platform labour as a socio-technical system, and what are the key social processes, conceptual schemas, economic practices and technical grammars integrated in its concrete functioning? This is a fundamental question because — as already noted — it is by understanding this integration of forms into concrete operations, that we can grasp the mode of functioning and the ongoing transformations of a complex technical object.

Understanding platform mediation as constitutive of both socio-technical ensembles and labour assemblages, what kind of relation does it configure between users, collective and individual labour, and aspects like temporality and spatiality? What is the logic, or the operational schema, of this relation?

How does platform mediation function in relation to the labour process? How is labour materially coordinated and managed through computational infrastructures? Crucially, this technical organisation of labour needs to be studied meticulously in its operations, but at the same time politically understood in relation to the economic model of gig work.

Lastly, what are the implications of this understanding of platform mediation for contemporary modes of labour subjectivation and class composition?

As detailed by the dedicated chapter, my methodological approach combines: an ethnographic engagement with the everyday practice of platform labour, in order to observe it in its embodied dimension; the observation of workers' online discussion forums, in order to add a heterogeneity of perspectives and insights to my situated experience; a critical investigation of technical objects through the close reading and analysis of technical

documents, product descriptions, management literature and corporate discourse. Thus, the research puts my ethnographic intervention in dialogue with the methods of critical theory and media and cultural studies, as well as with the analytical perspectives of autonomist marxism, marxist feminism and critical race theory.

Chapter summaries

The first and second chapters serve to provide, respectively, a review of relevant literature and theoretical concepts within the field, and a detailed outline and critical assessment of the project's methodological configuration.

After a brief foreword situating my experience of the platform economy through an initial reflection on its emergent dynamics, the third chapter directly considers platform labour as a historically emergent socio-technical phenomenon, addressing the question of platform mediation — a comprehensive survey of theoretical approaches to the concept of mediation is provided beforehand in the first chapter. The chapter maps out some of the key social forms, cultural logics and economic trends that the emergence of the platform as a concrete technology re-codes and integrates within its mode of functioning. In order to do this, the discussion follows three interweaving threads: that of the flexibilisation of labour relations, of the becoming logistical of labour, and of the progressive subsumption of subjectivation within capitalist production. The chapter draws from my ethnographic experience and research around platform labour and its cultural context, working through some key case studies. First, the case of sublet accounts as a form of access to platform labour will be helpful to discuss how platform mediation intervenes at the intersection of labour precarity and migration. Then, my engagement with gig work in the immediate aftermath of the Covid-19 pandemic serves as a case to observe how platform mediation embeds within urban spaces; for instance through the diffusion of so-called "dark" or "ghost" kitchens, through the adjustments of public and commercial spaces to accommodate platform labour, as well as the re-arrangement of domestic spaces in relation to remote work. Lastly, my observation of the cultural discourse and imaginary around gig work, particularly in relation to the proliferation of hustle within digital economies, highlights some interesting case studies to consider the investment of subjectivity across platform labour.

The fourth chapter looks closely at how the labour process is organised through platform mediation by a specific computational infrastructure: the coordination system of a food delivery platform, which constitutes a prime example of contemporary algorithmic

management. Starting from my ethnographic observation, the chapter then develops a critical reading of two patents filed by one of the major labour-mediating platforms, as well as of various product presentations and corporate documents. The analysis of this complex object will address the relation between computational and economic formalisation, as well as the heterogeneous material processes that are mobilised in order for computation to assume its powerful effects. Combining anecdotical accounts of everyday labour with genealogical research into the histories of machine sensing and media interfaces, the chapter will thematise algorithmic coordination as a mode of management based on predictive steering and distributed perception. An attentive reading of patent documents will be helpful to understand the ways of knowing that characterise platform coordination systems, and in particular: how these emerge from the sensing devices and wireless transmission, and how probabilistic forms of knowledge are produced from such noisy observations. In light of the centrality of these noisy transmissions, I will try to understand the relation between labour and its technical coordination from a non-deterministic perspective. The aim is to explore a certain dissonance between the material functioning of platform coordination and the way in which this functioning is taken up by the economic models of the gig economy. The final section of the chapter will discuss the political implications of this case study in relation to a broader critique of the "gig" model as the discursive device by which labour is made to appear as individualised and competitive, rendering its collaborative transindividual character as an unrecognised site of value appropriation.

The final chapter of the thesis asks what type of relation platform mediation configures between the user position, platform-ed services and labour — in both its collective and individualised dimensions — in order to understand the logic and constituting schemas of this relation. Starting once again from ethnographic accounts, focusing especially on the centrality of unremunerated waiting time in the platform coordination of labour — emerged in the previous chapter — the discussion draws from critical race theory and feminist critiques of technology to thematise certain fantasies and anxieties surrounding automated machines in relation to a historical division of labour. This will lay the ground for a critique of the user position, the technological mediation of service work, and the figure of the worker as the universal subject of labour. The chapter ends with a discussion of this critical understanding of platform labour in relation to contemporary modes of class composition and subjectivation. This final section will address how platform mediation operates within the baroque articulation of post-digital economies, mediating the pragmatic self-reflection through which contemporary living labour experiences and interprets the logic of platform capitalism.

Literature review

The purpose of this chapter is to situate my research within the field by surveying a wide body of literature relevant to the study of platform labour and digital platforms in general, as well as by evaluating some critical perspectives within the scholarship and proposing key theoretical concepts that will serve a basis for further discussion in the following chapters. The chapter is structured in two parts.

The first section starts by defining what digital platforms are through the work of different authors, focusing in particular on critical accounts of the platform economy and concepts like «platform capitalism» and the «platform society» (Srnicek 2016; van Dijck et al. 2018). The literature surveyed in this section will be useful to understand what «labour-mediating platforms» are and how digital marketplace infrastructures operate specifically in the context of the «gig economy» (Woodcock & Graham 2020). I will use this discussion to outline the different types of platform labour, individuating as the key focus of my research the category of «platform-mediated labour», which refers to the labour of workers mobilised through digital platform infrastructures which «draw on a large and scalable freelance workforce and use automated management systems for organizing and controlling that labor» (Jarrett 2022). Then, I will move on to define algorithmic management, reviewing how it has been categorised in relation to previous forms of management, and how others have described its automated and distributed action, which renders labour coordination and supervision immanent to technological infrastructures and tools of work (Cant 2020; Kellogg et al 2020). At this point, I will present some critical perspectives developed within the field of platform labour studies, which will broadly cover the following topics: the centrality of unpaid labour time within platform labour (Rosenblat & Stark 2016); the precarity and exploitation of labour especially in relation to the promise of technological automation (Benanav 2022; Casilli 2020); and the extractive dynamics that many have identified as a fundamental character of the platform economy, in relation not only to the exploitation of labour but also to the mining of data from everyday sociality as well as to the environmental implications of the contemporary tech industry (Crawford & Joler 2018; Mezzadra & Neilson 2017; Parikka 2015). This last point seems particularly important as it highlights the entanglement of platform labour with different modes of extraction and appropriation. The final segment of this section will draw from critical technology studies to present some initial observations on

the relation between abstraction and embodiment as a recurring theme across cybernetic thought, information theory and Marxist critique (Chun 2011; Franklin 2021; Hayles 1999).

The second half of the chapter will address the question of media and mediation. Through a review of different theoretical accounts, I will define media beyond the paradigms of «devices» and «determinacy», as something that forces us to think about «structures of interaction» as well as to critically consider the technical, social and psychical dimensions of technological forms (Galloway et al 2013). I will draw from digital media theory to characterise mediation as an underlying process by which technical objects exceed their everyday use, foregrounding their always emergent and reticular character (Kember & Zylinska 2012). This understanding of mediation helps me characterise media as stabilisations and activators of certain socio-technical relations. I will further explore this idea in the last segment of the chapter, which will turn to the work of Gilbert Simondon. Drawing from Simondon's concepts of individuation, technical evolution and concretisation, I will discuss how mediation can be understood also as the taking form of a synergic relation between technical and social forms, as the coming together of certain conditions for the emergence of technical systems (Combes 2012; Simondon 1992; 2017). This discussion will be useful to lay the ground for one of the initial arguments of the thesis, which is about understanding the model of platform labour as a concretisation of pre-existing socio-technical forms, within the technical evolution of capitalist production as an unfixed open system, of which the platform can be seen as a stabilisation.

Platform Labour

Digital Platforms

Over the last decade, digital platforms have become some the most discussed an analysed technological objects. Besides its use in computing to designate a programmable infrastructure, the expression “platform” gained wider cultural significance with the rise of the so called platform economy. In common usage, it came to signify a metaphorical space of inter-mediation, a neutral vehicle for interaction and communication (Gillespie 2010) — which is to say, for a set of social and technical relations connecting different actors. Benjamin Bratton defines a platform as «a standards-based technical-economic system that simultaneously distributes interfaces through their remote coordination and centralizes their integrated control through that same coordination» (Bratton 2016, p.42). The term is also generally used to refer to a business model, a type of company, and a corresponding mode of organising value production.

The platform economy emerged from the economic and financial crisis of 2008 as one of the key forms and solutions for reorganising labour and social cooperation. Technological advancements around automated data processing, connectivity and mobile media, facilitated the development of a series of business models — linked to the sharing economy, the gig economy, or the attention economy — within a systemic shift toward what Nick Srnicek named «platform capitalism» (2016). Srnicek defines some key characteristics of platform companies: their use of digital infrastructures to enable interactions between two or more groups or classes of users, their leverage of this infrastructural position to extract data from interactions; their reliance upon network effects; their use of cross-subsidisation to offer certain services or features at reduced cost; and their political power to shape the interactions they enable (2016). Management scholar Annabelle Gawer identifies the dual nature of platforms as both technological architectures connecting modular components, and multi-sided marketplaces serving as interfaces for different parties to conduct transactions (2014). The importance of network effects to the functioning of these platforms seems clearly fundamental, in that the value of platforms to each user is a direct function of the overall volume of users. It is precisely by maintaining control over the interactions taking place through their multi-sided marketplaces that platforms reap the benefits of these network effects (Casilli 2020; Srnicek 2016).

Tarleton Gillespie was among the first authors to understand the metaphorical construct of the platform in its socio-political dimensions (2010). The platform is often discursively figured as a neutral infrastructure facilitating connection and sharing, a space for the free exchange of goods and information — the apical point of realisation of the participatory culture of Web 2.0. In this sense, platforms work as instruments of user empowerment, enabling any personal enterprise to easily and efficiently run and develop via their programmable infrastructures. The alleged innovative and progressive character of digital platforms also lies in their dis-intermediating effect, whereby legacy institutions, incumbent organisations, and unnecessary regulations or expenses are bypassed in favour of direct interaction, realising the smooth encounter of supply and demand in a neutral marketplace (Botsman & Rogers 2010; Bruns 2008; Rifkin 2015). However, many studies have shown how platforms are not neutral spaces of inter-mediation between free actors, but rather enact certain politics and models of society, extending their organisation of production to all social relations (Gillespie 2010; Srnicek 2015; van Dijck et al. 2018).

José van Dijck — whose work has produced some of the most comprehensive structural accounts of what she calls «platform society» — defines a platform as «a programmable digital architecture designed to organise interactions between users» and other agents including private companies and public bodies, «geared toward the systematic collection, algorithmic processing, circulation, and monetization of user data» (2018, p.4). In their technical operations, single platforms are not independent from each other but rather co-evolve, structuring a «platform ecosystem» governed by its own logic, «an assemblage of networked platforms, governed by a particular set of mechanisms that shapes everyday practices» (van Dijck et al. 2018, p.4). The Western ecosystem — which this research refers to — is dominated by a handful of big tech companies: namely Amazon, Alphabet-Google, Meta-Facebook, Apple, Microsoft. The infrastructural services provided by these dominant entities are fundamental to the overall ecosystem, although a multitude of other organisations, businesses, co-operatives, and individuals still participate in shaping the economic and cultural practices that characterise the platform society. Van Dijck identifies «datafication», «commodification» and «selection» as the main mechanisms of platform society. Datafication refers to the practice of quantifying into data not just the information provided by users, but also behavioural meta-data that is automatically and systematically abstracted from everyday actions through software, sensors, and ubiquitous media (Mayer-Schönberger & Cukier 2013). All data is then constantly circulated across the interfaces and APIs of different platforms and third parties. While datafication mostly appears as a commercial practice, the everyday data practices of users also concur to this networked distributed process (Fotopoulou

2019; van Dijck et al. 2018). Commodification mechanisms — while on one hand potentially decentralising and shifting economic power from institutions to users — once again essentially facilitate the extraction of value from user activity, as well as the concentration of economic power enabled by the network effects and economies of scale that characterise multisided markets (Casilli 2020; Srnicek 2016; van Dijck et al. 2018). Lastly, selection mechanisms enact various forms of algorithmic sorting, organisation, and distribution of access, according to dynamics of reputation mainly based on users' constant reciprocal review. By doing so, these algorithmic selection mechanisms implement techniques of discipline by way of reward, punishment, and behavioural influence (Bucher 2012; Gillespie 2016; van Dijck et al. 2018).

Labour-mediating platforms

A key sector of the platform economy is that in which companies use digital platforms to provide a service of intermediation between workers, clients and third parties, often also coordinating the labour process itself through their infrastructures. Labour-mediating platforms are defined by Jamie Woodcock and Mark Graham as «companies that use digital resources that mediate value-creating interactions between consumers and individual service providers». This dynamic is usually associated to the so-called «gig economy», which denotes a labour market «characterized by independent contracting that happens through, via, and on digital platforms» (Woodcock & Graham 2020, p.3). The platform doesn't employ the workforce that carries out the actual work, but simply «provides tools to bring together the supply of, and demand for, labour» (Woodcock & Graham 2020). These types of companies tend to fall under the category of «lean platforms», defined by Srnicek, as they have no ownership of the commodities they manage or circulate — including labour — but simply of the programmable software infrastructure necessary to enable connection and interaction between different parties, as well as to maintain control over data circulation — «all that remains is a bare extractive minimum – control over the platform that enables a monopoly rent to be gained» (Srnicek 2016, p.76).

A 2021 report of the European Commission identified over 500 active «digital labour platforms» employing more than 28 million people, a figure expected to reach 43 million by 2025. While over 90% of these platforms classify the people working through them as self-employed, the report notes that over 5 million people might be at risk of misclassification given the actual conditions of their work (EUR-Lex 2021). In the United Kingdom — where

my fieldwork took place — the share of the adult population doing platform work went from 6% in 2016 to 15% in 2021 (Spencer & Huws 2021). Research found that over two thirds of workers were men (Autonomy 2021), that they were generally young — 31.5% between 16 and 24 years old, 28.7% between 25 and 24 — and quite evenly spread throughout the country, although with the strongest concentration in Greater London (SSCU University of Hertfordshire 2019). Platform workers are also more likely than other workers to be from ethnic minority backgrounds — with only 68% of them identifying as White British compared to 85% of the overall labour market (CIPD 2017). Migrant labour also tends to be overrepresented among gig workers especially in urban contexts (van Doorn et al 2020).

Within the broader category of platform labour, a number of internal distinctions and categorisations can be identified. A 2022 working paper by the European Trade Union Institute surveyed people across 14 European countries finding that 4,4% of the working-age population regularly performs «platform work», with 1.1% doing it as a «main» occupation — that is, in a way that accounts for more than half of their earnings and more than 20 hours per week (Piasna et al. 2022). The survey defines platform work as procured and performed «through digital labour platforms», and breaks it down in the following sub-categories: «remote clickwork» (data entry or sorting, transcriptions, paid online surveys), «remote professional work» (creative, IT or other professional freelance work), «on-location work» (for instance handyman work, cleaning, beauty treatment or childminding), «transport» (as a taxi or other driving service), and «delivery» (delivering food or other goods where you get the order through an app or online platform) (Piasna et al. 2022). On top of these platform workers, another 12.6% of the working-age populations falls under the broader category of «internet work», which includes all activities generating income through the use of online platforms, websites or mobile apps, including «influencer» (through blogs or social media accounts) «renting» (renting out their own accommodation, using an online platform, app or website) «sell self-made products online», and «sell or re-sell other products online» (Piasna et al. 2022). Theoretical and critical studies also have categorised platform labour in different ways. While these are of course arbitrary distinctions — reviewing some of these categorisations is useful to clarify the specific object of this research, but also the broader scope of the discussion.

In her recent survey of the field, Kylie Jarrett defined digital labour through three conceptual categories: «platform-mediated» work, «user labor» and «formal work» (2022). The first category will be the one discussed in this project, and generally identifies workers within the gig economy, employed through digital platforms which «draw on a large and

scalable freelance workforce and use automated management systems for organizing and controlling that labor» (Jarrett 2022). Interestingly Jarrett includes within this category also «creative and technical workers in the social media economy such as influencers, cammers, beauty bloggers, and live-streamers» (Jarrett 2022) — which I believe points to important continuities emerging within platform-mediated labour, as will be further discussed within the thesis.

The second category refers to the «unpaid, uncontracted work on social media platforms from which economic value is extracted» (Jarrett 2022). Although usually unrecognised as such, this constitutes labour by contributing to value production, either because it sustains the aforementioned network effects, enables the functioning of certain platform services or makes them desirable, or even because the data extracted from it are exploited within advertising and attention economies (Fuchs 2014; Jarrett 2022). This is key for understanding the operations of social media and sharing platforms within the emergence of Web 2.0, which was characterised by a pivotal intensification of data harvesting and analysis for marketing and profiling purposes. While the study of this category is not within the direct scope of this research, its relation to capitalist production is still important to understand, as it crucially highlights certain dynamics of valorisation that are also fundamental to platform-mediated labour. The early thematisation of «free labour» by Tiziana Terranova describes it as the cultural and technical activity that animates value production in the information age (2004). In fact, «the internet highlights the existence of networks of immaterial labour and speeds up their accretion into a collective entity» — channeling the social productive capacity already identified by *Operaismo* and Autonomist Marxism through the theoretical framework of the «social factory», into a continuous process of valorisation immanent to the infrastructures of the network society. «Free labour» thus emerges as a dispersed cognitive and cultural process characterised by «an investment of desire into production of the kind cultural theorists have mainly theorised in relation to consumption» (Terranova 2004, p.84).

The third category identified by Jarrett refers to a range of paid workers who at various levels sustain the operations of the digital platform industry, but «whose work is not mediated primarily through digital media platforms» — therefore this will also not be directly addressed within my research. On one hand, this category includes traditionally white-collar professions within the tech industry «such as design, programming, or marketing in the GAFAM/BAT companies, games companies, or in digital media industry startups». However «workers who are paid employees in less elite positions such as content moderators, Amazon fulfillment center workers, data-center workers, or game testers» are also crucially included in

this category (Jarrett 2022). For the purpose of this research, it is worth considering more specifically the first category and making some necessary distinctions within it.

Platform-mediated labour

The key distinction within platform-mediated labour is that between «geographically tethered» or «location-specific» work and remote freelance «cloudwork» (Woodcock & Graham 2020). However, as already mentioned, an important additional category within platform-mediated labour is that of the various content creators working within the social media and attention economy — as identified by Jarrett (2022) — which I think highlights important continuities between platform-mediated labour that is formally recognised as such and the unrecognised free labour of users, which has become increasingly platform-mediated.

The first type of platform-mediated labour is defined by two main characteristics: that of being «geographically tethered» or «location-specific» (Woodcock & Graham 2020), and that of being mobilised «on demand» (Casilli 2020). This category includes delivery work, ride sharing and taxi services, domestic and care work, as well as a variety of on-demand manual tasks organised through platforms like TaskRabbit.1 My research looks at this type of platform-mediated labour mainly thought the study of food delivery platforms like Uber Eats and Deliveroo, who connect customers and couriers with restaurants or takeaway outlets through geo-positioning systems. Restaurants usually use multiple delivery platforms to get their food to customers. The couriers provide the delivery service on an on-demand basis using their own vehicles — generally bicycles, e-bikes, motorcycles or cars — indicating their preferred method to the platform through their profile. Most often classified as independent contractors, couriers are paid piece rates calculated for each delivery on the basis of a combination of factors. These generally include distance, time, location, level of demand and an array of other variables — like weather conditions — which tend to be factored into the calculation of "boosts" and other bonuses. These are deployed by platforms to incentivise workers to make their labour available at certain times and locations in order to match forecasted customer demand. A small share of delivery couriers are directly employed by a platform and are thus paid an hourly wage, and entitled to standard employment benefits like minimum wage, sick pay, paid leave and national insurance contributions — however being

[1] As of November 2023, Uber has reportedly been testing Uber Tasks, an on demand task-based service that allows users to hire freelance workers to complete a range of everyday household chores and projects (Weatherbed 2023).

this the condition of a minority share of delivery workers, it was not the specific object of my fieldwork.

In order to efficiently manage and organise their labour, platforms are constantly monitoring and tracking the activities of workers — as I will discuss extensively throughout the thesis, the surveillance of labour is fundamental to its coordination. While working on demand as independent contractors seems to grant a higher flexibility in terms of schedule, previous research highlights how platforms tend to not only incentivise the availability of workers during busier times, but also penalise those who don't conform to certain rhythms of work (Cant 2020; Casilli 2020; Jarrett 2022; Rosenblat & Stark 2016; Woodcock & Graham 2020).

The second type of platform-mediated labour identifies work that is carried out remotely through information communication technologies, and it includes what is generally defined as «microwork», «clickwork» or «crowdwork» (Casilli 2020; Irani 2015; Tubaro et al. 2020), as well as other types of online freelance work like translation, text editing, and simple programming or graphic design tasks — usually mediated by platforms like Upwork, Freelancer or Fiverr (Qiu et al 2014; Jarrett 2022; Woodcock & Graham 2020). Given its more specific character, microwork will be more closely considered within this thesis. Microwork usually consists of a series of small tasks that revolve around the production, cleaning and validation of data — which means that workers might be required to: upload pictures, respond to surveys, produce or translate short texts (data entry); annotate, tag and label content such as images or videos (data cleaning); review, validate and correct algorithmically formulated solutions to queries (data validation). Workers are usually paid small piece wages for competing these tasks. The tasks might be made available through platforms like Amazon Mechanical Turk, Clickworker or Appen, by large tech companies but also smaller organisations or even individuals.

They are usually aimed at assembling, formatting and increasing the usability of datasets, which are often used to train and develop machine learning models. This model is generally described through expressions like «human-in-the-loop» or «human-as-a-service». Here, micro-tasks that are configured as «Human Intelligence Tasks» (or HITs) and outsourced to a globally distributed crowd of workers, in order to produce datasets that are instrumental to the development and operations of so-called artificial intelligence (Irani 2015; Quaranta 2021). Mary Gray and Siddharth Suri used the term «ghost work» to describe this invisible labour enabling the illusion of an autonomous AI:

> *«Beyond some basic decisions, today's artificial intelligence can't function without humans in the loop. Whether it's delivering a relevant newsfeed or carrying out a complicated texted-in pizza order, when the artificial intelligence (AI) trips up or can't finish the job, thousands of businesses call on people to quietly complete the project. This new digital assembly line aggregates the collective input of distributed workers, ships pieces of projects rather than products, and operates across a host of economic sectors at all times of the day and night.»* (Gray & Suri 2019, p.ix)

The Amazon Mechanical Turk was the platform that pioneered this model, providing clients with «artificial artificial intelligence» through access to «a global, on-demand, 24x7 workforce», a reserve of «human» cognitive qualities to integrate «in-the-loop» of machine learning cycles (mturk.com). Seeking to optimise previous and inefficient software solutions for scanning its inventory for double entries, Amazon had already experimented with fragmenting such detail intensive operations into a myriad of micro-tasks and outsourcing them to a distributed crowd of poorly paid piece-workers (Bergvall-Kåreborn & Howcroft 2014). In 2005, the company decided to start offering access to this flexible, scalable workforce to other organisations and charge a commission for it, thus establishing a new form of labour outsourcing through a digital platform. Even the name of the service — referencing an 18th century automaton that *appeared* to be able to play chess automatically, while actually hiding a human player inside its mechanical body — somewhat cynically revealed the trick of human labour secretly sustaining the prodigy of artificial intelligence (Irani 2015; Casilli 2020). This has since become the standard model for micro-work, enabling the integration of human computational power «in-the-loop» of machine learning cycles (Quaranta 2021).

Although the model of microwork has often been presented as a way to facilitate access to the labour market for historically disadvantaged workers worldwide, it has usually been found in practice to exacerbate inequalities and exploitation — producing precarious workers not so much as active participants in the AI industry or the platform economy, but more as a digital proletariat, a delocalised reserve of click labour sustaining the artifice of artificial intelligence (Casilli 2020; Crawford 2021). Crucially, the global dimension of remote freelance cloudwork re-produces an unequal division of labour between economies of the so-called global north and global south that already characterised historical dynamics of delocalisation — which is something that will be discussed further within the thesis.

Algorithmic management

A key characteristic of labour-mediating platforms is the use of automated systems to coordinate, supervise and control labour. An early technical definition characterised algorithmic management as «software algorithms that assume managerial functions and surrounding institutional devices that support algorithms in practice» (Lee et al 2015). Ethnographic accounts of delivery work highlighted the power of such automated systems specifically in the case of geographically tethered platform labour, inasmuch as «algorithmic management makes possible immensely complex logistical processes that organise thousands of couriers going from hundreds of restaurants to tens of thousands of customers» (Cant 2020, p.144).

A growing body of organisational and management literature — for instance as surveyed and systematised by Kellogg, Valentine and Christin — has observed how algorithmic management systems enact a form of rational control that is distinct from previous forms of technical and bureaucratic control (2020). If already in the early 20th century the Fordist assembly line established a mechanical pace — where «the worker became nearly as much locked in place as the machinery» (Edwards 1991, p.114) — then Taylorist scientific management replaced the subjective eye of direct human supervision with an impersonal technological gaze, evaluating work through the quantification and recording of time, frequency and accuracy (Kellogg et al. 2020; Veen at al. 2020). The bureaucratic type of control that later became dominant during post-Fordism, tends to direct and evaluate work using more abstract tools, such as job descriptions, rules of conduct and performance reviews, employing metrics extensively, but often filtering them through the subjective judgement of supervisors, who also perform a type of emotional supervision. Bureaucratic control disciplines the worker through a soft architecture of rewards, incentives and penalties, promotions, and the assignment of more or less preferable tasks (Kellogg et al 2020). In light of this review, algorithmic management appears more pervasive than technical or bureaucratic control, acting through an array of technologies that are increasingly integrated into working tools, like smartphones and scanners, or directly connected to workers' bodies, like wearable technologies (Delfanti 2021; Kellogg et al 2020). These management devices intimately surveil and quantify workers' bodies and actions, via sensors, accelerometers, GPS tracking, interfaces, cameras, image recognition models and various natural language processing techniques. Algorithmic management directs work through the platform's choice architecture, it evaluates performance through rating, ranking and sorting, and disciplines labour through

reward systems, incentives and penalties, automatic down- or up-grading, or even direct replacement. (Cant 2020; Kellogg et al. 2020).

The main differences with technical and bureaucratic control seem to lie in the dynamic and real-time character that bureaucratic auditing assumes under algorithmic management, in the opacity and informational asymmetry of managerial decisions, and in the dis-intermediation from direct supervision (Casilli 2020; Rosenblat & Stark 2016; Veen et al 2020; Zehle & Rossiter 2016). Another critical feature of algorithmic management is its black-boxed character, which establishes a distinct power imbalance between labour and automated corporate decisional systems (Pasquale 2015; Pirone et al 2022). In fact, workers only have a limited understanding of the logic of management, experiencing command as largely impersonal and decontextualised, while algorithmic black boxes maintain constant oversight and control over workers' conduct through data harvesting and surveillance technologies (Into the Black Box 2022; Zehle & Rossiter 2016).

Critical perspectives on platform labour

A central issue of platform labour is that of insufficient pay. The status of platform workers as "independent contractors" rather than stable employees is what formally enables their poor earnings, which often fall well below minimum wage. However, a more technical reason for the under-compensation of platform labour is the amount of unpaid time that workers are required to sustain in order to even access paid work. In the case of geographically tethered on demand labour, the idle time that workers spend waiting for "gigs", or moving towards areas with higher demand or more generous bonuses, is unrecognised as productive of value and therefore unremunerated. Within the model of the gig economy, all this waiting time is framed as a necessary investment of the self-entrepreneur for navigating the marketplace and positioning themselves in the optimal state to be allocated a paid gig. This unpaid time, during which workers are technically *at work* — they are "online" on the app and the thus the platform is harvesting data from their activity — but not *formally* engaged in a gig, is referred to by Uber drivers as «dead miles», which according to research can take up to two thirds of the entire workday (Rosenblat & Stark 2016). Similarly, in the case of freelance cloudwork, one third of the total time workers spend on platforms — on average 27 hours per week — is dedicated to unremunerated activities, like searching for tasks, understanding assignments and preparing to execute them, waiting for the interface to load, or trying to carry out poorly

explained tasks before deciding to abandon them (International Labour Organization 2021). The critical importance of this unpaid labour will be extensively discussed within my thesis.

The mainstream narrative around the gig economy assumes most people do this type of work as an additional source of earnings, using their surplus of time and resources (Botsman & Rogers 2010; Rifkin 2015). Such assumptions overlook how gig work has increasingly become a key source of income for many. The macro trend of declining economic growth over the last decades has converged with the rise of digital platforms and the dynamic control of the workforce they facilitate. This convergence has accelerated the already ongoing disarticulated hypertrophy of service labour, which combined the intensified flexibility, exploitation and deskilling of workers by introducing new forms of gig labour that scrape small quantities of surplus value from increasing numbers of people, who are generally unable to access sufficiently waged and stable work (Bernards & Soederberg 2021; Woodcock & Graham 2020). Considering such long-term economic and historical trends in relation to the technological promise of automation freeing the human first from undesirable work, and then potentially from work *tout court*, it is interesting to note how what is being automated is not so much labour per se but rather the management and bureaucratic techniques of control over the working class (Benanav 2022). Despite capital's fantasy to free itself from living labour through machinery, new technologies seem more geared toward automated and systematic surveillance and control (Casilli 2020). A recent patent filed by Amazon for a modular inventory system for its warehouses, openly acknowledges the physical and financial limits of labour-automating machinery, describing automation as «expensive and time-consuming to implement, unlike a human workforce, which can be allocated according to need» (Delfanti 2021). Because digital technologies and their ways of knowing facilitate an increasingly granular control over a distributed and dispersed labor force, researchers have noted how the gig economy operates as a laboratory through which new techniques of management, control, exploitation and extraction are tested and refined (Cant 2020; Woodcock & Graham 2020). This is why, despite being not nearly as numerically dominant as industrial work was in the Fordist era, platform labour seems such a significant area to understand the present and future relations between labour and technology.

The platform architecture also produces certain relationships between users in different positions, according to the diagrams of social organisation that platforms are programmed to enact. The characteristic division of labour of the gig economy also reproduces a discursive hierarchy between putatively dull, repetitive, undesirable, low-skilled work, and the innovative, aspirational, high-skilled work of designers, creatives, programmers, engineers

(Atanasoski & Vora 2019; Irani 2015). By integrating labour as part of an opaque service infrastructure, undesirable work is figured as an instrument to be employed by the intentional hand of the aspirational, high-skilled subject, who can mobilise it from two sides, in the double capacity of either programmer of the platform or user of the service. This pattern is not entirely new of course. This hierarchical division maps at least partially onto the traditional distinction between white collar work and blue collar or service work. However, the post-Fordist tendency to rely on delocalised, deskilled and precarious labour is possibly intensified by the management and organisational processes enabled by digital platforms. For instance, more and more middle rank jobs in the global IT industry have moved to developing economies, blurring the lines between skilled, «self-programmable» work and disposable work. The Chinese and Indian context for example has seen the emergence of the category of «grey collar» workers who perform «simplified tasks in the new information industry» which are usually quite repetitive and labour-intensive in nature, including software testing, low-end graphic design, quality control, database input, and simple micro programming — and that are increasingly organised through digital platforms (Qiu et al, 2014).

Automated management also serves a symbolic purpose, which is not less materially important. In fact, it's advantageous for what are essentially labour brokering companies to be perceived as technology companies from investors, in order to attract more generous capital investment. In other words, for *human-as-a-service* to look like *software-as-a-service*, labour must recede in the background, while its automated organisation through software is foregrounded. What a software company promises investors is the capacity to scale their operations quickly due to their nimble operative structure. The ideal growth trajectory for a "lean platform" operating in the gig or sharing economy is to formalise an semi-informal economic sector — think of short range logistics, short-term lettings, domestic labour, or the informal sharing of surplus space, goods and resources — aggregate supply and demand into one multisided market platform, benefit from network effects, and scale globally aspiring to a position of semi-monopoly.[2] The prospect of quickly-scalable multi-sided markets has been so appealing to financial investors over the last decade, that some of the most successful

[2] The prospect of this formula is what fuels the scaling financial valuations for companies of the app economy, linking them to higher multipliers, which are essentially rule-of-thumb quantities investors use to estimate the value of companies, based on the potential relation between capital investment and market value — which is not necessarily a function of profits of revenues, but rather of projections of future resale.

companies of the gig or sharing economy have operated for years without making a profit, simply fuelled by capital investment.[3]

Access & extraction

At the 2021 Architecture Biennale in Venice, the Austrian pavilion interrogated the urban impact of digital platforms, and how platforming and urbanisation intertwine in shaping everyday life practices. The main section opened with a series of floating panels declaring that «Access Is The New Capital» and posed questions regarding how and to whom platforms distribute access and possibilities according to models of subscription and rent (Mörtenböck & Mooshammer 2021). As the emergence of the platform society re-configures everyday life as an assemblage of services, access becomes a key concept for understanding the relationships between different users and technological infrastructures. In a certain sense, the platform economy model is based on the idea of purchasing access to — which really means inclusion into — a position of mastery over technological systems. This mastery is exercised via smooth, unproblematic, leisurely interaction with user interfaces that are currently articulated around touch and language recognition, increasingly becoming vocal and ambient.

Our interaction with technological systems might appear entirely localised in clearly contained interfaces, «but in this fleeting moment of interaction, a vast matrix of capacities is invoked: interlaced chains of resource extraction, human labor and algorithmic processing across networks of mining, logistics, distribution, prediction and optimization. The scale of this system is almost beyond human imagining» (Crawford & Joler 2018). A number of authors understand the relationship between contemporary techno-capitalism and this assemblage of resources as one that is based on an extractive dynamic. Vincent Mosco highlighted the contradiction between the ethereal metaphor of «the cloud» — used to denote the infrastructure of off-site computing services that is fundamental to the platform economy — and the reality of mineral extraction and dispossession that materially sustain the could computing industry (Mosco 2014). Mezzadra and Neilson have analysed the «extractive operations» sustaining contemporary capitalism, from the exploitation of labour in resource extraction to the «mining» and commodification of data from everyday life (2017). In recent years, different critiques have focused on how artificial intelligence systems are grounded in the extraction of different types of human labour, data, and material resources. Matteo

[3] Uber, the household name of the sector, recorded its first operating profit only in 2021, after over a decade in business (Bellon & Balu, 2021). Deliveroo, another major player, has yet to turn a profit (Hargreaves, 2022; Yahoo Finance 2023).

Pasquinelli and Vladan Joler traced the social origins of artificial intelligence, which in their analysis functions as an instrument of knowledge extraction and mechanisation of reason (Pasquinelli & Joler 2021). In a similar work with Joler, Kate Crawford had mapped out the fractal and multi-scalar forms of extractivism mobilised by the AI industry, «one that reaches into the furthest corners of the biosphere and the deepest layers of human cognitive and affective being» (Crawford & Joler 2018).

The intensive extraction of non-renewable resources and minerals that sustains the global technological ecosystem highlights the environmental implications of ubiquitous computing. A certain continuity between technics and geology is highlighted not just by the mineral extraction needed to make devices work, but also by how these devices return to the earth as residue and electronic waste (Gabrys 2011). In regards to these dynamics, Jussi Parikka suggests for example to understand media technologies themselves as geological processes (2015). The political and economic impact of the mineral and rare metals market on local politics, dispossession, war and violent conflict — evident in the histories of coltan mines in Congo, or Lithium mines in Chile and Bolivia — shows how deeply the digital is entangled with material processes across multiple scales (Crawford & Joler 2018; Mantz 2008). However, the global mineral supply chain that subtends the manufacturing of technology, as well as the logistics of waste that follow its disposal from the consumer market, are so intricate that even dominant corporations and international organisations struggle to trace and understand these flows.

In the context of this research, the relationship between technology and natural resources foregrounds an even deeper connection between extractive operations and exploitation of labour. It's important to understand how extractive operations encompass different materialities, from the harnessing and abstraction of data to the violent mining of minerals from the ground. Similarly, the exploitation of labour in contemporary techno-capitalism ranges

> *«from indentured labor in mines for extracting the minerals that form the physical basis of information technologies; to the work of strictly controlled and sometimes dangerous hardware manufacturing and assembly processes in Chinese factories; to exploited outsourced cognitive workers in developing countries labelling AI training data sets; to the informal physical workers cleaning up toxic waste dumps» (Crawford & Joler 2018).*

At every level of its operations, the obfuscated exploitation of human and non-human embodiment seems to ground the construction of a disembodied model of mastery.

Preliminary observations on embodiment & abstraction

The cultural logic of the app-mediated service economy is centred around the figure of a user — think of "user experience" or "graphical user interfaces" — experiencing the operations of their devices as silent, frictionless connection. We've seen how a certain illusion of seamlessness, fundamental to the ideology of user access, depends on the invisibilisation of the environmental footprint and the exploited labour sustaining the platform economy. This constructs a «myth of immaterial media» where «consumer goods have no history: no mines, no freighting, and no waste» (Cubitt 2017, p.13). That of technologically enabled disembodiment is one of the most pervasive fantasies underlying contemporary informational imaginaries. It is evidently at play within the transhumanist ambition to transcend biological finitude, liberating our consciousness from the material body and uploading our mind to a computational substrate. Speculated by popular authors from Ray Kurzweil to Hans Moravec, this fantasy promises to realise one of the oldest fantasies of humanity: the defeat of death and conquest of immortality.[4] This line of thought fundamentally sees any material embodiment of information as purely incidental to its most essential immaterial nature, rather than as a fundamental state for its existence — and therefore understands the bodily substrate of consciousness as a temporary accident of evolution that we might soon update or do away with. N. Katherine Hayles critiques this hierarchical conceptualisation of information and materiality as a historical construction that gained particular momentum during the development of cybernetics and information theory in the aftermath of World War II. Claude Shannon famously formalised information as a mathematical function, breaking its connection to meaning and semantic content. Although Shannon's theory actually identifies signal as the material econding of information, essential to its transmission, his abstract conceptualisation made way for information to be widely understood as a free-floating entity separate from its

[4] For instance, Nick Bostrom argued that «being an upload would have many potential advantages, such as the ability to make back-up copies of oneself […] and the ability to transmit oneself as information at the speed of light. Uploads might live either in virtual reality or directly in physical reality by controlling a robot proxy» (Bostrom, 2005).

material instantiation[5] (Gleick 2012). Fantasies of immateriality and disembodiment are based on a false information-materiality dichotomy that borrows directly from the older hierarchical dichotomy of spirit and matter (Hayles 1999). We can see the same dynamic reproduced by the contemporary belief in artificial intelligence as fundamentally separate from the resources and material relations that sustain it — an intelligence autonomous from embodiment.

The assemblage of systems that characterise the platform economy and planetary logistics are animated by an ideological promise already expressed by the value abstraction, and accelerated by digitality: the complete fungibility and control over labour and commodities by way of informatic representation (Franklin 2021). This promise was renewed by a cybernetic epistemology where information was constructed, in its primacy over matter, as «a kind of bodiless fluid that could flow between different substrates without loss of meaning or form» (Hayles 1999, p.xi). The technological infrastructure of planetary supply chains, digital marketplaces, and artificial intelligence, similarly promises to free value from the limits of material embodiment, to fully realise the «phantom-like» ontology of the «automated subject» (Marx 1976).

Seb Franklin's idea of the «informatics of value» highlights a certain resonance between value and digitality as linked modes of abstraction (2021). Marxian value is the expression of abstract labour, what is computed from human activity. This abstraction is the common substance that allows different commodities — including labour — to appear as if they were qualitatively equal (Marx 1976). Value is described as a «phantom-like objectivity» that abstracts concrete social forms, rendering them commensurable and thus interconnected through a value relation (Marx 1976, p.128). This abstraction remains somehow separate from concrete entities while still materially effecting the relationships between them, enabling capitalist social synthesis. In this light, Franklin argues that the core operations of value resemble the logic of digital computation, as value is essentially «computed» from a concrete substrata, and the abstract indifference of exchange value in relation to matter mirrors that of information as theorised by Claude Shannon in his mathematical theory (Franklin 2021). However, as Franklin also notes, the digital is not simply an allegory of value, but rather the two are in a recursive historical relationship: value appears already informatic centuries before cybernetics, and then the cybernetic ways of knowing and seeing produce new

[5] In the 1950s, Norbert Wiener suggested the possibility of telegraphing a human being, which echoes in cultural tropes like Star Trek's 'beam me up, Scotty' where the body is teleported by disappearing into a cathode ray tube. By the 1990s, MIT's AI laboratory co-founder Marvin Minsky discussed the possibility of extracting complete human memories from the brain to import them, intact and unchanged, to computer disks (Hayles 1999).

techniques for the control and management of value-mediated social organisation (Franklin 2021). Value and digitality thus produce similarly idealised models of material relations. The discrete state of any digital abstraction relies on the support of a continuous material substrate, which is often systematically obscured.[6] Although both value and digitality construct idealised representations of concrete relations, they still end up determining to some extent the shape of the material and social assemblages that ground their abstractions. In the case of value, the representation of an idealised state of relations necessarily obscures material conditions — such as the physical degradation of labour — but also historical factors — like race, gender and capacity — on which it is nonetheless dependent. «The concrete grounds the abstract, and the abstract disciplines the concrete» (Franklin 2021, p.15).

[6] The history of cybernetics shows how computing relies on idealised representations of materiality. Already Shannon, in his 1937 masters' thesis at MIT, which translates 19th century Boolean logic into the electrical circuits that are in every digital computer, is careful to establish rigorous relations between abstract numerical logic and the engineering of transistors and silicon chips, accounting for significant material differences related to timing, energy, and heat (Sack 2019). Later, Von Neumann, establishing how abstract logical propositions are translated into electrical systems, notes how «there is one important difference between ordinary logic and the automata which represent it. Time never occurs in logic, but every network or nervous system has a definite time lag between the input signal and the output response. […] The representative automaton contains more than the content of the logical proposition which it symbolizes» (2016, p.44). The relationship between logic and the engineered automaton can be seen at least on one level as analogous to the one between digital abstraction and analog substrate (Franklin 2021). This logic of digitality is fundamental to the promise of mastery over concrete social relations — which is exemplified by a fetishism for code and software as magically powerful entities, rooted in the privileging of programming and trivialisation of execution (Chun 2011, 2016). Chun — echoing von Neumann's notes on logic and automata — highlights how this view of code tends to erase «the empirical difference between the higher symbolic machine and the lower interactions of voltages» (2011, p.306). In fact, in programming, task completion needs to account for the translation of logic into execution, which is calculated as «latency», a measure of the delay and a key indicator of performance within computer systems — which must be reduced to an imperceptible minimum in order for interaction to appear seamless and continuous (Irani 2015; Sack 2019; von Neumann 2016). In light of these analogies, any suggested equivalence between representation and substrate is nothing short of a fantasy. Objects and processes appear seamlessly fungible only in the abstract, while material social and technical reality inevitably lag behind their representative reduction.

Media beyond devices and determinacy

Within the realm of social sciences and humanities, the study of media technologies often tends to limit its inquiry to what specific media do, to the immediate effects they directly produce or to how certain technologies are designed and engineered. Usually in similar accounts, mediation simply signifies inter-mediation between discrete entities, subjects or things, and thus media objects just constitute the communication devices carrying information from one point to another. An interesting inquiry into media and mediation jointly carried out by Alexander Galloway, Eugene Thacker and McKenzie Wark critically highlights how modern media studies generally understand media along the thematic axes of «devices» and «determinacy»: by which they mean that usually the notion of media is conceptually limited to media *devices*, and that these devices are understood as either *determining* or determined *by* certain social or cultural conditions. By this token, media seem to necessarily exist in hierarchical relations to their makers and their consumers, in turn establishing a vertical sorting between media-savvy individuals extending their power through their tools, and externally determined victims of media deception and manipulation (Galloway et al 2013).

However, a lineage of critical theory within media and cultural studies has also extensively explored media and mediation as conceptual objects in their own right. For instance, Galloway, Thacker and Wark in the above-mentioned work, consider how «media force us to think less about things like senders and receivers, and more about questions of channels and protocols […] about structures of interaction» (Galloway et al 2013, p.2). Addressing mediation as a transformative force, both affecting and emerging from the conditions of possibility of everyday life, inevitably raises questions about the technical, economic and political dimension of media forms. As the increasingly pervasive presence of media technologies within social and biological life intensifies our engagement with mediation, more and more aspects of life can be understood as "mediated"; as undergoing processes of transformation and interaction similar to those typical of media forms. In light of this, Sarah Kember and Joanna Zylinska thematise mediation as a «a key trope for understanding and articulating our being in, and becoming with, the technological world» whereby media forms assume a multiplicity of not only technical but social, psychical and aesthetic aspects (2012).

Mediation(s)

In his Keywords, Raymond Williams addresses the concept of mediation and its use in modern social theory. Interestingly, he notes how mediation takes on its general sense of «indirect connection» also in traditional Marxist thought, where it is «often used in an unfavourable sense, in a contrast between real and mediated relations» — as one of the essential processes of ideology (1985, p.206). According to Williams, this notion of mediation echoes in modern mass media studies as well as in psychoanalytic thought, whereby it acts within an assumed dualism between consciousness and reality. He credits Adorno for recognising mediation in a more positive and autonomous sense, as being «in the object itself, not something between the object and that to which it is brought». He summarises the complexity of mediation by delineating three main senses in which it is used: «(1) the political sense of intermediary action designed to bring about reconciliation or agreement; (2) the dualist sense, of an activity which expresses, either indirectly or deviously and misleadingly (and thus often in a falsely reconciling way), a relationship between otherwise separated facts and actions and experiences; (3) the formalist sense, of an activity which directly expresses otherwise unexpressed relations» (Williams 1985, p.206).

While the first sense resembles a more generic and literal definition of mediation, the second refers to a historically very influential understanding of mediation, as a process that while enabling knowledge of a certain reality, simultaneously stands in the way of a direct relation with it. This conceptualisation — which Galloway, Thacker and Wark trace back to Plato's *Phaedrus* — defines mediation as a separation between medium and self, as a correlating agent that filters and manipulates immediate perception or knowledge of the real. This notion of mediation as opposed to immediacy accompanies a model of communication concerned with truth and meaning, whereby immediacy is seen as preferable to mediacy, presence to absence, the thing itself to its representation (Galloway et al 2013). This representational logic of mediation as potentially conductive of deception resonates with Marxist readings of commodity fetishism, which critique the deceptive form of appearance in relation to the material reality of value creation, as well as with Freudian psychoanalysis, where the unconscious constitutes the latent reality behind the visible layer of consciousness. What Williams refers to as the third, formalist sense, in which mediation expresses the latent relations of an object, seems to derive more from Adorno's perspective, according to which there is nothing that isn't *already* mediated, at least by thought, experience or knowledge as socially produced (Williams 1985) — a perspective that is also similarly articulated in other modern accounts.

Alexander Galloway interprets these historical notions of media through what he considers the first two key figures of mediation. One is Hermes as the figure of the messenger, which hermeneutics and critical reading stem from. Hermes is the threshold, the signifier, the agent of transit, representation and circulation. The other is Iris, goddess of transparent mediation, pure communication and immediacy. If Hermes works through text and interpretation, Iris symbolises mediation as visuality, image and spectacle, as well as the excessive surplus of communication theorised by post-structuralist thought (Galloway et al 2013). Together these figures encompass the canonical field of media studies, where media are either complicated or clear, foreign or immediate, but always considered in their capacity to intervene on reality as it already exists.

Traces of this dualistic and deterministic paradigm also emerge in other modern theories of media, such as that of Marshall McLuhan, where media are extensions of man; agents of association, synthesis or fragmentation, with the formative power of determining transformations in society, although not so much at a discursive or conceptual level, but first and foremost at the level of patterns of perception and of the human sensorium (McLuhan 1994). Another fundamental influence for modern media studies is the model of communication emerging from postwar cybernetics and information theory, especially as formulated by Claude Shannon and Warren Weaver, where the medium functions as a channel for information, at once separating and connecting a sender and a receiver. The medium/channel works as a means for communicating a message — not necessarily anchored on meaning — encoded and carried through signal (Gleick 2012; Hayles 1999). This informatic notion of communication anticipates more properly cybernetic and computational models of mediation, while still remaining compatible with some of the media tropes delineated by Williams or symbolised by Galloway's figures.

Digital media

More recently, authors within the field of so-called "new media" studies focus more specifically on software and interfaces as conceptual objects, as well as on how digital media translate and re-synthesise older forms into new — thus shifting their attention beyond discrete media objects and towards what Lev Manovic describes as «meta-media» (Manovic 2002; 2005). Jay David Bolter and Richard Grusin understand «new» media, and their relation to earlier forms, through the concept of «remediation», which, they argue, functions through a «double logic»: on the one hand, «immediacy» as a form of visual mediation in

which the medium tends to disappear to produce an immersive encounter with the object of (re)mediation; on the other, «hypermediacy» as a multiplication of media forms and practices which does not hinder immediacy, but rather enables it. In this seemingly contradictory double logic, mediation becomes immediate precisely by intensifying, erasing its traces in the very act of multiplying its forms. Bolter and Grusin argue that remediation doesn't just refashion older media, nor does it neutrally represent information or communicate messages, but rather refers to the affective experience of an immediate encounter with the real through hyper-mediation (Bolter & Grusin 1998).

By taking the focus away from devices and determinacy — or perhaps in an attempt to start dissolving the boundaries between devices — digital media studies address the question of mediation at a more fundamental level, «as a process or event prior to and ultimately not reducible to particular media technologies. Mediation operates physically and materially as an object, event, or process in the world» (Grusin 2015, p.126). In an attempt to break with the deterministic binaries of Hermes and Iris, and with the bi-directionality of media as conductors for communication, Galloway proposes the third figure of the Furies; a paradigm for understanding mediation as multiplicity, agitation and energy. «Hermeneutic interpretation and immanent iridescence are, at the turn of the millennium, gradually withering away; ascending in their place is the infuriation of distributed systems» (Galloway et al 2013, p.62). This paradigm expresses an incontinence of forms that is better suited for dealing with complex systems like swarms, networks and assemblages as emerging modes of mediation, dismembering the traditional consistency of the human-scale body in favour of a distributed and heterogeneous totality.

Following this de-centring of mediation from the human, Eugene Thacker proposes the concept of «dark media» to understand mediation beyond the human communicational apparatus of the sender/receiver and channel/message diagram. Non-human dark media communicate autonomously across themselves, and their relation to the human produces the «weird», the paradox of connecting with something inaccessible to the senses, «the shadowy absence at the core of all mediation» (Galloway et al 2013, p.84). Here, media and communication mediate across different not just epistemological, but ontological registers. At the conclusion of their work, McKenzie Wark brings together Galloway's and Thacker's propositions through the concepts of «furious media» and «xeno-communication». This alien mode of mediation takes the form of «the irruption within a mundane communication of something inhuman» and simultaneously of «an alien mode of communication itself, which nevertheless seems legible» (Galloway et al 2013, p.161).

From this perspective, mediation — while still functioning as a mode of communication — also significantly puts us in contact with an alien outside, revealing the technical world as not entirely centred around the human. However, this alien mode of being does not constitute some completely withdrawn ontological order, but still fuses with the human at the thresholds of everyday mediations, especially in their opacity and otherness, re-organising human and nonhuman into new arrangements.

Ontological mediation, or mediation as becoming

Working towards a more radical conceptualisation, some theoretical approaches have been focusing on the ontological status of mediation, trying to challenge what Karen Barad has called representationalism; «the belief in the ontological distinction between representations and that which they purport to represent» (Barad 2007, p. 46). Drawing from the philosophical work of authors like Alfred North Whitehead, Gilles Deleuze or Henri Bergson, this lineage of thought understands mediation not as intervening between formed entities, but rather as the very process of becoming by which subjects and objects emerge within the world. The totality of reality, as an extensive continuum of difference and intensities, can be understood as an immanent process of (im)mediation — which re-situates mediation not only as part of the world, but indeed *as world*. Thus «mediation and communication come to be understood as a general condition of the world» (Murphie 2019, p.22). Not only mediation is not opposed to immediacy, but it's also itself immediate in the sense of radically immanent to the real. In diametrical opposition to the idea, previously mentioned, that there is nothing that is not *already mediated*, this line of approach suggests instead that «there is nothing *that is not mediation* and that mediation itself is immediate» (Grusin 2015, p.135).

However, as acknowledged for instance by Andrew Murphie, this expanded view of mediation seems to point to a complete dissolution of the categories of media and technology into a pure continuum, to the point where media coincide with the entire world (Murphie 2019). While interesting from a philosophical standpoint, this approach also tends to flatten the concept of mediation in a way that makes any empirical study of technological mediation in its specificity highly complicated. Therefore, for the purpose of this project, it might be worth adopting a working definition of mediation that takes into account its multiplicity and insufficiency.

The insufficiency of mediation

As the contemporary technical world challenges conventional ideas about media, a critical perspective on media studies highlights what Galloway, Thacker and Wark individuate as a certain «insufficiency of mediation» (Galloway et al 2013). Resolving this issue is perhaps the task of philosophical work, but within the scope of this research it might be useful to accept this insufficiency, while taking it into critical consideration. Working with mediation as a multi-faceted and always insufficient concept — that can be nonetheless conceptually functioning — means understanding it as a fundamental process underlying the functioning of media, while still thinking about it in relation to technical objects and communication, addressing media in its complexity and multiplicity. In fact, within existing media objects and formats, we can see elements of all modes of mediation operating in combination: the representational model and that of immediacy, both synthesised in remediation; the fury of distributed systems and the weirdness of an alien outside leaking through everyday communication.

For a critical study of contemporary media environments, it's important to address mediation in its material embodiment and its relation to collectivity. In fact, media function technically, materially and socially to modulate individual and collective being across assemblages of humans and nonhumans. The work of Adrian Mackenzie on transduction and transmission, as well as that of Anna Munster on signal and transmateriality — which will both be discussed later in the thesis — interrogates these modes of mediation to understand the embodied experience of contemporary media environments. Mediation here is neither neutral nor transparent, but something that is materially, psychically, aesthetically — and therefore politically — experienced.

However, while contingent and embodied forms of mediation need to be considered, it is also interesting to think of mediation as an underlying process by which technical objects exceed the familiar everydayness of their use, generating connections to other scales of operation and temporalities. In fact, mediation can affect the entities and processes it comes into contact with by shaping them as bearers or enablers of social relations and processes. This means that different types of devices, protocols, behaviours and mechanisms can *become* media, or be «activated as mediation» (Fuller & Goffey 2012). Thus, while mediation constitutes the underlying processual mode of being of technology, its can also stabilise in concrete or abstract parts of the socio-technical environment, through the taking form of objects, boundaries, connections or representations. In this sense, mediation also reveals the emergent and unfixed character of media forms.

Mediation within this project

The importance of this way of thinking about media and mediation is at least twofold. On the one hand, this perspective helps the development a certain critical sensibility, which is useful to the study of the operations of power, in which mediation is deep at work. In fact, as highlighted by Fuller and Goffey, media processes can often be characterised by a degree of greyness — a «minimisation of perceptual and affective contrast» — by which their functioning can easily go unnoticed, passing below the threshold of critical scrutiny (2012). While often social sciences tend to study digital media by looking at what happens ostensibly outside and around screens, my project tries to take into account aspects of mediation and computation that might be sometimes neglected by sociologists and ethnographers.Taking platform labour as an object of study, my research is inevitably situated within a lineage of Marxist critique that historically expanded from the factory to the whole of society — as will be extensively discussed later on. With this movement, the site and the conceptual object of critique also has expanded from strictly political economy to the cultural and technical artefacts of everyday life.

But a critical understanding of mediation can also be useful to investigate another crucial aspect of contemporary technological systems, which has to do with their mode of functioning and their emergence; not as isolated products of engineering, but in synchrony with other socio-technical forms. In fact, if we understand mediation as something that exceeds the individual utility of discrete technological forms, then even specific technical objects can be seen as testimonies of a mode of functioning that exists beyond the engineering principles by which a mechanism operates. In fact, by revealing the emergent character of technical objects, mediation can help us understand their relation to the social and cultural forms they emerge in synchrony with, as well as their role as components of broader technical ensembles. Here I am drawing some conceptual tools from the work of Gilbert Simondon on the mode of existence of technical objects and technical evolution, which is worth briefly reviewing.

Mediation and socio-technical individuation

The concept of mediation has affinities with Simondon's ideas of ontogenetic development, transduction and individuation. For Simondon, individuation is a fundamental dimension of being, a process by which an entity resolves tensions or incompatibilities with

the surrounding environment — its milieu — and that modifies simultaneously both the individuating entity and the milieu. Through individuation, their relation evolves through phases of equilibrium or metastability, constituting an associated individual-milieu system. Individuation is simultaneously psychic and collective, constituted across and between the interior relation to the self and the exterior relation to the world.[7] The resolution of tensions by which new phases of metastability are reached, which is the essence of individuation, is enabled by a charge of pre-individual potential carried by all things as a residue of their initial individuation. This potential grounds what Simondon defines as the transindividual: something that is both interior to an individual and common to the collective (Combes 2012; Simondon 1992).

Similarly to the idea — previously reviewed — of mediation as an ontological process of immediate becoming, as the general condition of reality, the concept of individuation can also be understood as a mode of mediation. Simondon himself notes how individuation or ontogenetic development can be considered as mediation, as it requires the constitution of a mediate order of magnitude between different energetic fields[8] (Simondon 1992). In a certain sense, the actualisation of transindividual potential also seems to function as a mode of mediation, connecting interiority and exteriority, individuality and collectivity, while also grounding ontogenetic development; the simultaneously psychic, social and technical individuation of systems of being. In light of this resonance between individuation and certain modes of mediation, all ontogenesis can be seen as mediation, pointing once again to a complete dissolution of the category of mediation into a pure continuum of becoming.

However, reading Simondon's theory of individuation together with his complementary thesis on technical objects is helpful to understand some specificities of technical individuation. I see this as useful to think about the evolution of technical systems not just as integrations of scientific principles and technical elements, but as repositories of social and cultural forms. In fact, Simondon sees technical individuation as the emergence of a qualitatively new mode of functioning from the coming into relation of different energetic forces. Here, a new operative synergy takes from through the actualisation of potential that was already present — even in cases of previous incompatibility or conflict. Within this

---

[7] Simondon's individuating subject is not conceived as pre-formed substance of thought, but more as a process of subjectivation, whereby the individual is constituted through psychic and collective relations of individuation (Combes 2012).

[8] This almost recalls mediation as defined by Williams in all three senses; as (1) bringing about reconciliation, (2) connecting separate experiences, and (3) expressing otherwise unexpressed relations.

model of individuation, mediation can be understood as the taking form of this synergic relation, as the coming together of certain conditions for the emergence of new socio-technical forms. For example, because a key condition for the emergence of industrial machines would be a certain division of labour (Marx 1976; Pasquinelli 2015; Simondon 2012), the conceptual discretisation of the labour process that enables this division can already be understood as a form of mediation of labour. Therefore mediation also reveals how beyond the functioning of discrete technical objects, their operations can be understood as stabilisations of certain relations between social and technical forms.

Simondon crucially understands this emergence of new forms through the schema of concretisation: the coming into relation, the effective coupling, of different elements, forms, and energetic fields into a functioning system. Within the schema of technical concretisation, human sociality acts as a transducer, an agent of correlation within ensembles of open machines. While the expression "concretisation" might suggest that an abstract pre-imagined technical solution is externalised in a concrete embodiment, this is precisely the model that individuation opposes, which is hylomorphism: the idea of imposing a pre-designed form upon inert matter by the moulding effect of engineering. In contrast with this idea, Simondon talks about concretisation as the schema of technical evolution. According to him, a more primitive technical objects is made of theoretical or material parts that function in relative isolation[9] — which makes their operation logically simpler but technically more complicated. In fact, the convergence of these functions causes technical problems of compatibility within a system. Progress from an abstract to a concrete mode of functioning is defined by the progressive reduction of this functional divergence, towards a unified and internally coherent system. While a more primitive technical object appears as the material translation of scientific notions, and functions in a generic — abstract — way, a more advanced technical object functions more specifically, becoming a more concrete form of *what it actually is*, autonomous from any abstract scientific principle. In fact, a perfected technical object exists increasingly as a milieu, as a ground for other structures, thanks to the higher «systematicity» of its constitutive forms (Simondon 2017).

Through this schema, Simondon understands the conditions of technical evolution. From certain socio-technical conditions, different elements and forms, that were previously discontinuous, come into relation, and couple by realising a new operative synergy. Their potential thus takes effect within their relation: different energetic fields resolve their incompatibilities as new forms of functioning start emerging, until a threshold is crossed and

[9] Closed to each other and only working together through the abstract schema of the technical object.

new metastability is achieved, in a new continuous mode of operation (Simondon 2017). Following this schema, he sees artisanal work as an abstract stage of production, where different functions have not yet realised an internal coherence, and are thus organised according to the external requirements of production as an abstract system. The emergence of industrial production then constitutes a more concrete technical stage, with greater internal coherence. It is not external requirements for standardisation that produce the assembly line, but rather the internal standardisation of labour functions that allows the industrial modality to emerge as a system.[10] Thus, the industrial modality acquires the power to affect social relations and progressively integrate them with its functioning.

Studying labour in relation to its technological mediation thus means trying to understand not only the operations of specific media within the labour process, but also their relation to the individuation of certain socio-technical systems. This means understanding the technical evolution of production in relation to political economy and class composition.[11] Returning to the example of industrial machinery, the emergence — individuation — of factory automata from the division of labour also functioned as a response to the rising insubordination of craftsmen, as a solution to automate the control of the labour process away from workers and crystallise it into machines, thus enabling the emergence of the industrial modality as a new metastable mode of functioning (Marx 1976; Simondon 2012; 2017). Authors associated with the Marxist current of *operaismo* have widely theorised the importance of class composition within the socio-technical evolution of capitalist forms. Although this analysis is completely absent from Simondon's account of technical evolution, I argue that integrating the conceptual tools of socio-technical individuation with the analysis of *operaismo* and *autonomia* can be particularly useful to understand the developments of capitalist production as re-codifications and concretisations of certain technical and social relations.

---

[10] Here, engineering is not the historical cause of technical invention, although it does help its emergence.

[11] That of class composition is an analytical framework developed within the Marxist movement *Operaismo* and later *Autonomia* throughout the 1960s and 70s. The process of composition can be understood in two parts: the «technical» organisation of labour power within relations of production, as variable capital; and the «political» composition and self-organisation of this labour against capital, as a working class. The leap from a certain socio-technical composition to a political class composition is what shapes workers' organised struggle and antagonism (Alquati 1975; Negri 1988). The framework of class composition is used to understand the feedback relation between organised workers' struggle and its displacement — or de-composition — by way of capitalist technical development. In fact, class composition needs to be understood as the core of *operaismo*'s "reversal of perspective"; whereby class struggle acts as the motor compelling capital to reconfigure value production in order to de-compose or capture any forces that disrupt or escape its functioning.

In fact, if it is true, as posited by Simondon, that «what resides in machines is human reality […] fixed and crystallised into working structures», then mediation is related technical evolution: to how technical systems integrate certain social forms into the systematic organisation of their functions over time (Simondon 2017, p.18). Therefore the transformations of labour as a social relation can be studied through its technological mediation — understood both as a process of communication and a process of individuation of certain socio-technical forms.

The mode of functioning of platform mediation

In light of this review of Simondon's conceptual frameworks, we can understand technical progress as the organisation of different functions and sometimes incompatible structures within the operations of an ensemble. Therefore, I propose to understand the model of the platform as a concretisation of pre-existing socio-technical forms, and to study platform mediation as an ongoing process of connection and synergic integration of media objects and social relations within an unfixed and emerging open system. Significantly, I think it's interesting to apply Simondon's conceptual tools to a less normative account of socio-technical reality: understanding the conditions of individuation and technical evolution through the historical relations between labour and capital — as analysed for instance within the lineage of *operaismo* — as well as by taking into account key critical perspectives from the field of digital media studies.

In doing this, it seems particularly interesting to receive some of Simondon't own intuitions regarding certain tendencies within the contemporary technical reality of open systems and ensembles — keeping in mind that his work dates back to the early days of information and cybernetics, whose evolution has since been studied by countless others. Simondon notes how, while primitive technical objects constitute «the translation into matter of a set of notions and scientific principles […] the physical translation of an intellectual system», evolution through concretisation brings the technical «closer to the mode of existence of natural objects», by which he means that the technical object loses its artificial character, which requires man to protect the technical by separating it from the natural world, and becomes capable of incorporating parts of the world as conditions of its functioning (Simondon 2017, p.49). In fact, while a more abstract technical object needs a regulative milieu — the laboratory, the workshop, the factory — the concrete technical object «frees itself and becomes naturalised» as it dynamically incorporates the milieu into itself through

the systematic organisation of its functions, to the point where its mode of functioning becomes its relation to other technical and natural objects (Simondon 2017, p.50).

This resonates with a lineage of Marxist thought, informed by some early intuitions formulated by *operaismo* but also by Deleuze and Guattari, whereby capitalist production progressively extends and naturalises valorisation as an immanent process within social relations, which are in turn increasingly re-made as labour through a re-composition of the labour-capital relationship beyond and away from the factory (Deleuze & Guattari 1983; Negri 1988; Thoburn 2002; Tronti 1962). For instance, Mario Tronti specifically theorises an extension of the Fordist-Taylorist factory model into a social system by which «the whole of society is turned into an articulation of production, that is, the whole of society lives as a function of the factory and the factory extends its exclusive domination to the whole of society» (Tronti 1962).

We can understand the evolution of capitalist production also through concretisation: through the synergic integration of separate and sometimes incompatible forms, always emerging and leaping into new temporary states of metastability. However, because valorisation is not only a technical object, but itself a socio-technical assemblage, it evolves in a less normative way, for instance in relation to the dynamics of class composition and struggle, as well as to processes of subjectivation and to the pragmatic re-appropriation of dominant logics by those who, in a more normative system, would appear as simply inert victims. Through this process of socio-technical individuation, the capitalist production evolves as an unfixed open system, which nonetheless produces specific stabilisations and concrete technical forms. I argue that platform mediation represents one of the most interesting of these forms in contemporary society. The scope of mediation and individuation particularly in the third chapter of this thesis, is understanding platform mediation in its specific operations, in its ongoing process of socio-technical individuation, as thus significantly in relation to living labour and its forms of subjectivation.

Lastly, a methodological note in light of this understanding of the role of mediation within the mode of existence of technical objects. Simondon already notes how the consequences of technical evolution and concretisation are not only technical and economical — for instance, decentralisation and economic integration — but also intellectual. In fact, since the mode of existence of evolved technical objects is analogous to that of the natural world — tending toward a sort of reformulation of what he described as the reticular unity between man, technics and nature — they can be studied inductively. No longer mere applications of scientific notions or simply deduced from engineering principles «they are testimony to a

certain mode of functioning» that exists without having been planned and that is not contained in specific scientific principles, but can only be discovered empirically (Simondon 2017). Working backwards to understand the correlation between forms and principles that grounds their individuation, concretised technical objects can be studied to understand the process of technical evolution not as a complete project, but as a tendency.

Research Methods

The aim of this section is to discuss the methods employed in this project, describing the research techniques, critically evaluating them, contextualising methodological choices, as well as discussing some of their limitations.

The research began with an auto-ethnographic engagement with platform labour, by which I worked as a courier for one of the main delivery platforms, in London, from September 2022 to January 2023, spending an average of 20 to 24 hours per week at work. Prior to that, for a period of three months between April and June 2022, I had already worked as a click-worker on a major microwork platform, completing several tasks on a daily basis in order to study the platform and the practice of work. A key focus of my ethnography was on the operations of platform technology within the everyday practice of labour, and on my embodied relations with technical objects like smartphones, sensors, interfaces and algorithms, but also other tools of work like bikes, thermal bags and various gadgets.

In order to add a heterogeneity of perspectives to my auto-ethnographic standpoint, during my time as a courier, I also conducted an ethnographic observations within workers' group chats and online forums. Specifically, I participated in a Discord server counting hundreds of members — mostly based in London but also from other UK cities and some even abroad — a popular subreddit for UK-based riders, and several more-or-less popular Facebook groups run and frequented by platform workers. At the same time, I also researched and extensively consumed a wide variety of content about platform labour and delivery work, produced and distributed mostly by other workers via social media and sharing platforms — in order to explore the cultural context and popular discourse around platform labour.

Because of the «reluctance displayed by platforms to allow access to internal information» and of «the lack of physical co-presence» of workers, they present a complicated access to the field for research. In response to this, researchers have developed a variety of mixed methodological strategies to address platform labour at different scales — which this section will discuss — some of the most widespread techniques being direct ethnography and the study of online forums and conversations (Cornet et al. 2022; Rosenblat 2019). However, due to the centrality of critical theory and media studies in my approach to the subject, it was important to employ ethnographic observation not as a strictly sociological or anthropological

tool, but rather as a method to think through this intervention to establish a reflexive dialogue between embodied engagement, social enquiry and other critical theoretical modes of interrogation.

Therefore, in parallel to ethnographic methods, I conducted a critical investigation of platform technologies by employing methods derived by cultural, media and software studies. Specifically, this included tracing histories and genealogies of technical objects and processes, critically reading patents and technical documents, as well as studying the management and business literature around the platform economy.

The rest of the chapter will first address some methodological and epistemological issues related to ethnography in general, and then critically discuss the specific configuration of methods employed in my project, in particular: contextualising choices made in relation to participant observation, detailing methods of engagement with technical objects. Lastly, I will highlight some methodological limitations of this project, as well as some ways to hopefully mitigate them.

The ethnographic approach

The methods employed in this project situate within lineages of social research that are broadly linked to ethnographic practices. Therefore, it seems necessary to critically thematise ethnography as a hegemonic form of empirical social sciences.

In her work on «the end(s) of ethnography», Patricia Ticineto Clough reviews the cultural criticism of ethnography, drawing from feminist theory, poststructuralism, Marxist cultural studies and the field of Science and Technology Studies to bring these critical perspectives in relation to sociological research (1998). Poststructural criticism problematised ethnography as predicated on an idea of «realist narrativity» that discursively constructs the authority of empiricism (Clough 1998). Postmodern approaches to anthropology also critique ethnography as a form of «general knowledge» that preconceives an objective whole that is transparently available for the subject of science to know (Smith 1989). Social studies of scientific methods analysed scientific representations themselves as constructions of social and narrative practices, rather than neutral abstractions of empirical reality (Latour 1983). Post-colonial critiques similarly questioned the figure of the ethnographer as the authorised unitary subject of complete and empirically adequate knowledge (Austin-Broos 1998). If these fictional constructs appear to produce factual representations of empirical reality, it is only by the

effect of a disavowal of — more or less conscious — narrative desire through the deployment of narrative realism in the production of knowledge and meaning (Clough 1998; Lury 2020). However, Clough argues that these recognitions do not invalidate social sciences entirely, but rather present an opportunity to reconstruct them as social criticism rather than realist empirical sciences (1998). In line with these perspectives, feminist critique has moved past some of the semiotic and psychoanalytic approaches of poststructuralism to insist on the proposal of a feminist empiricist science, which critically explores the narrativity, desire and knowledge-power relations that ethnographic realism sought to deny (Clough 1998; Haraway 1988; Hughes & Lury 2013). Over the past 40 years, a wide range of feminist interventions in methodological thinking developed concepts such as «standpoint», «situated knowledges» and «reflexivity» in order to problematise «the god trick of seeing everything from nowhere» (Haraway 1988) as a position of masculine privilege and disengaged transcendence — using instead the the critical recognition of one's limited and particular point of view in order to claim a stronger embodied objectivity, in opposition to any fantasy of omniscient knowing which denies its own contingency (Clough 1998; Lury 2020). Thinking through «situatedness» is not about positioning in a fixed or essential identity, but rather recognising one's partial standpoint as a relation of multiplicity, which «persists as a process» and as such provides the ground for a reflexive practice, and for a critical consideration who can produce knowledge and what can be known (Hughes & Lury 2013).

In light of this thematisation, doing research in the social sciences requires a critical consideration of the relation between field methods and writing. Situatedness also means that as researchers we are always in the middle of what we study, not above, but in relation with the social world as we investigate it. Therefore, methods take form in relation to what they seek to address, and cannot be applied as if they were neutral, indifferent or external to the happening of the social in its ongoingness and contingency. This seems particularly important for a research like mine which engages with socio-technical ecosystems. As we recognise that knowledge practices and agential processes are encoded in both research methods and everyday technical objects, we need to understand both social phenomena and observers as always materially and discursively entangled (Hughes & Lury 2013; Lury & Wakeford 2012).

Methodological configuration

In a certain sense, a method is situated when it is designed for a specific project, as research instruments and practices are not taken as static techniques, but rather brought together in a specific way, producing a particular method — which Lucy Suchman describes as a «configuration», a method assemblage (Suchman 2012). Methodological configurations shape the relation between fieldwork and writing, so that each device or practice of research acts «as a hinge between concepts and practice», and the overall methodology supports certain «coordinates of signification» and specific «capacities to introduce answerability into problems» (Lury & Wakeford 2012, p.9,18). Considering that my research takes ethnographic observation as an entry point into the complex figurations of socio-technical systems, I believe the project requires a mixed, multi-sided and inventive configuration of methods in order to sense, probe and critically understand different dynamics within the grammars and diagrams of such heterogenous social phenomena.

My methodological configuration thus starts from an ethnographic intervention into platform labour, whereby I worked as a delivery courier for four months in London and before that as a click-worker for three months, while living in Naples. This «observant participation», which affords a more embodied perspective, was combined with forms of «participant observation» — specifically, through workers' group chats, forums and online discussions, as well as other secondary sources like content produced by content creators on social media platforms — in order to capture a diversity and heterogeneity of perspectives. This mixed approach constitutes a form of «hybrid ethnography» (Seim 2021). This hybrid ethnographic approach is also combined with the critical tools of cultural and media studies, like the close reading of technical objects and patents to understand their social and cultural implications. I will now discuss in more detail the key techniques, materials and practices brought together in my research, critically evaluating my approach as well as discussing some of its limitations.

The «slowness of ethnography» can provide the necessary space for attending to the messiness, unexpected insight and complexity of temporalities in which the method is embedded (Law 2004). At the same time, its «multi-sided» forms can enable the researcher to follow objects and practices beyond the traditional bounded field site — for instance across different scales of operation, geographical locations and virtual spaces (Marcus 2012).

Auto-ethnography

I started with an auto-ethnographic approach that enabled me to explore the daily practices of platform labour. Auto-ethnography is a mode of research in which the researcher's personal experience constitutes the base of the data. However, it differs from more performance-oriented methods as the experience is situated in relation to broader sociocultural dynamics, enabling the researcher to reflexively examine their relationships to other people, objects and processes (Chang 2008).

The auto-ethnographic component of my research constitutes a commitment to understanding the sensory thickness and everyday messiness of platform labour, and to maintaining a contextually embodied standpoint — as opposed to a more detached perspective that would study labour schematically or clinically, from above. In fact, ethnographic accounts of platform labour emphasise the importance of «contextual embeddedness» to the study of complex economic practices (Timko & van Melik 2021). For instance, Peter Timko and Rianne van Melik argue that because «platforms are what platforms do», grounded accounts of how «actually existing» platform labour is carried out produce more nuanced knowledge compared to disengaged descriptions of its technical arrangement (2021).

Within my research, the main purpose of an auto-ethnographic approach was to develop a «practice-oriented perspective» and closely observe the «micro-social activities» of everyday labour (Jones & Murphy 2011). The attention to everyday practice is important to explore the routine activities by which heterogeneous elements are brought together in the constitution of a social phenomena, including «forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge» (Reckwitz 2002, p.249-250).

This focus on the everydayness of social practices foregrounds embodiment as a process through which knowledge is developed through affective and sensory attunement with the environment, its objects and contingencies (Clough 1998; 2007). Sensation necessarily highlights a phenomenological perspective within auto-ethnographic and practice-oriented research. This can bring an «intense sensory immersion» to the study of labour, which is crucial for researching the more physical aspects of work of course, but also for understanding mobility and technological connection as embodied and affective practices, while also considering this embodiment in relation to a social and technical dimension (Jones 2012). From the point of view of social research, experiencing the «sensory plenitude» of one's

partial perspective has the effect of expanding what might count as data within the environment (Lury & Wakeford 2012, p.19).

Furthermore, since the point of this research is to understand labour in its condition of technological mediation, auto-ethnographic practice necessarily needs to account for the presence and activity of digital media. Investigating how interfaces «affect the body on a variety of habitual, unreflected upon and non-discursive registers», researchers have developed «a post-phenomenological approach to studying interfaces, websites and apps that explicitly interrogates how they appear as objects […] to unpack interfaces as sets of entities that work together […] to modulate user response and action on a series of habitual and un-reflected upon levels» (Ash et al. 2018). The post-phenomenological investigation of software enables me to think through my experience not just of work, but of the platform as a material and technical object that affects my sensation, cognition and embodiment — which becomes especially important in relation to the critical reading of software as a cultural and social object (Fuller 2008; Hughes & Mee 2019; Kitchin & Dodge 2011).

Methodologically, the «sensory plenitude» afforded by auto-ethnography presents an opportunity for grasping the excessive quality of embodiment — its non-representation and non-rational component. In the reflexive exercise between field methods and writing, trying to critically configure this excess necessarily expands the relations between what is sensible and what is knowable. This practice of engaging with phenomenological excess can be deployed to hopefully «lure materials into posing their own problems» (Fraser 2009; Lury & Wakeford 2012, p.21)

Practical implementation

In order to practically implement ethnographic research in the context of labour, I followed a few key steps drawn from a range of methodological discussions — from the pioneering work of the Johnson-Forest Tendency and Operaismo, to more recent revisitations by Kolinko and Woodcock (Badger & Woodcock 2019; Kolinko 2002; Woodcock 2014). The initial stage of «pre-inquiry» or inquiry «from above» involves researching the workplace, reviewing previous academic research, as well as news articles and reports from labour researchers and trade unions (Kolinko 2002; Woodcock 2014). The aim is to understand the possibilities and challenges of accessing the workplace, but also to develop initial theoretical insights. The inquiry then moves into a direct investigation of the workplace itself, with the aim of moving as much as possible towards an inquiry «from below» from which a fuller knowledge can

emerge (Notes from Below 2018; Woodcock 2014). Preliminary research and reviews of the field suggested that the on-boarding process of most platforms was not going to be too problematic, presenting very few barriers to entry for a non-disabled man with access to the required technologies and devices for the job (Badger & Woodcock 2019; Waters & Woodcock 2017). The non-platform specificity of my job search also facilitated this process, as I wasn't looking to be employed by a specific platform. The recording techniques employed during my auto-ethnography included taking field notes, mainly trough my phone, in different forms, mainly consisting of written notes, but also photography and video, as recommended by Iphofen, Huws and Spencer (2022).

Critically evaluating auto-ethnography

However, auto-ethnography comes with risks of over-descriptiveness, self-indulgence and over-dependence on personal memories — which I think I managed to stay away from by not leaning too much into ethnographic writing, and keeping ethnography as a method of observation always centred around the critical and theoretical development of an argument, which is the purpose of this thesis.

Ethnographic research offers an advantage over more dis-embedded methods of data collecting such as interviews, inasmuch as it enables researchers to gain direct experience of the practices and subjective states that characterise certain social phenomena (Chang 2008; Fraser 2009). However, ethnographers sometimes tend to claim a status of "complete" membership of the social context they investigate, which seems to characterise their embedded participation as a somewhat transparent (Anderson 2006; Timko & van Melik 2021). Therefore it is important to maintain a «situated» awareness of research methods as something that does not produce a neutral reflection of empirical reality, considering how events always affect the storyteller and how the standpoint of the storyteller necessarily shapes the ethnographic narrative of events (Clough 1998; Haraway 1988). David Silverman explains how ethnographic data can be useful to qualitative research only if understood as «activity awaiting analysis and not as a picture awaiting a commentary» (2007, p.56). Therefore, in order to understand what kind of knowledge can be produced from fieldwork, it is important to think critically about the theoretical framework through which the data captured is analysed and interpreted (Back 2012; Becker 2007).

While my research mobilises the phenomenological perspective of auto-ethnography to take embodiment in to account, it neither produces a complete account of any specific

subjective experience, nor does it claim any "insider" status or in depth knowledge of a community — and crucially doesn't aim to document the practices of labour organisation and struggle studied by militant ethnographic research (Haider & Mohandesi 2013; Woodcock 2014). Over the last two decades, the tradition of ethnography and action research has been a key source of inspiration for the qualitative research of precarious gig work and platform labour (Graham et al 2020; Iphofen et al. 2022). Significant influences have come from workers' inquiries and other research approaches developed outside of the academy, such as journalistic accounts and undercover research on poor working conditions (Chan et al. 2020; Kolinko 2002; Waters & Woodcock 2017). However productive, these methods also raise ethical and methodological questions especially relating to the safety, consent and anonymity of informants and vulnerable subjects — some of which I'll get to in more detail (Iphofen et al. 2022). Most critically, some researchers and organisers have pointed out the «often-problematic relationship between researchers and the people whose working lives they research, especially in situations where the researchers are actively engaged in the struggles of their research subject», as researchers can use their advantaged position to get to «the front» of struggles and organisation and «substitute themselves for the worker» (Wolfson et al. 2022). Although my methodology draws insight from workers' inquiry and the research that emerges from it, my project doesn't focus on the militant engagement that is fundamental to this method. In fact, the main tenet of workers' inquiry is that it «combines knowledge production with organising», and analyses labour by actively engaging in the political self-organisation and resistance of workers (Notes from Below 2018; Waters & Woodcock 2017). While everyday practices of resistance to work are interesting to my research and need to be taken into account, my auto-ethnographic engagement with platform labour doesn't involve organised political action. The fact that my research doesn't aim to document the experience of workers' struggle might significantly reduce the risk of establishing the problematic or exploitative relationships with other workers described by Wolfson (2022).

Debates around the positionality of researchers engaged in ethnography have acquired new relevance in the context of platform labour research, posing challenges regarding the researcher's critical reflexivity and understanding of their own position as part of their intervention within the research itself — from their motivations for work and economic condition to their embodied experience of race, gender and ability, to becoming active part of the environment they observe (Badger & Woodcock 2019; Wolfson et al. 2022). As a researcher, my perspective is that of a relatively young, non-disabled white man, who had access to higher education, which positions me in an inevitably limited standpoint. Another relevant aspect of my position is the fact that my livelihood is at least temporarily guaranteed

by my PhD scholarship. I will be doing the job only temporarily, and my motivations, expectations and future career prospects are tied to my academic performance, rather than platform work per se — as it is likely going to be the case for most of the workers I'll get in contact with. However, this partial perspective can be enriched to a certain degree by employing a hybrid and heteronomous ethnographic approach, which brings multiple experiences into conversation with each other (Brewer 2000).

Building this heterogeneous character of the method requires taking a multi-sided approach to ethnographic research, which means recognising the networked nature of social and material processes, following objects and practices beyond the individual experience of the field site, across different perspectives, scales of operation and virtual spaces (Marcus 2012). In order to do this, my research takes auto-ethnography and the phenomenological standpoint not as the end goal of the research, but rather a component of a broader methodological configuration, which aims to study the relations of power embedded within the socio-technical assemblage of platform labour. In order to do this, on one hand it brings together ethnographic accounts with the analytical frameworks of critical theory and cultural studies — such as the close reading of technical objects and patents as well as media archaeological readings. On the other, my methodological configuration also tries to de-centre ethnographic observation from my subjective standpoint — which is not neutralised but merely contaminated and enriched — by attending to the heterogeneity of standpoints and the multiplicity of other-than-human forces presented by socio-technical systems.

Participant observation

In light of these considerations, my ethnographic investigation of platform labour combines my embodied observation with the heterogeneous voices of other workers. After initially considering interviews, I decided instead to focus on gathering qualitative data from workers' own narratives and conversation, which have been extremely prolific across social media, blogs, forums and group chats, where workers discuss small or bigger issues that are relevant to them. «These methods make it significantly easier to collect and share experiences of workplaces. The prevalence of these also lowers the barriers to writing, and it is a much more common experience now to write, even if briefly on social media» (Woodcock 2014). A fundamental ethical issue highlighted in most methodological discussions is that of ensuring the anonymity of participants by anonymising all data when discussing or publishing results — in order to not put anyone at risk of being identified and experiencing repercussions on

their job (Wolfson et al. 2022; Spilda et al 2022). In order to ensure this anonymity, all the data and quotes within this thesis are completely anonymised; not only names and usernames of workers, but also the names of the group chats, Discord servers, subreddits or Facebook groups from which the data is gathered. When presenting this data, the only references I make are to the platform it was collected from — simply to give a sense of what kind of environment a certain perspective was expressed in.

I think it is interesting at this point to motivate my choice of opting for this method of participant observation, rather than conducting interviews. As I said, while preparing for this project, I conducted some preliminary interviews with other people who had been working as delivery couriers, recruited mainly through personal connections and word of mouth. However, the impressions gathered from these conversations, from the review of other studies who featured a prominent presence of interview data, as well as from an initial contact with online communities of platform workers, forced me to question the usefulness of continuing interviews as opposed to conducting an online ethnography by taking part in workers' group chats and online forums.

A key issue emerges from the fact that the interview format itself creates expectations, like the idea of being questioned and going "on record", which influence respondents in expressing their perspective. At the same time, the interview is also crucially shaped by what the researcher expects from participants (Rapley 2004) — which is something that, considering the political and theoretical implications of the subject of my research, I started questioning during the early stages of drafting questions. Discussing the interview method in relation to the technique of recording, Les Back notes how an over-reliance on interview data can reduce the involvement and attentiveness of researchers to the social world, while simultaneously stabilising a certain way of listening, which fixes the subject of the interviews as an authorial consciousness, producing the the interview as a tool for mining some truth from an "authentic" subject (Back 2012; Rapley 2004; Atkinson & Silverman 1997). If Everett Hughes already declared that «sociology has become the science of the interview», Back notes how «the desire to 'give voice' is a lasting impetus for sociologists» (Back 2012, p.248; Hughes 1971, p.507). This well-intentioned desire to give voice to participants, and the general pervasiveness of the interview method among social researchers, produced what Paul Atkinson and David Silverman called «the interview society», where accounts that are socially shaped are mistaken for authentic voices of truth (Atkinson & Silverman 1997). Letting go of the idea that interviews provide access to truth through the voices of

respondents, Back suggests that «we should see the interview as a place where social forms are staged rather than a resource to understand the nature of society» (2012, p.249)

Other issues presented by the interview method in specific relation to my research have to do with recruiting participants. While smaller cities might host more tight-knit communities of couriers, workers in large cities like London tend to be fragmented in social groups striated along the lines of language, nationality and local background, which makes them harder to get in contact with and appropriately represent (Badger & Woodcock 2019). Moreover, the faster pace of the job reduces occasions for shared downtime, and while a small sociality between colleagues still exists, it is hard to establish any stable relationship between workers, or even meet the same people consistently — which can make approaching other workers for research purposes unpractical, inappropriate and somewhat invasive (Timko & van Melik 2021; Wolfson 2022). On top of this, I had the chance early on to see that the attitude of online communities of platform workers towards approaches from researchers is understandably unsympathetic when not openly hostile — usually because people feel that researchers have often treated their voices superficially, opportunistically or even hypocritically.

In light of these methodological, practical and ethical issues, I decided to proceed by joining workers' group chats and forums — specifically on Discord servers, subreddits and Facebook groups — and to integrate my field notes with anecdotes and quotes from the discussions and exchanges happening in these virtual spaces. By this process, instead of addressing a specific respondent with a specific set of questions in a more or less controlled research environment, while trying to mitigate both their expectations and mine, I instead integrated the observation of conversations between other workers with my everyday embodied experience, establishing cycles of critical reflection, whereby insight and suggestions coming from each component would resonate and re-orient my perspective on the others.

It seems to me that this approach — instead of giving voice to an authentic subject in a specific moment through a succinctly designed format — helped me establish a certain heterogeneity in my observation, drawing from more vivid and spontaneous discussions that unfolded in a completely unstructured form. This exposed me to a vast amount of uninteresting conversations I wouldn't have encountered otherwise, but also to different takes on the same topics over time, to repetitions of the same points over and over, and plenty of other uninvited material.

Trying to understand this approach as I was starting to implement it, I found Mike Michael's discussion of the anecdote as a methodological tool for social studies particularly interesting. Michael characterises anecdotal events as having a certain capacity for problematising the authorial voice, as «the 'I' that emerges within and across anecdotes is marked by distributed-ness, heterogeneity, flows of materials and signs» (2012, p.34). Especially in the study of techno-science and everyday life, the anecdotical flow can help trace a certain «recalcitrance» that characterises relations between humans and nonhumans, bringing them into the research as «heterogeneous interlocutors». By this heterogeneity, «moments of difference» can produce insight into the mundane flow of everyday events (Michael 2006; 2012). Michael specifically argues for the «topological and nomadic» character that the anecdote adds to the research method: «it brings together what might once have seemed distant and disconnected: past episodes that are marginal and trivial illuminate contemporary moments of critical reflection and reorientation, and contemporary concerns render what had long been uninteresting past moments full of relevance» so that «anecdotal pasts trigger contemporary reorientations» (2012, p.33). The specific and contingent nature of anecdotes does not reduce the complexity of what is researched, but rather foregrounds unplanned connections that can add something new to the conduct of research, establishing a «dialogue between past and present through, and with, bodies, memories, stories, objects and texts. If this conversation is any good, uninvited topics, unexpected insights and untoward issues should emerge» (Michael 2012, p.34). In light of this, I saw the anecdotes gathered from my observation of workers' group chats and forums, as well as from my embodied experience, not so much a evidence to use within a process empirical induction, but more as activators of connections and resonances within my methodological configuration.

Engaging with technical objects

As already anticipated, my research combines ethnographic observations with methods of critical analysis derived from the tradition of cultural studies and employed within media and software studies. The close reading of texts and cultural artefacts has been widely employed for uncovering their social and political implications by applying critical theoretical frameworks to the analysis of their forms, histories and layers of meaning (Bennett & From 2008; Clough 1998; Lentricchia & DuBois 2002). Digital media studies have adapted similar reading techniques to the analysis of technical objects, interfaces and software, drawing from critical media theories and technology studies to move beyond the surface-level functionality of these objects and understand them as social and cultural research sites (Fuller 2008;

Kitchin & Dodge 2011; Manovich 2022). Therefore, it seems essential for a research like mine, so closely engaged with mediation and technical reality, to integrate similar critical readings of these objects within my methodological configuration.

Within my research, I engaged with a series media objects and technical documents, but also techno-scientific practices and ideas, considering them as actants, repositories and concretisations of cultural and social relations as well as of certain ways of knowing (Fuller 2017; Lury & Wakeford 2012). Technical objects can be both practically and theoretically probed and engaged with, in order to sense and understand the grammars and power dynamics they encode and mediate by the taken-for-granted of their daily operations (Fuller 2017; Suchman 2012). Therefore, within my auto-ethnographic engagement, I also addressed platform labour as a form of technical practice and data practice. Within feminist STS, Aristea Fotopoulou describes data practices as «sets of dynamic actions and materialities, competencies, and meanings that entail data, digital technologies, and human and non-human actors» (Fotopoulou 2019, p.228). She crucially highlights that, because of the black-boxed character of many technologies and of the epistemological difficulties inherent to the study of data, ethnographic documentation is not sufficient for a comprehensive understanding — which is why it was important for my research to establish a reflexive loop between embodied experience and theoretical analytical tools (Fotopoulou 2019). In fact, if we consider that «knowledge can be contained in an object and its functioning is its explanation» then practical engagement and analysis are not necessarily processes that need to be separated, as we can use practice to think about theory and vice versa, moving back and forth in iterative loops of embodied experience and critical reflection (Chiappini & Bogers 2019, p.30).

Following this methodological approach, I addressed interfaces both at the level of my embodied experience of them and through the critical theoretical exploration of their functioning (Andersen & Pold 2018; Ash et al 2018). Similarly, I explored platform coordination both by taking notes on its daily operations in relation to my work, as well as thought the technical and managerial literature surrounding it. A particular technique I took interest in was the critical analysis of filed patents — specifically, I ended up using two patents for service coordination and deep learning systems filed by Uber Technologies in recent years, as well as the corporate literature surrounding them, which are extensively discussed particularly in one chapter. Despite their conservative — and rather «grey» (Fuller & Goffey 2012) — character, patents encode and express certain meanings, practices, motives and perspectives condensed and negotiated among all those participating in their production, like designers and engineers, writers and researchers, legislators and examiners, as well as the

business practitioners and the broader industries they operate within (Foscarini 2019). Because of this quality of the patent «genre», patent analysis has been widely used in legal studies, business literature and for monitoring technological development (Burk & Reyman 2014; Foscarini 2019; Tsuji 2012). However, patent analysis has also been applied to the critical study of labour in its relation with technology, in order to investigate the technical objects described in the documents to uncover the logic and desire of those who filed them, as well as the social and technical implications potentially brought about by the inventions documented (Delfanti & Frey 2021; Hlongwa 2022; 2023). As noted by Lungani Nelson Hlongwa, «in these documents, companies disclose their inventions to the public in exchange for a temporary, state- granted monopoly. Since patents contain ideas about novel inventions and how they may be used in society, they are a valuable resource for critically examining the logic and priorities of those who file them» (2022, p.41). Focusing specially on platform labour, Hlongwa also indicates how critical patent analysis would be particularly useful as a reinforcement and counterpoint to other methods (2022) — which is also how I use them in my project in relation to ethnographic observation and anecdotical data.

Methodological limitations

Generalisability of findings

Methodological reflections on researching platform labour often highlight poor representativeness and generalisability as critical issues. The general unwillingness of platforms to make their data available, the proprietary nature of their infrastructure, and the poor consistency of surveyed data on the social composition of platform work, leave researchers unable to evaluate the representativeness of their sample of workers, having no reliable reference group against which to compare and validate their findings (Spilda et al 2022). On the other hand, when platforms have made their data available to research, by partnering, hiring, or collaborating with academics, the academic community has raised questions about the integrity and rigour of such research projects, also noting how proprietary data policies tend to obstruct methodological scrutiny and peer review (Gig Economy Researchers United 2020). Ethnographic studies of platform labour are similarly associated with poor generalisability, as the situated nature of the practice may not provide the levels of

generalisability necessary to establish a solid correlation of hypotheses with findings (Badger & Woodcock 2019; Cornet et al. 2022).

Furthermore, the high heterogeneity between different platforms represents another key impediment to the representativeness of research findings. As much as researchers try and identify clear characteristics to define the general category of platform labour, platforms themselves do not constitute a homogenous group of organisations, spanning different sectors and operations, and also mutating over time. Generalising results from empirical research on specific platforms to describe platform work as a whole potentially introduces a significant bias (Cornet et al, 2022). Many researches highlight this limitation, and that is also the case for this project. I think it's important to recognise how such an ambiguous and multifaceted object of study defies the rigid classification of traditional sociological categories. This suggests that the study platforms can't be approached with rigid sociological methodologies, but requires more hybrid or inventive ones that match the heterogeneity of platforms themselves. According to a recent volume of Work Organisation, Labour & Globalisation focusing on the ethics and methods of gig economy research, a combination of research methods that articulates observation at both micro and macro levels across platform systems can help mitigate a frequent limitation of platform labour studies, which is the generalisability of empirical observations that are usually based only on few well-known platforms (Cornet et al. 2022; Iphofen et al. 2022; Kampouri 2022).

However, it is also possible to see the situated nature of platform investigations as a strength, as the method can reflexively engage with the limits of its own perspective rather than trying to detach from its own embedded position, thus producing more critical readings of social phenomena (Burawoy 1998; Haraway 1988). My research will not produce a systematic, omni-comprehensive account of platform work as a sociological form. Rather, the project aggregates multiple perspectives and levels of inquiry to bring itself beyond the pretence of a universally generalisable study, trying instead to produce a critical reading of some of the dynamics that are transforming the relation between technology and labour today. While issues of representativeness need to be seriously considered when making generalised statements, I think an excessive concern with replicability could hinder my research. Because my project is not an intervention into the sociology of work, or a quantitative survey trying to understand how prevalent or statistically distributed certain issues are, then «representative samples are not needed» (Fairwork; Spilda et al. 2022). Recognising the impossibility of «seeing everything from nowhere» through scientific knowledge, I think that a rigorous critical reading of such a complex and moving target requires an approach that is closer to the

critical empiricism of Haraway's «situated knowledge»: one that accepts the limits and responsibilities of its particular point of view, but uses precisely this critical recognition to claim a stronger embodied empiricism instead of trying to deny its own contingency (Haraway 1988).

The issue of generalisation in research also raises concerns in regard to the nature of situated knowledges. Because knowledge is recognised as always partial and relative, the rigour and disciplinary legitimacy of research doesn't depend on its capacity to produce "proved" facts that can be universalised (Lury & Wakeford 2012). Instead, generalisability can take form through the mediation of critical elaboration and writing. Thus, the critical knowledge produced by social research can become productive only by circulating and connecting with other knowledges, both within its field and across disciplines.

Non-disclosure

According to the accounts of other researchers, the undeclared character of my research towards the platform or other workers does not represent neither a legal risk not an ethical issue, as undisclosed research in this type of setting «has to be accepted as a normal part of academic enquiry» (Spicker 2011). The positioning of workers as independent contractors creates a unique situation for the researcher. In fact, remaining separate from the company, the worker/researcher has no contractual obligations to them beyond what specifically agreed upon in terms and conditions (De Stefano 2016; Badger & Woodcock 2019).

Registering an account as a worker on the platforms I used in research required me to accept terms and conditions which usually included the non-disclosure of platform information and of identifiable materials such as imagery from the interfaces. In order to fully conform to the terms and conditions, in this thesis I will not share any identifiable materials such as screenshots from the apps. Furthermore, the specific names of the platforms are made generic (usually as "the platform") both when used by me or in quotes from other workers — unless when referring to the content of patents that were publicly filed by those companies or of other publicly available documents.

The emergence of platform mediation as a socio-technical object

My interest in the subject of this thesis started before I decided to embark on a PhD. In 2015 I got my first white-collar job, as a junior writer and researcher at a trade magazine covering technology and marketing. Soon after, I switched to working for a digital communications agency, and from there moved to a small research and strategy consultancy. During the following years, I worked for a handful of companies within the media and communications sector, either stably employed or as a freelancer. Most of my duties consisted in what is usually labeled as "knowledge work"; producing parts of immaterial products that could be either directly used by other workers or sold — in the form of a finished written product or as part of an ongoing consultancy or subscription service — to other organisations. Despite the emphasis on collaboration and community within the media and so-called creative industries, in my experience the firms who function more efficiently tend to organise work in a dimension that is not so much collective or shared, as much as it is networked and transmissive. The meetings are short, talk is quick and informal, and most of the planning, organisation and division of work happens through carefully crafted GANTT charts; software-based project management tools that enable a team to break down a project into a series of tasks, organise them by allocating a certain amount of time, resources and personnel to each piece of work, all while arranging them in a logically executable sequential structure. The work chart is then usually shared with all workers participating to the project, so that they can visualise it on their devices, mark the assigned tasks as partially or fully completed and update others on their progress via the software.

Obviously this is not all there is to it, as working together over time mobilises a messier sociality made of informal reciprocal support, quick chats and frequent messaging, negotiations, competition and gossip. However I, like many in this type of industry, experienced a organisational tension toward an increasingly fragmented and distributed mode of work, together with a tendency to employ information communication tools that seemed to bring co-operation under a digital organisational logic. By digital I mean of course mediated by computational tools, but also made conceptually discrete and manageable via symbolic manipulation. This trend was only intensified by the increasing expectation of workers to be able to work autonomously, away from the office and far from their bosses, in the comfort of their home or in a cafe in their local neighbourhood — which given the housing market

situation in large cities, was likely to be situated further and further away from office districts. Some people even managed to negotiate working from different cities or countries, which they might had left in search for better careers, and that they now wanted to visit more often or semi-stably return to. The possibility of remote work has been increasingly prized by workers in recent years (Koranyi & Baum 2023), also fuelled by aspirational narratives such as that of "digital nomads" who get to keep their career paths fully on track, while also freely traveling the world instead of spending most of their youth in a cubicle (Frydman 2022; Hannonen 2020). While this tension was already present in certain sectors, it was drastically extended to the general population by effect of the Covid-19 pandemic, during which remote work became a society-wide economic necessity (Ceurstemont 2020). But besides lockdown conditions, being able to work mostly away from the office, while only occasionally popping in, seems to be in line with a view of the job market as progressively more dynamic and less stable, where workers — particularly the specialised — identify more as free providers of skills and knowledges, that they can develop and valorise on the market at a higher frequency, rather than office workers who are expected to commit to a stable career within the rigid ranks of a single firm. This decreasing rigidity of labour relations also has to do with the increasingly flexible character of enterprises, not simply in the spatial dimension of the work-place, but in their whole organisational structure. This flexibility, I will argue in a moment, might have its roots in wide scale economic and social transformations, but is concretely enabled by specific socio-technical arrangements of the labour process.

As operations are increasingly fragmented in micro-parts of a networked sequential structure, they can be more easily distributed also outside of the firm's stable workforce, across a network of freelance workers. These workers float outside of but adjacent to the core organisational structure, and are plugged in and out of projects depending on needs, for just a few hours or for a few weeks. External work can be integrated into internal processes at all levels; a certain project might require specific creative skills — a particular design technique or specialised software use — that are not present among the stable workforce because they are not usually necessary to day-to-day operations, and therefore an external worker can be brought it. Alternatively, during intense periods, where a small enterprise might take on more work than what the internal workforce can manage, freelancers can be brought in during decisive days as an extra support on a specific project. Otherwise, there's a whole range of menial yet time-consuming tasks that it's particularly cost-effective to outsource. This is because instead of having them completed by someone internal — whose time is paid at a higher rate — these tasks can be commissioned to an external worker for a more convenient fee. For instance in my experience, whenever a researcher, an editor, or a strategist needed

transcribing for a long recorded interview, or translation from another language, they were instructed to outsource it to someone external rather than spend half a day on it. Within the GANNT project chart, that task would appear as simply automatically executed. While some people do this by relying on external contributors that they knew personally and professionally, many organisations have come to integrate an array of digital freelancing platforms into their processes. While more specialised or senior figures would be recruited and brought in by HR, less specialised and therefore cheaper workers could be recruited by any employee simply by accessing an online marketplace for freelancing services with the company's account. In the everyday routine of the office, platforms like UpWork or Fiverr would be just another technological tool of work at your disposal, same as any cloud-based suite of applications or productivity software. I would upload a task, propose a desired completion time, and invite freelancers to apply for the job. Once assigned, the task would be completed and ready to download at the agreed time. Over time, I might find some freelancers particularly reliable and send a job directly to them, and only if they weren't free I would make it publicly available. For some of them, this was a side-hustle to a main occupation, for others one of multiple jobs, or an additional source of income on top of a pension or some form of benefit.

An interesting tension that emerged during the years was the increasingly tangible possibility of substituting these freelance workers with automated systems. For example, AI-powered services for transcriptions, especially those that charged subscription fees, started becoming increasingly reliable, although not quite as a human transcriber, so that the end result would still require you to adjust some misinterpreted or poorly transcribed passages. The choice of resorting to these systems would essentially come down to having a job done immediately and for cheap, although at a lower quality. If outsourcing was a flexible and sometimes cheap alternative for the company to the stable hire of new employees, AI-powered services were now infiltrating the market as some form of cheap labour. Since 2019, Uber Eats has been announcing and testing its plans for introducing drones into the delivery process, so that at least part of the delivery would be carried out by an automated courier receiving the order from the restaurant, while a human worker would only have to pick up the delivery from a drop-off location and fulfil the so-called "last mile" (Dickey 2019). More recently, the company started testing four-wheeled sidewalk robots for fully automated deliveries that would only require the remote supervision of human operators (McFarland 2022). Developments in automation and ubiquitous connected devices, seem to encourage the companies owning digital platforms to progressively automate a growing share of their services, making them more convenient and affordable for consumers, more seamless to

integrate in the urban fabric, while pushing the distributed labour force of the gig economy into even more precarious territories.

All around the increasingly less fixed boundaries of the firm, a flexible system of supply and demand of work is mobilised. However, there is nothing new about this *per se*: the relations between labour and enterprises have undergone a process of flexibilisation and atomisation at least since the 1970s, with the crisis of the Fordist industrial model and the accompanying financialisation of the economy driving an overall tendency to externalise work from the firm (Casilli 2020). What seems interesting to me is the role of digital platforms in brokering these flows of flexible labour, and how their technological infrastructures have come to «cut into the chain» of the supply and demand of work (Kushner 2013, p.1249). A key initial point for this thesis is that digital platforms as media objects seem to intervene within labour relations and in a certain sense re-mediate them. In fact, through this "cut" into labour relations, digital platform infrastructures have become increasingly integrated into pre-existing organisational structures, business models, and social processes. The platform mediation of labour is now a daily presence even for those whose work isn't directly based on platform infrastructures. After I outsource some menial tasks of my job to a freelancing platform, for the rest of the working day and beyond, I am assisted in a whole range of operations, from professional to personal productivity, by automated processes embedded in the operative systems of my devices — which are now all "smart" or "intelligent" to some degree. As highlighted by a whole field of research in the last decade, this smartness or intelligence doesn't descend from pure science as sometimes suggested, but rather derives from the platform-based labour of a globally distributed workforce (Gary & Suri 2019). This atomised crowd of platform workers engage in a number of detail-intensive micro tasks that revolve around the production, cleaning and validation of data, which is then formatted and assembled into the large datasets that are used to train and develop the automated intelligence of our devices.

My perspective, which is that of a white and relatively skilled male worker living in Europe, already puts me in a specific position within the division of labour that organises this globally distributed workforce. In fact, when my working life — not just my workday, but my commitment to my career, to the development of valorisable skills, to cultivating my reputation — starts overtaking my free time, and the time necessary to my own reproduction, I can at least resort to a range of platform-based services that are sustained by someone else's labour. If I haven't had the time or energy to make a meal, I can conveniently open an app on my phone and order something that will materialise at my door in about half an hour. If I

haven't had time to go shopping, I can just order my groceries and whatever I need for the house online — in fact I could also regularly schedule these deliveries or, with the appropriate gadgets, even automate my Amazon cart. If the cheap wardrobe I ordered last week has been sitting unopened in a corner of my room, with just a few swipes on a screen I could hire someone willing to come and build it for me. My position as a user of platform services means that I am assigned by default a certain role within the platform economy, which is that of the consumer, a condition of access to at least some of the pleasures and comforts enabled by platform interfaces.

While this preamble serves to situate my experience within the emerging dynamics of the platform economy, it also introduces a reflection on platform labour as not just another non-traditional type of employment, but as a scalable and transversal model organised through digital infrastructures. Through specific social and technical forms, digital platforms are installed in the cultural and economic fabric of contemporary capitalism, emerging as a key paradigm for the organisation and exploitation of labour. It is important to be cautious when bringing together different working conditions that, albeit subject to similar dynamics, experience them at widely different intensities. Having said that, authors like Kylie Jarrett or Antonio Casilli have suggested that different forms of freelancing and gig work — from freelance programmers to delivery couriers — might exist at the extremes of the same spectrum of flexible and precarious work (Casilli 2020; Jarrett 2022). This whole spectrum is invested by some general tendencies linked to pauperisation, self-exploitation and technological mediation (Mazali & Gay 2022). It is telling how, in the last decade, the struggles of gig workers have catalysed public attention for their political significance, despite originating from the interests of a relatively small number of workers. One of the reasons might be that this line of struggle seems to bring together a much broader problematisation, around conditions of precarity and self-exploitation that are transversal and in some ways generational. While focusing on the need to see their labour recognised and protected, the struggle of gig workers also «calls into question a desire for autonomy and personal remodulation of the temporality of work» and for modes of work articulated through sharing and cooperation, rather than longing for the lost rigid categories of the Fordist economy (Chicchi & Marrone 2023). Digital infrastructures are employed to channel this desire into mechanisms of capture, exploitation and value extraction, as I had the chance to observe in my research. However, I will try to argue that platforms also mediate collective relations and forms of co-operation that retain a certain potential for difference and negotiation, which can be articulated both technically and politically. Within the scope of this research project, I aim to study how the socio-technical arrangements of our contemporary class composition have to

do with circulation, logistics, and with a certain investment of subjectivity in the capitalist mechanisms of exchange, but also with what I will try to understand as an emerging character of the labour-force. This, in its dispersed and precarious state, seems to be in the process of being re-made as an on-demand flux of productive forces channeled by digital platforms, that can be accessed and integrated into any organisational model, following a software-like logic.

The platform mediation of labour, of wage relations, of propensities and desires, is an integral part of both contemporary working lives, and of our daily experience of technology. In this light, platforms present a scalable model of technological mediation between different firms, independent workers, communication networks, and user and consumer communities. This mediation configures digital platforms not as simple intermediaries, but as assemblages of valorisation operating through specific modes of infrastructural power that need to be understood in both its socio-economic and socio-technical forms. The purpose of this chapter is twofold. First, understanding the modes of mediation at play in the relation between labour and digital platforms, situating them within longer historical lineages. Then, because these are both social and technical machines, I will illustrate how platform power operates and manifests precisely through the relation between social forms and concrete technical ones.

Platform mediation and labour

In light of the multiple and always insufficient meanings of mediation already reviewed — I propose to understand the technological mediation of labour by thinking through three modes of mediation: mediation as technical abstraction, as social mediation, and lastly as an underlying process which expresses certain social relations concretised in the individuation of technical forms.

By the first mode of mediation, digital technologies mediate labour technically, through its abstraction into computation, whereby information itself functions as a medium of labour. Working as a delivery courier, most of my everyday activity produced information either directly, through data tasks that are carried out via user interfaces, or indirectly, by way of being perceived, measured and located by sensor devices. At every step of delivery tasks, my app interface prompted me to click, swipe and provide feedback about the labour process and about my interactions with "third parties" — i.e. restaurants and their employees — for instance about whether they prepared the meal in a timely fashion, and packaged it appropriately for me to carry and deliver. As I leave the restaurant, I need to tick off the order, marking it as collected, and swipe through a bar on my screen in order to move on to the next step, which brings me back to the map view and starts guiding me toward the destination. But first, I am quickly surveyed on how my pick-up was. Thumbs up or down? And if down, why? I am invited to select what went wrong from a list of options.[12] However, these are only the active, conscious tasks of my daily data practice. On top of these, there is a whole complex of data activities that I carry out unconsciously, in co-operation with the sensing devices integrated in my smartphone, and with the algorithmic agents on the other side of the interface. The next chapter will discuss this more in depth, but at this stage it's important to understand how my activity is constantly abstracted into data by way of technological mediation — an extraction of «valorising information» from living labour that is used by the managerial apparatus to re-organise the whole labour process (Alquati 1962). Working as a click-worker this is even more straightforward. Here, the whole purpose of my work is precisely the production, cleaning and validation of data, which I carry out through a digital

[12] Sometimes, if I feel like I waited too long or the overworked staff at McDonald's was rude to me, I hit that thumbs down. I do it out of frustration and perhaps for stress release, but I am not entirely sure to what degree it will impact the restaurant's rating, or whether they will get bits of feedback like I do when someone leaves a comment about my delivery — "an item was damaged" says a notification with a little exclamation point, "friendly service" says a little sticker with a smiling hamburger under the "customer compliments" section of my profile.

platform. For one of the jobs, I give the platform access to my laptop's camera to record a short video of me cracking a smile or moving back and forth, which I presume the platform will assemble with countless other videos into a training dataset. In another type of task, I am presented with a list of pictures and have to "trace polygons" around certain objects, adding metadata to images that other people have uploaded, contributing to the usability of a training dataset. In yet another scenario, I am presented with a query that asks for the location of a certain shop, and I am asked to review and validate an answer already formulated for this query — presumably by an algorithm trained on already usable datasets. My job here is to check whether the shop *actually is* at the location indicated by the algorithmically formulated answer, and thus mark the answer as either valid or incorrect. These examples, from both location-based delivery work and web-based micro work, show different ways in which platforms mediate my activity through techno-scientific abstraction.

However these examples also show how digital technology mediates the socio-economic dimension of labour relations. In fact, it is by the mediation of the virtual multi-sided marketplaces operated by the platforms that workers trade their labour. This already corresponds to the second mode of mediation, by which platforms function as social and economic mediators of labour relations: they organise the supply-and-demand networks of labour by producing the marketplace infrastructures through which the labour-capital relationship is constituted and enforced.

By these two first modes of mediation, we can understand how digital technologies function simultaneously as interactive computational media and as social mediators, a conjuncture which is an important starting point for this project. Another way in which this two integrated modes of mediation can be understood is one employed by Matteo Pasquinelli in a recent article exploring the notion of information as a metric that encodes knowledge, labour and communication. Here Pasquinelli argues for the role of information technologies as «mediating machines» within capitalism, suggesting that they operate both as «epistemic mediators» of techno-scientific abstractions, and as «social mediators» of economic abstractions (Pasquinelli 2023). On the one hand, following an understanding of early industrial machines as already informational, he considers information as a medium of labour, and therefore informational machines as mediating this abstraction of labour into

information.[13] On the other, the same machines also mediate labour-capital relations, thus constituting a site of political conflict and socio-economic negotiation.

In light of this framing of the relation between labour and informational machines, we can also understand how the mediation of labour by networked digital media activates «large and small objects and technologies that transmit, produce and encircle the practice of management and its experience by workers» (Andrijasevic et al 2021, p.ix). This leads us to consider the mediation of labour in its third mode: as a process that exceeds the technical and social functioning of discrete object and processes, expressing certain effects, practices and dynamics which are not programmed or fully contained in any specific object, but brought about by the integrated functioning of social, economic and technical systems.

I will try to illustrate this point further in relation to digital platforms throughout this chapter, but first it might be useful turn to some key theorisations of industrial machines to understand how technology has *been* been mediating labour since long before electronic computation. Considering for example the clock — «the key machine of the modern industrial age» according to Lewis Mumford (1963, p.14) — we can already understand it as a media technology that operates through formal abstraction, as a social mediator, and whose relation to labour already points to a broader historically unfolding process of mediation. In fact, the clock «dissociated time from human events and helped create the belief in an independent world of mathematically measurable sequences: the special world of science» (Mumford 1963, p.15). As a consequence, «abstract time became the new medium of existence», accompanied by the emergence of «a generalised time-consciousness» (Mumford 1963, p.16). At the same time, the production of this discretised mechanical temporality was fundamental to the formalisation of life as abstract labour, to the disciplinary practices that materially

[13] Simondon describes how the «industrial modality» emerges from the separation between the source of energy and the source of information — both previously situated in the human artisan as the operator of tools — so that industrial machines derive energy from natural sources, while information is input from the human worker (Simondon 2012). Charles Babbage similarly studied the Jacquard loom as an already mathematical machine, significantly influencing the Marxian understanding of industrial machines as something that emerges from a previous division of labour to «abolish the role of the handicraftsman as the regulating principle of social production» (Marx 1976, p.489-90; Pasquinelli 2015). Receiving the influence of Marx's Fragment on Machines on Italian Operaismo, Romano Alquati noted how «information is essential to the labour-force, it is what the worker transmits to the means of production, through constant capital, on the basis of valuations, measurements and processing», envisioning an almost cybernetic understanding of labour as «valorising information» (Alquati 1962, p.121). Alquati's understanding of labour abstracted as information seems to anticipate later readings of Marxian «general intellect» elaborated through the concepts of «mass intellectuality» and «cognitive capitalism» (Giuliani & Vercellone 2019; Pasquinelli 2015; Virno 2001).

enforced the labour-capital relation, and therefore to commodity production (Foucault 1991, Marx 1976). In this light, the functioning of the clock mediated: the abstraction of labour-force into standardised metrics, the social relation of production, and the historical articulation of a growing share of social relations through a mechanical logic. From this framework, other technologies — from the stopwatch to the punch card, from the first industrial sensors for automatic control in the factory to the sensing devices integrated in our smartphones — can be studied as media types that express certain forms of power, operate as organisational forces, and catalyse certain management practices. Therefore, these objects and their genealogies need to be problematised not only «in terms of communication systems, but as a constellation that organizes the production of life and labor» (Andrijasevic et al 2021; Beyes et al 2019; Zehle and Rossiter 2016, p.46).

Studied from this perspective, mediation also reveals how certain social and cultural forms are expressed in the mode of functioning of technology — through the process of concretisation that Simondon understands as key to their individuation (2017) — and by this process they are newly re-coded in the evolution of technical systems. Already in Marxian formulations, technical objects seem to express not only the social forms that make use of them, but to also reveal the conditions from which they emerged: «instruments of labour not only supply a standard of the degree of development which human labour has attained, but they also indicate the social relations within which men work» (Marx 1976, p.286). Charles Babbage theorised how the division of labour had enabled its systematic organisation according to mathematical principles, thus grounding the emergence of automated machinery as already informational (Pasquinelli 2015). Receiving this intuition, Marx notes how machinery develops historically from an already ongoing process by which labour had become increasingly discrete and mechanical (Marx 1976). In Simondon's terms, the technical evolution of production leaps into the industrial modality as a new phase of metastability by effect of a process of concretisation, where production integrates the functioning of different components into a new and higher mode of operative synergy (2017). Significantly, Marx theorised the cooperative dimension of living labour not only as the principle behind the engineering of machinery, but also as a direct force of production, highlighting the political centrality of «general social knowledge»[14] (Marx 2014).

[14] «The development of fixed capital indicates to what degree general social knowledge has become a direct force of production, and to what degree, hence, the conditions of the process of social life itself have come under the control of the general intellect and been transformed in accordance with it» (Marx 2014; p.64)

Situating the emergence of platform labour

«The machines are social before being technical. Or, rather, there is a human technology which exists before a material technology. No doubt the latter develops its effects within the whole social field; but in order for it to be even possible, the tools or material machines have to be chosen by a diagram and taken up by the assemblages» (Deleuze 1988, p.39)

By understanding platform mediation as a socio-technical process, this chapter aims to situate digital platforms in relation to some historical transformations of labour, specifically studying how certain social forms are concretely expressed in the modes of functioning of contemporary platform labour — as I will argue in more detail in the following sections.

The work of Simondon of technical objects is an interesting starting point. Writing during the very early days of cybernetics and of the information age, Simondon already delineates a key tension within technical evolution, which is the shift from automated «technical individuals» towards open machines and «technical ensembles». Simondon considers three levels of technical objects: elements, individuals and ensembles.[15] A technical individual is a machine whose functions are automated to at least a certain degree, and that is capable of replacing humans, but only insofar as humans have centralised technical individuality within themselves through the model of labour, becoming tool bearers.[16] But for Simondon, the true progressive perfecting of machines does not tend toward increased automatism[17], but towards technical ensembles, which replace the logic of thermodynamics with that of information and self-organisation. As the higher degree of technicity shifts from individuals to ensembles, technical reality assumes an open relation with culture. Through technical evolution and concretisation — the synergic integration of different functions — technicity frees itself from the need of a closed regulative milieu — the laboratory or the factory — and becomes sensitive to outside information, capable of processing a certain margin of indeterminacy and

[15] Technical elements are component parts without their own associated milieu — like the organs of a living body — which are integrated into technical individuals (Simondon 2017).

[16] The emergence of the industrial modality accelerates a technocratic phase of progress based on the exploitation of energies, including that of workers (Simondon 2017).

[17] «Pure automatism, excluding man […], is a myth that does not correspond to the highest level of possible technicity: there is no machine of all machines.» (Simondon 2017, p.xvi)

thus of integrating the surrounding milieu in the systematic organisation of its functions. The capacity to enter relations with other technical or natural objects constitutes the mode of functioning of ensembles. Here, man operates not so much as a tool bearer, but more as a connector and translator of information, a transducer intervening within the contingency harboured by open machines (Combes 2012; Simondon 2017). This suggests that, while industrial machines concretise the pre-existing diagram of the division of labour in a deterministic way, open machines function through the progressive metabolisation of indeterminacy.

Following this tension of technical evolution, my proposal for the rest of the chapter is to look into how the platform individuates as a concrete technical system in relation to the social transformations of the so-called post-Fordist era. As already anticipated, I don't think that adhering strictly to the schemas of technical evolution as delineated by Simondon would be particularly useful or interesting for the study of contemporary systems, mainly due to the quite normative and mechano-centric character of his analysis. Instead, precisely because of the open relation between technical reality and socio-cultural forms — enabled by the development of ensembles — I take the schema of concretisation as a starting point, to try and understand how technical evolution integrates with historical dynamics of class composition and with the neoliberal mutations of capitalist production. To Simondon, the coming into being, or individuation, of technical objects consist in the progressive organisation of their functioning schemas, which is how ensembles incorporate newly adjunct structures and components. Any incompatibility or conflict can be resolved in new synergistic associations, by which new functionalities are concretised and integrated in the technical schema. This continuous evolution produces successive phases of coherence and metastability, where previous inconveniences are resolved and stabilised in new functional reforms (Simondon 2017). The socio-technical development of capitalist production can be understood through a similar schema, whereby the integration of technology and social governance tends to produce functional solutions to class conflict and resistance. Through dynamics of class de-composition and re-composition, unforeseen associations between social and technical forms produce newly concrete modes of functioning within capitalist production — like that of platform labour.

Crucially, such infrastructures are neither created out of pre-imagined solutions by some capitalist science, nor according to a pre-designed abstract form which is then engineered into the living matter of the social. Rather, they emerge as technical stabilisations within an ongoing process of integration between social processes and technical forms, which produces

newly concrete functioning schemas. This is why, studying the relationship between technical mechanisms and social mechanisms of power, we can see how any technological apparatus crystallises and re-codes certain social or cultural processes, and not simply techno-scientific principles. In fact, it is important to note how the social mechanisms at play in the platform economy are obviously not new simply for being expressed and mediated by technologies that didn't exist just over a decade ago. Rather, even the functioning of seemingly unprecedented technologies — like AI-powered digital platform systems — highlights numerous continuities and ruptures with previous socio-technical paradigms.

Deleuze's intuitions about social and technical machines indicate that «machines don't explain anything, you have to analyze the collective arrangements of which the machines are just one component», but also suggest that this can be done precisely through the study of machines *in* their collective arrangements — for instance through mediation — as they always «express the social forms capable of producing them and making use of them» (Deleuze 1995, p.175, 180). Part of may proposal is to understand the individuation of digital platforms as a concretisation and integration of pre-existing social processes, conflictual relations and technical forms, into emerging and unfixed open systems. Social and technical forms are not equivalent, one does not fully determine the other, nor are they necessarily structured according to the same logic. However, there can be certain operational analogies and synergies between them, a resonance between their respective potential, which is what enables their integration into a concrete mode of functioning, the individuation of a certain socio-technical system. Because of the openness of post-industrial technical ensembles, social and technical individuation enter into a relation of transduction. And because individuation always has a certain transindividual character, this transductive synergy also relates to psychical and collective individuation, which means that the functional organisation of certain socio-technical systems is accompanied by certain processes of subjectivation (Combes 2012; De Boever et al 2013).

This section served to lay out the theoretical ground for what I will discuss in the rest of the chapter through specific cases and empirical observations. I will now move on to consider some of the conditions under which digital platforms have come to mediate labour. My aim here is to situate these technologies within historical tendencies that have been unfolding at least since the second half of the last century — always keeping in mind that, although we can discuss such transformations as distinct phenomena, they are not independent mechanics, nor do they follow any linear or teleological progression. Having considered this, in order to focus on certain mechanisms and dynamics that appear particularly significant for understanding the

specificity of platforms within recent capitalist mutations, I will follow three main threads and discuss how they interweave in the platform mediation of labour. These threads are: the externalisation and precarisation of labour, the spatialisation of labour or the growing focus on its logistical dimension, and the progressive subsumption of modes of subjectivation within capitalist production.

Externalisation and precarisation of labour

The first thread to follow is that of a progressive externalisation of labour from the rigid boundaries of enterprises. This tendency accompanied what many consider a «crisis of the firm», which up to a certain point in the 20th century had been the historically designated site where variable capital and fixed capital came together in a relation of production (Schoenberger 1997). In the industrialised West, this crisis corresponded to the post-Fordist transformation of capitalist production beginning in the mid-1970s following a decade of intensifying class conflict (Negri 1988, Virno 2004). A key feature of this mutation was the increasing financialisation of the economy. Financialisation conditioned a general tendency among firms to downsize and externalise their workforce, through various forms of outsourcing, delocalisation and subcontracting (Casilli 2020). As Jarrett puts it, «with financialization came the restructuring of the labor market – often supported by neoliberal state policy and deregulation – intended to enable more flexibility in hiring practices» (2022). As a result, a growing part of the working population, especially the young, began experiencing more precarious working conditions compared to the prospects of guaranteed employment of previous generations. Virno's reading of the emergence of post-Fordism as a «counter-revolution» follows the typical reversal of perspective of *Operaismo*, identifying class struggle, and capital's reaction against it, as the main driver of evolution in capitalist operations — rather than capitalist innovation *in itself* (Tronti 2019, Virno 2004). As the historical conditions of the «mass worker» were de-stabilised, «a working population characterized by its mobility, low job security, and high student participation, and animated by a hatred for the 'ethic of work', frontally attacked the tradition and culture of the historic Left and marked a clean break with respect to the assembly line worker.» (Negri 1988; Virno 2006, p.243). The struggle of this precarious labour force for forms of income decoupled from work was characterised by an growing indifference to steady employment and refusal of factory

work, and simultaneously by a higher propensity to learn and familiarity with communication networks (Bologna 1991; Virno 2004). In Virno's reading, it is precisely these collective tendencies and desires, which «made their appearance under the semblance of radical conflict», that ended up being converted into «ingredients of the production of surplus value» and «professional pre-requisites» for a newly flexible and opportunistic labour force (Virno 2006, p.243). The neoliberal counter-revolution took place via this new cycle of economic and institutional innovation that, instead of trying to restore previous states of affairs, inverted the disruptive revolutionary tendencies of the 1970s to synthesise new regimes of intensified domination in the following decades. As a result, what seemed like a marginal condition, at least to the industrialised West, progressively became a distinctive quality of labour relations under neoliberalism.

With this crisis of the traditional firm as the privileged model of value creation, financial capital assumed a growing centrality from the 1980s onwards, with the distribution of dividends to shareholders being prioritised over investments in production. Financial capital re-shaped business strategies as well as processes of production and accumulation, as enterprises started devoting an increasing share of their profit to the purchase of their own stocks on financial markets in order to inflate their return value, a practice which reached its peak in the mid 2000s (Lazonick 2013; Marazzi 2010). As a consequence, "downsizing" strategies became common practice, as businesses aimed to scale down their organisation to a lean structure of core operations. This strategy required the externalisation of parts of the business seen as less fundamental to its core operations; which importantly includes sections of the labour force — all supported by appropriate state deregulation (Budros 1997). As the stable employment that characterised western economies in the mid-20th century began losing centrality, new and older paradigms of flexible work proliferated and hybridised, from freelancing to subcontracting, from precarious contracts to delocalisation at a global scale.

This tendency to externalise labour can also be read as a displacement of workers' struggle and organisation, what we could call a de-composition of the working class. Following the reversal of perspective started by Mario Tronti within *Operaismo*, Alquati develops the framework of class composition to understand the feedback loop between class struggle and capitalist technological change (Alquati 1962; Tronti 2019). If the organisation of early-19th-century textile and craft workers led to the need for capital to «abolish the role of the handicraftsman as the regulating principle of social production» by subsuming their knowledge into factory automata, this industrial mode of production in turn laid the ground for new forms of struggle that were centred in the factory (Haider & Mohandesi 2013; Marx

1976, p.489). Thus, because the Fordist era had produced unions and workers' parties who could strengthen their militancy in the factory and seize control of the assembly line, the post-Fordist mutation of capital had to disrupt these centres of organised labour (Upadhya 2018). Within these cycles of class de-composition and re-composition, the post-Fordist precarisation of labour also served the historical function of weakening workers' power once again. However it is important to note that the precarious condition of post-Fordist work was *new* only to the white western male working class. In fact, the privilege of secure employment had only been accessible for a few decades in the industrialised economies of the global north. Post-Fordist precarity only extended to these workers the conditions of vulnerability and exploitation that were already familiar to most non-white and female workers, as well as to many in the global south (Qadri & Raval 2021; Qiu et al 2014). If the political power of organised workers, combined with macroeconomic conditions of almost full employment and a stronger regulatory presence of the state, had established limits to the inherent violence of the value relation, the debasing of this political force enabled a socio-technical reconfiguration whereby the vulnerability of labour under capitalism brutally re-emerged even in the most developed economies.

In light of this, the aspect of this post-Fordist flexibilisation of labour that seems most significant is not precarity *per se*, but rather the erosion of a labour-capital compromise between subordination and protection, which undermines the historical purpose of the firm as the site of stable waged employment. A widely influential 1937 article by economist Ronald Coase explains the historical reason why the firm emerges as the optimal model for organising economic relations of production. According to Coarse, production could also be carried out without forming companies and organisations, simply through bilateral trading between entrepreneurs and workers. Here, tasks would be contracted to workers through the labour market, with the price system operating as the most efficient coordination mechanism as suggested by the traditional economic theory of the time (Coase 1937). However, Coarse highlights how resorting to the market implies a number of transaction costs adding to the price of labour, including search and information costs, bargaining costs and legal enforcement costs. Therefore, hiring an «internal» workforce, through stable contractual relations, becomes a more efficient way of dealing with both the transaction costs of labour exchange and with the fluctuations of prices inherent to the bargaining system (Coase 1937). Organising production internally to the firm enables entrepreneurs to maintain the optimal balance between external transaction costs and internal overhead costs. To workers, stable employment within the firm offered a compromise between obligated subordination and guaranteed income. However, this balance tilted with the mutation of the logic of value

production that accompanied neoliberal financialisation.[18] As a result, the boundaries between the inside and outside of the enterprise became increasingly flexible and less stably defined. This means that the process of constant bargaining with external subcontractors, independent providers and freelancers, was progressively re-integrated within the same structure — the firm — that had originally emerged to limit it (Casilli 2020). At some point, this old praxis of routinely resorting to the market for human resources finds a new concrete form in the centralised software-based brokering services of digital platforms, which emerge as new entities integrating between the boundaries of the firm and the labour market. As highlighted by Casilli, decisive to their force was precisely the technical capacity to absorb and minimise transactions costs and automate market mechanisms in their algorithmic infrastructure (2020).

Crucial to the social, cultural and technical conditions that produced digital platforms is the emergence of the «network society» and the «information age» (Castells 1996, Terranova 2004). Between the last decade of the 20th century and the new millennium, the diffusion of information communication networks, our increasing familiarity with computing devices, and the growing economic importance of informational commodities, created the conditions for an even more flexible mobilisation of labour (Berardi 2009; Terranova 2004). At the end of the 2000s, the increasing ubiquity of broadband service and connected mobile devices enabled an acceleration in the fragmented, hyper-connected and reticular state of this already precarious living labour (Bifo 2010; Srnicek 2016). The emergence of digital platforms as key oligopolistic forces capable of re-making labour relations, was enabled by the social conditions discussed until this point (Srnicek 2016; van Dijck at al 2018). In fact, the flexibilisation of labour that began with the crisis of Fordism and intensified during decades of neoliberal transformations, not only enabled the emergence of the platform labour paradigm, but produced the economic forms capable of receiving this paradigm and putting it to use. In turn, as the individuation of digital platforms concretised these mechanisms, their emergence integrated and transformed the socio-economic milieu surrounding them. This progressive functional integration is what made platforms such powerful generative forces. In order to understand this force and the transformations it is still bringing about, it’s important to look at how the concrete technical forms of digital labour platforms express and concretise the pre-existing social forms hitherto reviewed.

[18] This logic, as already discussed, incentivised the externalisation and outsourcing of labour over the investment in an internal workforce

Lean models: flexible boundaries and platforming the «entreprecariat»

Let's consider once again the flexibilisation of labour relations: the logic by which the boundaries between the firm — as the site of managerial hierarchy and protected employment — and the free market as the site of autonomous bargaining, become less stably defined. Platform mediation takes this pre-existing mechanism to its extreme consequences. In one form or another, platform labour is integrated into the daily organisation not only of large firms, but also small businesses and even individual users. A new mode of outsourcing emerges, as labour is not simply delegated to an individual contractor or a group, but outsourced to a network of constant bargaining, sorting and matching coordinated by automated digital infrastructures. This networked ecosystem assumes the form of the multi-sided marketplace, providing «the basic infrastructure to mediate between different groups» and positioning «as the ground upon which their activities occur, which thus gives [the platform] privileged access to record them» (Srnicek 2016, p.30). This is particularly significant for what Nick Srnicek calls «lean platforms»; business models attempting to establish themselves as the marketplace for users, workers and customers, operating «through a hyper-outsourced model» where «all that remains is a bare extractive minimum – control over the platform» (Srnicek 2016, p.43). This is the type of platform that has come to technically and socially mediate labour relations. The emergence of such platform infrastructures marks an interesting shift from a previous empowering effect of digital networks, which in the mid-2000s seemed to enable the feasibility of distributed forms of social production that were outside of the model of the firm, while also to some degree autonomous from market logic, as illustrated for instance by Yochai Benkler's work on «commons-based peer production» (2002). Platform mediation comes to re-organise this decentralised exchange by instead re-coding the labour capital relation. In fact, working simultaneously as an enterprise and a marketplace, these infrastructures draw on a large and diverse pool of workers, and use automated management systems for controlling their labour and assembling it into a scalable software-based service. Although these platforms insist on presenting themselves as neutral intermediaries, they actually exert control on the labour they mediate by modulating intentions and influencing behaviour. As I will further discuss, this form of control is what enables them to capture value from the activities taking place within their metaphorical space.

With stable employment on the decline, low barriers to entry make digital platforms an increasingly popular source of work for people across the world, especially younger generations. According to research by the International Labour Organisation, over 60% of

workers globally are not in a formalised wage relation, but even among those who are, less than half is in a stable permanent contract — a share that increases in more developed economies, but gets to less than 25% in south-east Asia, Africa, and some areas of South America (International Labour Organization 2015). Research also shows a decline in the quality of non-stable employment over time, as the poverty rates for households headed by part-time and informal employees has significantly increased between the mid-2000s and the mid-2010s (International Labour Organization 2015). This means that most people entering the active working population today start from a vulnerable position, with access to mostly fragmented and part-time work, especially those from developing countries and the global south. For this precarious workforce, «the platform economy has emerged as a significant source of employment and economic possibility across the globe» due to its low barriers to entry and worldwide availability (Jarrett 2022). In recent surveys, as well as in the online discussions I observed during my fieldwork, gig work is often mentioned as an easily available resource for workers who have lost their jobs, especially during the pandemic (International Labour Organization 2021). Furthermore, people who access work though platform mediation are often piecing together their income through multiple gigs or part-time jobs. For instance, although most of those working on location-based platforms indicate platform work as their main source of income, *multi-apping* — the practice of having accounts on multiple apps and using them at the same time — seems to be fairly common among them (International Labour Organization 2021). As shown by many of the online discussions and group chats that I followed during my research, as well as by the ethnographic observation carried out during my time as a gig worker, many resort to *multi-apping* to be contemporarily active on multiple marketplaces, as one is often not enough to get sufficient work. This doesn't seem to be always tolerated by platforms, as often workers report having their accounts suddenly deactivated — despite their status of "independent contractors" — precisely for independently contracting on multiple competing platforms at the same time. The issue being that the organisation of work across different marketplaces is obviously not integrated and harmonised. Therefore, by taking orders on multiple platforms simultaneously, a worker is operating beyond the oversight of the platform, bending the work process to their benefit and against the management interests of each individual platform.

On the other hand, among workers on web-based platforms only about one third indicates platform work as their main source of income — although this share is higher in developing countries and among women — and they quote complementing an existing income as a main motivation for micro-work (International Labour Organization 2021). While the uncertainty of getting enough gigs makes it necessary for workers to combine multiple hustles, it's

important to note how income insecurity is structural to platform mediation, as this model is predicated precisely on fragmenting work into smaller tasks and distributing it across a networked community.[19] The ambivalence of its flexibility is a central aspect of platform labour. On one hand, the desire for flexibility and autonomy in their working schedule is clearly important to people and one of the most attractive promises of digital platforms. The possibility of working from home and having job flexibility is listed as the chief motivator for working on freelance platforms, and one of the main two — together with complementing an existing income — for web-based micro work, with particular importance among women. For workers of location-based platforms job flexibility is still one of the main motivators together with lack of alternative opportunities and the prospects of better pay compared to other available jobs (International Labour Organization 2021). A Discord user discusses the pros and cons of gig work compared to a 9-to-5 job, saying that «At the end of the week my average is around minimum wage, most of the time a bit above like £11 or £12 an hour. I could probably find a job that guarantees £13 or £14 an hour especially since I have a degree in IT but after doing this full time for 2 years, the flexibility and not having a boss absolutely spoiled me to a point where I'm willing to put up with [the platform's] bullshittery and working at minimum wage. However if my average drops below minimum wage then I'll start looking for something else.» However, flexibility is not a concession or an emancipatory tool digital platforms are handing to the workers, but rather a fundamental dynamic of their business model and their control over labour. The relative autonomy of individual workers in choosing when and how to work enables platform services to dynamically adapt to the wild fluctuations of demand in time and space, in such a way that would be extremely difficult in case of centralised planning. While the platform reaps the fruits of the auto-regulating functioning of its workforce, workers pay the price for it, in terms of the negative impact of over-hiring on their earnings, as well as by the necessity for more intense self-exploitation.

In fact, the progressive platforming of the job market, not only intensifies this tendency toward income precarity, but normalises having a side hustle by facilitating access to it, for almost anybody equipped with a connect device. A platform-based side hustle is increasingly useful to compete even in less precarious and more white-collar careers. Running a popular Substack, working fluently as a digital creator of some sort, or even just having a good social media presence, all function as good indicators of the entrepreneurial disposition that was already prized and encouraged in the post-Fordist worker, and which can also facilitate the early breakthrough of a freelance worker in the media or creative industries. The difference is

[19] We'll see in a following section how the platform architecture arranges this in such a way that the increased socialisation of work develops in parallel with greater exploitation and forms of wage theft.

that now, digital platforms make frenetic side-hustling so accessible and visible that it is almost inexcusable not to engage in it. After all, a key promise of the platform economy is that of connecting one's passion to monetisation, potentially materialising an avenue for freeing oneself from the dread of salaried work by pursuing an independent venture. Platforms democratise entrepreneurial hustle by enabling anybody anywhere to trade on extremely dynamic marketplaces, connecting with an audience, reaching potential customers, finding inventive ways to monetise attention, to live off one's previously un-expressed talent. This promise resonates with a general need for opportunities in the face of precarity, but also with a desire for self-realisation and liberation from the drudgery of a day job. The ease of access to digital marketplaces for virtually any material or immaterial good, seems to extend the hunger of the «slashers», co-workers and start-uppers of the «entreprecariat» to whole new populations, beyond the geographical limits of traditional hotspots (Lorusso 2019).

The extreme diversity of conditions across platform labour at large hinders the appreciation of the characteristics that are common to many of its forms — which complicates the possibility of a mutual recognition for instance between free-labouring users, geographically tethered workers, laptop-based click workers, and digital creators who monetise attention on social media. What is important to the argument of this section is that the most significant trait of platform-mediated labour is not its precarious character *per se*, but rather the socio-technical and cultural arrangements under which labour is made precarious. In order to understand these conditions, I will now consider how the logic of externalised labour and the social mechanism of flexibilisation find expression in the concrete infrastructures of digital platforms.

Mediated marketplaces and labour-as-a-service

Let's consider for instance how platform mediation integrates pre-existing technical and social modes of mediation. If labour relations are already fundamentally mediated by the abstraction of value, platform mediation comes to re-mediate these relations, through the concrete abstraction of information (Marx). As labour is abstracted and assumes commodity form through value, it is already organised by the market — which economists like Frederick Hayek conceptualised as an *abstract calculating machine* enacting automatic regulation[20]

[20] «It is more than a metaphor to describe the price system as a kind of machinery for registering change, or a system of telecommunications which enables individual producers to watch merely the movement of a few pointers […] in order to adjust their activities to changes of which they may never know more than is reflected in the price movement.» (Hayek 1945: 527)

(Hayek 1945). Now that labour relations are re-mediated through digitality, they come to be organised by the *concrete calculating machine* of the platform.

Although platforms present themselves as neutral inter-mediators between different actors, their marketplace ecosystem is not produced through a smooth or "natural" integration of market relations, precisely because their inter-mediation is not neutral. In fact, a functioning digital marketplace requires an infrastructure capable of processing information to determine price fluctuations, but also of coordinating and influencing behaviour. Casilli illustrates how any multi-sided market combines processes of technical coordination and economic coordination. Technical coordination is enacted through the price system, matching supply and demand, while economic coordination operates through a system of incentives motivating the participation of actors on all sides (Casilli 2020). The platform re-codes these social mechanisms under its centralised control, through a proprietary technical infrastructure that gives concrete form to these abstract machines. Within the platform, the technical coordination of market mechanics is reified in an algorithmic infrastructure that quantifies preferences and uses them to match supply and demand. At the same time, the economic coordination of the incentive system is enacted through a control apparatus that monitors behaviour to estimate each actor's propensities. According to these estimations, the platform arranges a system of tailored incentives and behavioural stimuli that dynamically respond to the observed behaviour, in a mechanism of positive feedback. This mechanism can be understood as a modulative mode of power that characterises societies of control in Deleuze's famous account, and that significantly differs from the traditional exercise of disciplinary power (1997). The following chapter will look more closely at algorithmic management, and this concept of modulation will be useful to understand the forms of power and control over labour enacted by digital platforms, as distinct from those expressed by previous managerial apparatuses. For now, it's important to note how the social forms of neoliberal control societies are concretised and expressed in the technical apparatus of digital platforms, and thus their logic is reproduced and recursively extended in the platform-mediated social.

Some have likened the model of crowdwork and gig work to the older paradigm of piecework (Alkhatib et al 2017; Casilli 2020). What is interesting to me about this historical analogy is how platform-mediated marketplaces incorporate from the model of piecework to re-make labour into an on-demand service, which can be plugged into any organisation through application interfaces. Whether I need a courier to carry out a delivery, a cleaner, a programmer, web designer, someone to transcribe an interview, or a large sample of people to label and categorise a dataset of images, I can recruit these workers through almost identical

processes. A dedicated platform marketplace organises these occasional service provisions as packets of labour time, all similarly accessible through an app. With analogous user experiences, a large software company, a small startup or a local business can all access this on-demand flux of labour. For a firm, platforming means integrating the platform into its organisational structure. A multinational enterprise might want to plug in externalised labour at different points across their global supply chain. A small organisation might need to recruit labour through a digital marketplace, while at the same time using another marketplace for distributing their products or services. Platforms concretise the historical models of externalised labour, piecework and subcontracting, and re-code them following the *software-as-a-service* paradigm. *Software-as-a-service* means that a software application is not installed by the user on their machine, but hosted on a proprietary cloud platform and accessed remotely for a subscription fee. The Amazon Mechanical Turk was the platform that pioneered the *human-as-a-service* model, providing clients with «artificial artificial intelligence» through access to «a global, on-demand, 24x7 workforce» (mturk.com).[21] This has since become the standard model for micro-work, enabling the integration of human computational power «in-the-loop» of machine learning cycles (Quaranta 2021). However, I argue that, in a broader sense, the same logic underpins the general re-composition of labour operated by way of platform mediation. Thanks to systematic processes of fragmentation and externalisation of tasks, a distributed and precarious workforce is reconfigured as an on-demand source of labour to integrate in any given organisation of production — similarly to the operation of a metaphorical API. Thus, the mechanical ordering of labour emerged in the industrial age and re-composed across the social factory after the crisis of Fordism, is now concretised and re-mediated by computational infrastructures, making it really seem like «the logic of production has become one with the logic of software» (Parisi 2016).

Platforming labour within global racial capitalism

As highlighted thus far, the platforming of labour markets is made possible by pre-existing historical tendencies linked to the externalisation and precarisation of labour. The technological forms emerging from such conditions then concretise these social mechanisms

[21] Seeking to optimise previous and inefficient software solutions for scanning its inventory for double entries, Amazon had already experimented with fragmenting such detail intensive operations into a myriad of micro-tasks and outsourcing them to a distributed crowd of poorly paid piece-workers (Bergvall-Kåreborn & Howcroft 2014). In 2005, the company decided to start offering access to this flexible, scalable workforce to other organisations and charge a commission, thus effectively establishing a new concrete form of labour externalisation (Casilli 2020).

by individuating new operative functions of delocalisation and outsourcing, while also extending old ones through digital marketplaces and software services. The following two case studies highlight how this relation between platform infrastructures and neoliberal social forms is not just one of historical continuity, but of a sort of recursive re-articulation[22]. The first is related to the integration of micro-work within the logic of delocalisation; the second illustrates how precarious gig work intertwines with the precarity of undocumented migrants.

Through Clickworker, one of the major digital platforms for micro work — which I also used almost daily for tree months during my research — users can access an endless list of data labelling tasks. One section of the platform is entirely dedicated to the crowdsourcing of micro-work by one of the world largest tech companies, in order to develop its AI applications. However, the main section of the platform is also open to other companies or users who might want to upload certain tasks and make them available to the crowd of workers assembled by the platform. During my time doing micro-work, it was interesting to encounter questionnaires uploaded onto the platform by Masters' students who needed respondents for their research dissertations, which were often compensated not by monetary payment, but by way of entries into a raffle. This highlights an interesting aspect of how micro-work platforms intervene within practices of outsourcing. Because of the level of investment and the scale of operations required, industrial delocalisation was a process historically undertaken only by large firms. But in today's digital economy, micro-work platforms enable even a small business, a startup, or an individual student, to delocalise informational tasks, even for just a few hours. This sort of *delocalisation-as-a-service* shows how the global division of micro-work plays on historical asymmetries between the global north and the global south, re-programming the logic of neo-colonial delocalisation within virtual value networks. For instance, countries like India and China have been central to 20th century delocalisation, with garment factories and call centres offering western corporations a surplus of cheap labour through labour arbitrage companies. Now, workers in these same countries are also similarly involved in the global division of digital labour, for instance through micro work or through the «grey collar» work of labour-intensive informational tasks that are increasingly distributed via freelancing platforms — from software testing to low-end graphic design and simple micro programming (Qiu et al, 2014). Here, the vulnerability of workers from the global south is extended through platform mediation — despite the

[22]In computer science, recursion is a method by which a function re-calls to itself from within its own code. That of recursion is a circular movement which has to return to itself in order to newly determine its operations. In fact, recursion does not necessarily only entail a return of the same, but also the production of difference; the operability across heterogeneous cases of a continuous, self-consistent pattern (Hui 2019).

promises advanced by micro work platforms of lowering geographical barriers by connecting workers with employers from the global north, as well as with an entrepreneurial and future-oriented professional culture (Graham et al 2017; Qadri & Raval 2021). In fact, despite the universalising character of its virtual, a-geographical location, the actual economic value of platform-mediated work seems to vary significantly at different latitudes. Research on platform freelance work found that workers in developing economies tend to earn 60% less than those performing the same tasks in more developed ones (International Labour Organization 2021). This suggests that the computing and cognitive power of labour from the global north is deemed more valuable even on digital marketplaces, in line with the historical pauperisation of racialised and colonised workers. However, this dynamic is not always linear or free from contradictions. In fact, the necessity to train machine learning models in languages for which there's not an abundance of audio or text data available online, can raise the contingent value of languages spoken by extremely marginalised communities. Recently, this created an opportunity for Indian startup Karya to experiment with the micro-work model and benefit economically disadvantaged rural communities in central and southern India, whose native language of Kannada, although spoken by almost 60 million people, is largely absent from online sources. Operating as a «data cooperative», the company enables tens of thousands of people to access data tasks that mostly require them to read text aloud in their native language, for a $5 hourly minimum — twice the country's minimum daily wage. Interestingly, workers also maintain a sort of ownership over the datasets they produce, continuing to earn from future resales of that data, thus benefiting from the value generated from their labour past the wage (Perrigo 2023).

While such types of micro work or web-based freelance work can be organised by digital platforms through this global division of labour, a different dynamic applies to location-based platform work. In April 2023 alone, over 60 delivery couriers were arrested in London as part of a Home Office «crackdown on alleged immigration offences», which mainly refers to workers who are undocumented, without visas or "right to work" in the country (Braverman & Home Office 2023; Burrell 2023). The news is widely shared and discussed on Facebook groups and Discord servers. Some workers report on the Home Office stopping riders to check their immigration status in various areas of the city during previous weeks.[23] Many are glad, they resent undocumented workers for "stealing jobs", flooding the market and bringing

[23] About two months later, one of the workers reporting on this also recounts being stopped and checked: «They asked me if I deliver, I told them I do probably cause I had my backpack on and told me they will have to check my immigration status, they were profiling but I didn't say anything. Home office officer turned up, asked me if I have ID, I said no but I have a picture of it and she immediately said she's not gonna bother cause she heard me speak English fluently»

down wages by accepting lower fares. Some say this type of crackdown will hopefully bring about more chances of earning for them. During my fieldwork, I noticed how the issue of migrant workers was often brought up in conversations and briefly discussed among couriers online. Most of the time workers complain about “Brazilians” renting multiple accounts from registered users and working extremely long hours, not speaking English, and accepting even the lowest fares for a gig. A Discord user reports «90% of riders in my area are Brazilian and minimum wage in Brazil is 90p per hour which is why they are more than happy to go far for £2.90. I'm sure [the platform] knows this and takes advantage of this». Another one on Facebook laments «most of these guys coming over as students and then smashing out a hundred 100hr [per week]». This case shows how the precarious conditions of gig work intersect with the precarity of undocumented migrants. In fact, within and below the formal marketplace of the platform, a very large secondary market exists, in which regular couriers can informally rent out their accounts to migrants who don’t qualify to legally work in the UK, being in the country with a non-working visa or undocumented. This type of geographically tethered, manual, platform-mediated labour allows these people to work under minimal visibility and risk, as they interact mainly with an interface and don’t necessarily need to speak the language particularly well[24] — a condition of invisibility and ease of access that is not common to most other jobs. People look for accounts to rent, or to let out their official accounts, through various social media, often receiving verbal abuse from regularly documented workers, who see this activity as a threat to their earning prospects. Some couriers subcontract their account temporarily, having others working as a substitute rider in their place for a period of time. Some rent out accounts they don’t use anymore, taking advantage of the high demand for accounts on platforms that have long waiting lists. Others rent out their accounts to middlemen whose entire hustle consists in subcontracting multiple accounts to undocumented workers, sometimes also renting out bikes, helmets and various gear (Mendonça et al 2023). Whenever the platform demands a Face ID check, the undocumented worker can message the official account holder asking them to remotely log in and quickly show their face to their phone camera. While I was working, the platform launched a feature that enabled users to let a substitute ride with their account, which is meant to give them the opportunity to have someone else covering for them in case they are unavailable to work. However, the responsibility for checking that substitute riders are regularly qualified to work ultimately lies with the account holders themselves, thus not really

[24] It is not infrequent for workers who don’t speak the language to stop other riders and ask them for help understanding messages or to speak to the assistance line for them.

posing any real obstacle to informal sub-contracting and to the exploitation of precarious undocumented labour.

This practice of informal subletting of accounts illustrates how platform marketplaces can integrate with informal labour markets in such a way that enables the expansion of violently precarious working conditions. This is especially true for migrant workers, who are made more intensely vulnerable due to their legal status, being forced to work illicitly with no access to legal or social protection, and subject to increased economic exploitation by often having to contract debt to even access the labour market. Migrant labour here also works as a labour reserve that sustains the general precarisation of work through the threat of substitution. In fact, the exploitation of labour in the global north depends also on the precarity of global south workers, who function as a «relative surplus population» — a Marxian notion describing the share of working-age population that serves as a surplus to the immediate needs of capital for waged labour at a given time, encompassing a range of structural conditions, from wagelessness to under-employment to a general inability to meet basic subsistence needs (Marx 1976). Those who find themselves in this position are not only subject to intense exploitation, but also to cycles of integration and dismissal within the value network as sectors emerge, expand, shrink, or cut employment through automation and productivity increase. The relative surplus population has grown disproportionally in the global south, where it even outnumbers the population of the fully employed (Bernards & Soederberg 2021). The relative surplus population was essential both to the post-Fordist transfer of laid-off industrial workers to precarious service jobs and to neoliberal delocalisation. It historically functions as a threat to the employed, facilitating intensified exploitation, as «the greater pressure that the reserve by its competition exerts on the employed workers forces them to submit to over-work and subjects them to the dictates of capital» (Marx 1976, p.789). While the industry narrative around the platform economy suggests that platform mediation necessarily formalises previously informal labour, making it visible and regulated, the position of migrant labour shows how even location-based marketplaces are integrated within a global network of exploitation, where local flexible outsourcing in the global north depends on exploited and dispossessed labour at a global scale.

These cases — the re-inscription of delocalisation in micro work and the connection of precarious gig work to the precarity of undocumented migrants — are helpful to understand how the gig economy is always entangled to what researchers working as the Precarity Lab call the «undergig»; the disorganised and invisibilised forms of exploitation needed to create

the material conditions for the platform economy (Precarity Lab 2020). This critique fits within the broader understanding of capitalism as a racial system, where the concrete violence of dispossession isn't limited to occasional episodes of expansion through primitive accumulation, but rather constitutes an ongoing and fundamental dynamic of the value relation (Robinson 2000; Mezzadra & Neilson 2017). From the dawn of industry to platform capitalism, the inside of the value relation can only function *as if* it was a «self-equilibrating and self-sustaining system», while in reality depending on a constant undoing of its frontiers to absorb some form of «cheap» outside into its folds (Marx 1976, p.874; Franklin 2021; Moore 2018). Furthermore, recent developments within migrant reception policies in Europe also suggest a becoming logistic of migration (Bojadžijev & Mezzadra 2018). For instance, the asylum agreement between the UK and Rwanda, whereby the UK would outsource migrant reception to Rwanda, thus physically deporting thousands of asylum seekers, makes explicit how migrant reception is increasingly treated as a logistical issue.[25] Among other things, this highlights the commodity status of migrant labour as a structural reserve, that therefore needs to be coordinated with the circulation of other commodities across state economies. This integration of migrant reception with labour logistics, and the presence of a similar management logic grounding the organisation of both, seems particularly significant as a context in which to understand the role of platform mediation in organising flows of precarious labour. In fact, platform infrastructures produce increasingly dynamic and granular techniques for organising populations, which enables the re-composition of globally distributed crowds of precarious labour, by making it available on demand.

This section served to critically situate the individuation of digital platforms as labour mediating technologies, understanding how their emergence integrates the historical dynamics of outsourcing and delocalisation, re-coding the operations of these abstract social machines in their concrete infrastructure. The following section will discuss the growing importance of the spatial and logistical dimension of labour.

[25] Significant to this is also the appointment of multinational consulting firms to design the appropriate management systems to deal with the logistics of migration (Fotiadis & Stavinoha 2020; MacDougall 2019).

Spatialisation of labour

By spatialisation of labour here I want to refer to the growing importance of the logistical dimension of labour relations.

Just-in-time, from manufacturing principle to the governing logic of labour relations

As part of the mutations undergone by the logic of production in the second part of the 20th century, industrial manufacturing and planning were progressively re-structured according to principles of dynamic responsiveness and instant communication between the enterprise and its external supply chain or value network, as well as the market. This informational responsiveness was fundamental to the model of "just-in-time" management, historically associated with the industrial manufacturing system developed by Toyota across the 1950s and 60s. The principles of this "lean" and "agile" manufacturing logic were then progressively extended to the management of labour relations, organising them in their spatial and circulatory dimension. As production leaves the boundaries of the firm, outsourcing and re-assembling the labour force into a more flexible social body, it also becomes increasingly networked across extended global supply chains, not only of material components, but especially of surplus labour reserves that are tapped into by way of outsourcing (Tsing 2009). In this scenario, mobility and circulation assume a new centrality in business thought and management practice. Logistics emerges as a «capitalist science» for managing production in its intensifying circulatory dimension, weaponising the space and time of — and between — manufacturing and consumption (Cowen 2014; Harney at al 2018). In what is often referred to as the «logistical turn», that of mobility becomes a key governing logic of capitalist production, to the point that authors like Alberto Toscano argue that the circulatory space replaces the factory as the key site of «political and class conflict» (Into the Black Box 2022; Toscano 2014).

The trans-Pacific encounter of Japanese and US management practices after WW2, exemplified by Toyotism, produced a «lean» manufacturing logic based on bottom-up efficiency and temporal contraction (Andrijasevic et al 2021). This was pioneered by supply chain management techniques where enterprises «communicate with markets constantly and immediately» so that factories maintain the lowest minimum stock necessary and commodities are «produced just in time according to the present demand of the existing markets» (Hardt & Negri 2001, p.290). Just-in-time production embodied a new operative synergy between the spatiotemporal focus of logistics and cybernetic principles of automatic

regulation. As the circulation of commodities is conceptualised and managed according to the same principles employed for information systems, the postwar study of communication and self-regulation is progressively applied to the development of new «geographies of calculation» (Rossiter 2016). British cyberneticist Stafford Beer was among the first to apply cybernetic principles to industrial management. Beer's management cybernetics theorises the organisation of production within a socio-economic environment as a system of two parts that exists in a homeostatic relationship, where the output of one functions as the input for the other (Beer 1959). On one hand, there is an organisation consisting of machinery, manpower and labour processes, with its outputs being profits, products and services, and a workforce of a certain size and spending power. On the other, the environment comprises supply and demand, available labour, materials, money and price fluctuations, with its outputs being demands, availabilities and their relative variations. Within this system, Beer works on a model for an adaptive enterprise whose activity and outputs adjust dynamically in response to the demand and availability of different elements (Beer 1959). Different studies of management and technology have noted how the idea of a system auto-regulating through adaptive mechanisms and information communication with the surrounding environment seems like a conceptual parallel to just-in-time production (Andrijasevic et al 2021; Franklin 2015). This resonance between cybernetics and the logistical turn of post-Fordist production highlights the conceptual and practical importance of information and calculation to the management of production in its spatiotemporal dimension.

However, a rich body of literature also traces longer genealogies, connecting logistics to the history of military organisation as well as to transatlantic slavery. In fact, the coordination of global supply chains to prevail over commercial competitors depends on maintaining continuous connection and circulation, preventing or circumventing any interruptions. This requires a set of practices that borrow, in terms of lexicon as well as of conceptual and material devices, from military techniques aimed at ensuring the uninterrupted supply of forces, resources and equipment to the field of battle (Dyer-Witheford 2015). Furthermore, Stefano Harney and Fred Moten also trace the origin of modern commercial logistics back to the global infrastructure of circulation that emerged «with the first great movement of commodities, the ones that could speak […] the Atlantic slave trade» (Harney & Moten 2013). These genealogies of logistics uncover how the management of mobility is historically and discursively linked to a competitive logic of efficiency shared by military expansion and business strategy, as well as to the capitalist commodification and enslavement of life and

labour.[26] In what Anna Tsing refers to as «supply chain capitalism», the mobilisation of capital and labour is structurally entangled with racialised and gendered differentiation, as well as with social control and self-exploitation (Tsing 2009).

The reason why the history of logistics as a capitalist science is useful to the study of platform labour has to do with how the externalisation of labour from the boundaries of the firm and the increasingly precarious character of work described in the previous section create the necessity for capital to manage labour in its spatial dimension. In response to this necessity, the lean model of just-in-time production is progressively translated from a manufacturing principle into the governing logic of newly flexible labour relations. The spatiotemporal contraction and cybernetic principles already employed in supply chain management are extended to the circulation of workers within urban landscapes, as well as to the transnational flows of a temporary migrant workforce (Andrijasevic et al 2021; Rossiter 2016). This importantly highlights how the logistic management of labour does not function as a neutral mechanism, but is rather directly related to class composition, as it involves a constant disassembling and re-assembling of the workforce, and depends on labour being socially and technically re-made as a modular and flexible entity.[27]

Networks, ubiquitous computing and «logistical media»

As the logistical turn extends from supply chain management to labour relations, the increasing value of mobility brings about new investments in techniques for calculating, monitoring and managing the circulation of commodities and labour. Significantly, computation and information technologies assume a crucial role within the increasingly distributed and flexible productive activity of post-Fordism (Hardt & Negri 2001; Jarrett 2022). Manuel Castells connects the restructuring of industrial economies following the 1973 downturn and the subsequent financialisation of the economy to the emergence of the network

[26] For instance, Simone Brown considers the historical role of branding as a method for subjugating black life within transatlantic slave trade, drawing conceptual links between the technological production of blackness and the social sorting enabled by contemporary surveillance infrastructures (Browne 2015). At the same time, even more seemingly innocuous objects like shipping containers, GPS trackers and barcode scanners play a fundamental role in assembling the networked infrastructures that integrate small-scale technical objects with planetary-scale information communication systems (Into the Black Box 2021; Rossiter 2016).

[27] Recent multidisciplinary inquiries have shown how logistics does not simply constitute a set of techniques for managing commodity circulation, but rather a critical site of power, struggle and political conflict (Pirone et al. 2022; Neilson 2012).

society, leading to the establishment of what he called the «space of flows» as the topological pattern of globally networked economies (Castells 1996; 2007). The case of a large corporation like Walmart exemplifies the historical conjuncture of logistics and just-in-time with the newly granular control that digital technologies enabled over labour, production and distribution (Lichtenstein 2006). For instance, the adoption of Radio Frequency Identification technology, embedded in every single product through applied tags and unique product codes, allowed large organisations to leverage the huge capacity of their computer networks to establish systems of general addressability, enabling a company like Walmart to track and monitor not only inventory and transactions, but also «workers and consumers within and beyond its global supply chain» (Dyer-Witherford 2013). The diffusion of wireless broadband networks across the first decade of the 2000s, together with the emergence of ubiquitous computing and connected sensing devices, was fundamental to the extension of this addressability not only to objects, but to people and their relationships. As highlighted by Benjamin Bratton, this general addressability is fundamental to the mode of power embodied by the planetary scale computational architecture he calls «the stack»; an accidental but coherent whole emerging through the assemblage of interfaces and users, software and algorithms, platforms and apps, global urban geographies and mineral sourcing (Bratton 2016). The weaponisation of this general addressability by logistical management promises to realise a fantasy that — for instance according to Lisa Blackman — has animated modern media since the telegraph; that of remote control and action at a distance, a defeat of the limits imposed by embodiment by way of immaterial connection (Blackman 2012). At the same time, cybernetic control through informational systems also seems to work toward establishing a complete fungibility of social forms, a tension already expressed by the «phantom-like objectivity» of the value abstraction, as described by Marx (Franklin 2021; Marx 1976, p.128).

Ned Rossiter's theorisation of «logistical media» seems to me particularly useful to think about how software infrastructures articulate the management of mobility within contemporary capitalism, as it foregrounds how logistics and digital communication function according to a common logic of seamless interoperability and general addressability (Rossiter 2016). The power of logistical media to organise labour depends precisely on their ambient and embedded character, their capacity to function under the threshold of critical scrutiny, enmeshed in an assemblage of ubiquitous computing devices, databases and interfaces, which «recedes into the periphery of attention», in the background of everyday life (Fuller & Goffey 2012; Schmidt 2012, p.182). Thus, the pervasive action of logistical media becomes one of the prime means by which «technology-intensive capitalism extracts value [...] through the

continuous valorisation of human labour in both its physical and affective engagements with the social environment of the metropolis» (Rossi 2019: p.1428).

Platform labour and urban geography: «the street is our factory» and «spatiotemporal forecasting»

The platform as a spatial technology emerges by integrating various instances of logistical media into a proprietary assemblage. Here, the management principles and cybernetic logic of just-in-time, the social mechanisms of supply-chain capitalism, the software, hardware and social components of the stack, all concretise in a systematic organisation, a ubiquitous open machine that integrates with the post-industrial metropolis, remaking its geography into a space of platform-mediated production. It is the internal coherence reached between the different pre-existing machines that enables their operative synergy, and thus the individuation of the concrete ensemble of the platform. As we've seen, labour in its spatial dimension was already organised by the abstract logistical principles absorbed in the functioning of the global economy. But in the platform-mediated city, labour's relation to the urban geography becomes mediated by specific and concretely integrated infrastructures. Through a distributed assemblage of devices and interfaces, the mobility of labour in space is captured by a distributed perceptual apparatus and processed by computational systems into statical models. From this data modelling the system then feeds information back to user interfaces, to choreograph the movement of labour in space. This computational choreography operates through systems of incentives aimed at motivating workers to voluntarily position themselves at the location in space and time that is most efficient for the whole system.

As a famous slogan of the French *Collectif des Livreurs Autonomes de Plateformes* claims that «the street is our factory», there is indeed a sense that the platform mediation of location-based work displaces the workplace as a single designated location (Aunis & Stevens 2021; Hayns 2018). For example, Alessandro Gandini identifies the platform as «a digital-based point of production […] the place whereby the social processes of production are put under logics of managerialization and work organization within a single, clearly delimited environment» (2019). Others like Armano, Leonardi and Murgia argue that «a new conception emerges both of the workplace and of urban space […] by this experience of connectivity […] riders can enter and exit their workplace with just a swipe of their smartphone» (Armano et al 2022, p.92). Whether the workplace has been dematerialised into a digital environment or geographically expanded through ubiquitous connectivity, it is not merely by the touch of a

screen that workers access labour. By "going online" on the app, a courier merely makes their body available to work, they open their productive potential to the marketplace, seeking to connect with a contingent demand and generate earnings. This means that, although they are connected to the digital marketplace, they are still not quite at work. They are seeking work, but there is still a significant amount of time and space separating them from a remunerated gig.

Working as a courier, when I get on the bike, I slide my smartphone in the holder I set up on the handlebar and open up the app. The map indicates which areas of the city are likely to be busier by displaying the various "boosts" associated with different zones. From the residential neighbourhood of South East London where I live, finding an order generally requires me to at least cycle to a nearby area that is busier with restaurants, particularly fast food outlets located on the high street. This might be enough to find work on weekend evenings, but during weekdays I usually have to cycle up to the office district between Waterloo and London Bridge, and from there usually end up crossing the river into the areas of central London or the City. As I move from one neighbourhood to another, or along the arterial roads connecting outside areas to the centre, a swarm of riders with backpacks of all the main platforms are also heading in my same direction, from their homes towards busier areas. Many of those who live further out of the city even have to take the train to reach central zones. The mass commute of platform workers is now common to most large cities, with sometimes controversial consequences. For instance in 2020, Italian newspapers reported on «armies of riders» getting on suburban trains to get into Milan from the province or the surrounding cities, to the point that the regional railway company *Trenord* decided to ban them from taking their bikes on the trains, triggering protests from couriers who felt discriminated against, especially considering their position as a category of workers who carried out essential work during the Covid-19 pandemic (Corriere Della Sera 2020; M.M. 2021). Unlike other commuters, platform workers are not reaching a localised workplace, but rather navigating the spatial dimension of a virtually experienced[28] marketplace of opportunities that they access through the platform interface. What motivates and compels their mobility is the system of incentives through which the impersonal management of the platform choreographs the distribution of labour across the city.[29]

---

[28] The embodied experience of virtuality will be discussed in the next chapter.

[29] While this system of incentives is a rather explicit one, this managerial architecture also resonates with the techniques of behavioural influence mobilised by social media platforms in modulating the conduct, attention and desire of other types of users — who are not formally at work in their use of digital platforms — which is something that will be discussed in a later chapter.

This spatial organisation of labour is informed by a set of operations that Uber describes as «spatiotemporal forecasting» (InfoQ 2019). At a 2018 international software conference in San Francisco, the head of Uber's Machine Learning Platform Michelangelo discusses how deep learning models are employed across a variety of the company's operations. One of the uses of these models is the monitoring, forecasting and management of supply and demand across the marketplace. Because the «proximity in space and time of supply and demand is quite important» to services like ride hailing and food delivery, the platform needs to monitor marketplace activity metrics as granularly as possible, in order to build models capable of predicting customer demand and workers' availability, not so much in their total volume but specifically in their spatial distribution, in order to «identify gaps between supply and demand in the future» across different areas. This spatiotemporal forecasting is then leveraged to «encourage» workers to reach beforehand locations that are likely to be in high demand, which the platform does through the strategic deploying of incentives, "opportunities", "boosts" and "quests" (InfoQ 2019). The next chapter will look more closely at the role of computational perception and prediction within algorithmic management. What is interesting to note here about spatiotemporal forecasting is how logistical data about workers' mobility, processed through recursive loops of statistical calculation, is weaponised by digital platforms to enact a modulative and impersonal control over labour. Logistical media here operate as an essential component of the spatial management of location-based gig work, enabling the platform to mediate labour specifically in its relation to urban geography. This spatial mediation enables the granular management of a flexible and distributed workforce, re-making labour as an on demand resource that can be modularly recomposed. It is through logistical mediation and topological calculation that platforms capture and deploy collective mobility as a productive force. One of the main arguments of this thesis is that value appropriation and exploitation in platform labour are enabled precisely by the capture and calculation of different characters and qualities of work. Among these qualities, mobility appears as a particularly important one to study the case of geographically tethered platform labour.

Platform mediation as spatial software: the pandemic «spatial fix», the case of ghost kitchens

Studying platforms in their geographical dimension, it is interesting to consider not only how the mobility of labour is captured as a productive force, but also how precisely through labour mediation the individuating ensemble integrates with the metropolitan milieu — which

is to say that platforms install themselves within the city landscape, producing urban spaces as instrumentalised sites for capitalist production. In his account of platform urbanism, Mark Graham argues that platforms operate «through a strategic deployment of 'conjunctural geographies'» by which they embed themselves in the urban landscape, mediating labour and commodity circulation «whilst remaining sufficiently materially and organizationally disembedded to avoid significant accountability» (Graham 2020). Besides cases in which their presence and activity within urban territories becomes materially impossible to keep unnoticed — like the above-mentioned instance regarding the presence of riders on regional trains — platforms try and keep the regulatory attention of institutions and other local resistances at bay for as long as possible. However at the same time, and possibly precisely because of this lack of direct scrutiny, platform mechanisms of value extraction and social sorting become deeply embedded in the economic and cultural fabric of the city. The entanglement of platform labour with urban dynamics such as commuting routes, commercial patterns, gentrification and urban redevelopment, is an example of how the production of space within the contemporary city happens by way of computational operations almost as much as by brick and mortar construction.

Carrying out my fieldwork as a gig worker in the aftermath of the Covid-19 lockdowns, I came to understand the pandemic as an experimental phase for the integration of platform mediated labour within the city landscape — at least in a couple of ways, which I would like to critically illustrate starting from the concepts of abstract space and spatial fix. Talking about the production of space during the Covid-19 pandemic, Marco Briziarelli & Emiliana Armano draw on Lefebvre's notion of abstract space — a space rendered as entirely instrumental to capitalist production — to describe «digital abstract space» as a social field that, by the infrastructural power of digital technology, is produced as a networked space of neoliberal subjectivation (Briziarelli & Armano 2022; Lefebvre 1991). As the pandemic slows down circulation and productive circuits, capital operates what David Harvey described as a «spatial fix»: a movement of geographical expansion and restructuring, accompanied by technological change especially in communication or transport (Briziarelli & Armano 2022; Harvey 2001). The spatial and technological fix of platform capitalism reacted to the pandemic with a new production of space, operating precisely in this tension between the temporary stalling of previous mechanisms production and the new spaces of intensified productivity.

I will now consider two case studies that illustrate different but complementary modes of spatial fix during the pandemic: the diffusion of remote work and the intensification of last-

mile delivery infrastructures across the city. Working freelance at the beginning of the pandemic — when working from home became not so much a perk as an economic necessity — I experienced, together with many others, a reconfiguration of domestic space according to the demands of newly distributed workspaces. This was made all the more intense considering that I, like most people of my demographic in large cities, was sharing a house with other people who also had to produce a working space within their private living arrangement. Working as a delivery courier in London during the aftermath of the second season of lockdowns, I also witnessed an acceleration in the ongoing integration between urban space and the operations of the platform economy.

According to the Online Labour Index[30], both the demand and supply of web-based platform labour, after a steady growth between 2017 and 2020, further increased as a result of the Covid-19 pandemic in 2020 — with supply significantly rising faster than demand (International Labour Organization 2021). As a result of this excess of labour, increased competition even for poorly remunerated tasks caused an overall lowering of pay rates, to the convenience of businesses (International Labour Organization 2021; Dube et at 2020). This trend was common to both micro-work platforms and more general freelancing ones, but especially pronounced for programmers and IT workers, as tech companies increasingly turned to digital labour platforms during the pandemic to outsource their work (International Labour Organization 2021). Lastly, according to studies conducted by the EU Joint Research Centre, with the increase in remote work and «telework» determined by the pandemic, even forms of work that are not directly based on digital platforms — for instance most office jobs — have seen an increase in the use of platform services and algorithmic coordination to monitor and organise workers (Adascalitei et al 2022; Joint Research Centre 2023). The popularisation of remote work and telework highlights a spatial dynamic that has been a distinctive trait of web-based platform work since its emergence. As labour stably invades the space of workers' private residencies, not only the post-Fordist extension of labour time over leisure is facilitated and intensified, but the domestic space has to be materially reorganised to accommodate an externalised piece of the workplace. With this compression of space and time, companies are free to reduce their investment in office space, offloading the ownership, furnishing and overall keeping of workplaces onto workers. As living rooms and bedrooms are integrated into the space and time of flexible, distributed labour, they are formally subsumed as what Briziarelli and Armano define as «digital abstract space» (Briziarelli & Armano 2022). However, this form of subsumption doesn't necessarily entail unilateral

[30] built by researchers at the Oxford Internet Institute with data collected from 105 countries on the five largest web-based platforms since 2016 (Kässi & Lehdonvirta 2018).

exploitation. In fact, as work gains a stable foothold in the intimate sphere, the intimate sphere troubles the rhythm of work. Anyone who has been part of this general relocation from offices to domestic space has in some way experienced at least a contingent escape from the discipline and constriction of direct workplace supervision — whether this means getting back to bed after an early morning meeting, not having to perform a productive attitude for the gaze of the boss, or even using software solutions like "mouse jigglers" to simulate mouse input, essentially hacking remote supervision by faking activity. This tension between an intensified subsumption of life and the establishment of a relative autonomy from supervision is a distinctive trait of platform labour — which I will problematise further by discussing impersonal management, self-exploitation and the investment of workers' subjectivity into production.

The second case deals with the relation between the platform mediation of location-based work and the production of space across the city landscape. In fact, during the pandemic, domestic spaces are not the only ones to be re-organised by the spatial-technological fix of the platform economy. The intensification of last-mile delivery was accompanied by a range of micro-reconfigurations of dormant spaces, while at the same time being entangled within large-scale dynamics of urban development. Discarded Amazon cardboard boxes piling up at every corner have become a ubiquitous trace of the capillary diffusion of logistical flows within the city, operating through a network warehouse facilities, sortation and fulfilment centres, delivery stations, hub lockers and distributed pickup points outsourced to a myriad of third-party corner shops. The entrance halls of large buildings have been gradually but automatically reconverted into hubs for micro logistics, accommodating a bustle of couriers, riders and delivery service partners. In my experience, working as a delivery courier in London in 2022, the navigation of buildings was a key part of the working routine; from co-operating with reception staff when dropping off orders, to communicating with customers through the app in order to have them coming to collect their meals — or, in less comfortable situations, navigating the staircase plans of large housing estates. A particularly interesting case was that of student halls, where entrance receptions saw a particular traffic of couriers delivering fast food orders, especially on weekend nights[31]. At a particular student hall in Greenwich, the reception staff was so used to interacting with couriers, that after a few visits, during customary small talk while I waited for the customer to come and collect their order,

[31] Delivering to student halls seems to be a particular pain point for many couriers. A Discord user who seems particularly familiar with this scenario recounts: «I have 7 student accommodations in my area, like 30% of my weekly orders are to students and they are one of the worst customer types to deliver to. The ones that I hate the most is the ones that don't say anything, not a hello, thank you or a goodbye, I don't care about the manners it just makes the situation super awkward for me».

they would inquiry into how much I was making on a busy weekend night like that, and even suggested I joined a newly launched app — whose logo I actually started seeing more and more on couriers' backpacks in the following weeks.

I also found that, outside of the city centre and other touristic areas, fast food chain restaurants were populated more by riders than regular customers. Given that outlets like McDonald's or KFC present a reliable source of work, couriers of all platforms were stably assembled outside of these restaurants waiting to receive orders. At a particularly busy McDonald's in the area of Camberwell, a "note from business" politely asked couriers to park their bikes further away instead that on the pavement outside, as "this is causing a lot of issues with local businesses and Transport for London and it is becoming an health and safety risk to pedestrians". Inside, some restaurants set up a separate room, directly facing into the kitchen, entirely reserved to couriers waiting to pickup their orders. However in many cases, riders were simply queuing on the shop floor, backpacks at their feet or against a side of the room, most of them talking on the phone in different languages, some of them making conversation, complaining about their shift, or showing off the previous night's earnings. They are not treated as customers by the restaurant's staff, but more like "external service providers" — or as the next worker in an assembly line. If something is not working out, if an order is taking too long, an item is missing or the information on the restaurant's screens doesn't match up with that on the courier's smartphone, it was up to the two parties to figure things out. Both are often tired, hot, in a hurry, and both are asked to provide feedback on their interaction by their respective side of the interface. However, only rarely there was conflict, the common interest being to sort out any issue quick and easily. Those like me who were new to the job might have looked a bit clueless and occasionally needed a little emergency training and support from either other couriers or restaurant staff. This type of tense and disorganised cooperation, taking place in these improvised logistical venues, seems to be absolutely essential to the seemingly smooth functioning of the platform-ed supply chain.

However it's not just the floors of specific shops and buildings that had to restructure to accommodate platform labour in its spatial dimension. During the pandemic, the logistics of last-mile delivery produced entirely new spaces in unexpected areas of the city. The most direct connection from the South-London area of New Cross to more central areas and office districts is a large arterial road — called New Cross Road up to a certain point and then Old Kent Road. This road delimits on the west the area of South Bermondsey, which is bounded to the opposite side by the railways going from London Bridge towards the South East, and to the north by the more residential area of Bermondsey and the Millwall FC stadium. Most of

South Bermondsey is currently occupied by a 30 acre industrial site sometimes referred to as the “Bermondsey triangle" or more ironically as the "concrete riviera”. Described as «underused» by the company who is planning its redevelopment, the area is currently home to mostly industrial estates and warehouses, some metal or brick workshops, small religious centres and associations, a handful of artist studios, clubs and squats — as well as a few building sites preparing its imminent transformation into a gentrified «New Bermondsey» (New Bermondsey 2023). During my time there, the area was almost exclusively populated by workers during the day, while partygoers and people in religious dresses could be seen walking around in the early hours of the morning. However, during the pandemic, a swarm of food delivery couriers began frequenting the area between the late afternoon and the night hours, guided by their apps. The orders were coming from what are generally called “ghost kitchens” or “dark kitchens”: warehouse laboratories hosting a number of kitchens that are not open to the public, but only accessible through delivery platforms — a model which has gained popularity mainly during the pandemic (Euromonitor International 2019; Giousmpasoglou et al 2023). Out of the four that have emerged between Ilderton Road and Ormside Street, one is directly owned by a major delivery platform while the other three have been set up by private entrepreneurs. Each unit hosted between five and twelve kitchens, most of which were rented out to restaurants who wanted to expand their delivery capacities, and some to others who choose to work exclusively through delivery. Once riders approached the area and received an order, they parked outside the warehouse, and entered into a waiting room which could be variably equipped with a bathroom, a drinking water sink, charging stations for phones and electric bike batteries, as well as screens indicating the state of the orders. From there, couriers could move into the food collection area, usually a corridor connected to each of the different kitchens through kiosk windows lined up on both sides of the corridor. Here, couriers receive their orders from the designated kitchens and leave.[32]

The emergence of ghost kitchens can be understood as an effect of the generative power of lean platforms to operate as foundations or infrastructures for other processes and organisations. As noted by Alex Williams in his discussion on platform logic, «platforms act as a kind of possibility space […] setting the conditions for autonomous self organisation» (Williams 2015). The peculiar strength of platform power — compared to other more dystopic accounts of cybernetic power such as that of Tiqqun (2020) — is precisely their capacity to operate through enablement rather than just constraint, opening up their functions to the unpredictable initiative of others without pre-set directions, and on the basis

[32] See in the Appendix: a floor plan of a ghost kitchen (Fig. 1); a map of the South Bermondsey area (Fig. 2).

of this then «metabolise contingency into power itself» (Williams 2015). What is interesting here is how this generative power of the platform economy produces a spatial fix, a reconfiguration of space that re-composes value production in the face of a stalling of circulation determined by the pandemic. In the case of South Bermondsey, the production of space is temporarily reoriented, within a process of gentrification and real estate development, toward producing new logistical and infrastructural sites. I argue that, the synergistic integration social and technical operative structures, which drives the individuation of digital platforms, is enabled precisely by their capacity to operate as what Keller Easterling calls a «spatial software» (2016). By this functional integration, platform mediation concretely integrates with the city landscape. Across the diffuse social activity of the metropolis, platform power over labour operates through the integration and modulation between platforms' generative capacities and the free initiative of entrepreneurial subjectivities. This is not only true for the commercial initiative of firms and business owners, but especially for the mobilisation of user subjectivity through various forms of platform mediated labour. This will be the topic of the next and final section of this chapter, which discusses how platform mediation concretises certain qualitative and conceptual transformations that characterised post-Fordist labour, accompanying the extension of direct valorisation to the whole social field, and newly emerging forms of labour subjectivation.

Subjectivation and capitalist production: from post-Fordism to platform labour

Following the thematisation of the increasing flexibility of labour relations, and of the growing centrality of their spatial dimension, this final section looks at how social cooperation and forms of subjectivation are increasingly subsumed into capitalist production. To understand how this tendency is concretely expressed in contemporary platform labour, I will follow two historically entangling processes. One is the qualitative mutation of labour in its increasingly collaborative, cognitive and affective character, as thematised by autonomist Marxism. The other has to do with certain cultural and technical developments that enable the abstraction of labour into quantified information. I will argue that the functional integration of these two processes is fundamental to the re-making of a growing share of social relations as labour. This happened first conceptually with the absorption of cybernetic logic into socio-economic thought and practice (Franklin 2015), and then technically as networked media

infrastructures enabled labour to concretely assume computational form. Following this line of argument, this section will discuss how the managerial apparatus of platform labour concretely expresses of the abstract machine of modulative control — famously sketched out by Deleuze and elaborated by many others (Deleuze 1997, Dixon-Román & Puar 2021, Hui 2015, Rouvroy et al 2013, Williams 2015) — through which not only social relations but also forms of subjectivation are re-made into economically valorisable forms.

Socialised, machinic, immaterial: post-industrial labour as generalised virtuality

The «industrial modality» of production emerged through the technical concretisation of an increasingly mechanised division of labour into industrial automata (Marx 1976, Simondon 2012; 2017). In what Marx describes as an ongoing process of «real subsumption», machinery comes into its own as a concretisation of pre-existing social relations of production, expressing and in some way naturalising capital's power over labour as technological rationality (Marx 1976, Panzieri 1976). Already in the early industrial age, labour starts being technologically re-made; not only formally subsumed as an economic entity under the commodity form, but also materially subsumed through technological mediation — in a way that will then serve as the model to re-make social relations, other than directly productive ones, as labour. By way of real subsumption, industrial automata can replace the need for a human master by abstracting productive power away from the co-operation of craftsmen and producing «a framework apart from the labourers themselves» (Marx 1976, Sohn-Rethel 2021, p.122). Marx's «Fragment on Machines» explains how through this framework «general social knowledge has become a direct force of production», and readings of this thesis by *Operaismo* further articulate how «general intellect» as a complex of social cooperation and knowledges is made increasingly subordinated to capital, as production becomes immanent to social relations (Marx 2014; Pasquinelli 2015, Thoburn 2003). Specifically, Mario Tronti theorises an extension of the Fordist-Taylorist factory model into a social system, noting that as «the social relation is transformed into a moment of the relation of production, the whole of society is turned into an articulation of production, that is, the whole of society lives as a function of the factory and the factory extends its exclusive domination to the whole of society» (Tronti 1962). Authors associated with *Operaismo* and *Autonomia* focus on how productive relations are infused and naturalised across the social field, through a re-composition of the labour-capital relationship beyond and away from the factory — which historically served to curtail the growing power of factory workers in industrial cities, as already discussed (Bologna 1991, Tronti 2019). In particular, Antonio

Negri sees that of the «mass worker» as a phase in the movement of real subsumption, that follows the skilled craftsman of early industries, before the emergence of a fully «socialised worker» (Negri 1988).

This socialisation of work accompanies a de-composition of the traditional industrial working class and a new class composition of the «fully diffuse proletariat» in which precarious and flexible work increasingly assumes productive centrality, together with housework, non-remunerated and unrecognised work (Negri 1988; Thoburn 2003). This diffuse and socialised character of labour observed by *Operaismo* and *Autonomia* resonates with the movement described by Deleuze and Guattari by which capitalist production comes to depend less on the *quantity* of extracted surplus labour time measured by «human surplus value», than on the complex *qualitative* process of «machinic surplus value». In the production of machinic surplus value, social, human and technical relations function as an integrated whole, an assemblage of mechanic and organic, material and immaterial. This «machinic» relation doesn't replace the elementary labour of the worker, but comes to «correct the relative diminution» of its value, as the central constituent part of production becomes precisely this functional integration of social life, technical innovation, manual labour, information and specialised education (Deleuze & Guattari 1983, p.232-234).[33] This machinic character of surplus value production can in a certain sense be understood as a process of concretisation of capitalist production, through the synergic integration of previously separate — non directly productive — social relations. This mutation in the composition of labour also corresponds to a qualitative difference in the content of work. In its socialised or machinic dimension, labour encompasses a range of communicative, affective and cognitive activities not traditionally recognised as work, but that nonetheless produce the «cultural content» of the commodity (Lazzarato 2006). These are carried out more or less consciously not only by the creative or the knowledge worker, but especially by precarious or informal workers, the young and the unemployed (Hardt and Negri 2001). At the same time, this transformation also has to do with the increasingly informational quality of the skills and tasks involved in the labour process itself, as the focus of economic activity shifts «from secondary to tertiary industries – from manufacturing to service economies» (Jarrett 2022). In the post-Fordist economy, not only the production, manipulation and transmission of symbols and knowledges becomes a growing part of everyday work, but materials and products

[33] The «elevation of the rate of profit through machinic surplus value» is not explained or determined by the «intensity of the exploitation of human labor, the diminution of the price of the elements of constant capital» or by technical innovation in itself — in fact, «on the contrary, these factors depend on it» (Deleuze & Guattari 1983, p.232-234).

themselves increasingly circulate in an informational form (Lazzarato 2006; Davis et al 1997). Work in its fully socialised form — controversially described by Maurizio Lazzarato as «immaterial» (2006) — becomes «a virtuality (undetermined capacity) which belongs to the post-industrial productive subjectivity as a whole» (Terranova 2004, p.83). Across this machinic social body, collective knowledges, capacities, propensities and patterns of interaction become productive as a generalised potential, which is valorised through its actualisation in specific enactments of work and exchange (Lazzarato 2014).

Labour as conceptually digital: the informational social logic of human capital

At this point it's interesting to think about how, in this progressive integration of social cooperation within capitalist production, labour is increasingly being remade *abstractly* in digital terms, long before being mediated by *concrete* digital technologies. Analysing the role of the digital computer in the emergence of control societies, Seb Franklin argues that it's not so much the development of electronic computers that determined the historical transition to a post-industrial society. Rather, the diffusion of informatic machines was imbricated within a more fundamental re-conceptualisation of social life, in which the principles of post-war cybernetics were generalised and absorbed by economic thought, social theory and management praxis. This system of knowledge produced «digitality as cultural logic», establishing that of control as the epistemic grounding for re-making of social relations as immaterial labour (Franklin 2015). Within this episteme a series of operational metaphors drawing from information theory and cybernetics served as the conceptual basis for a progressive social and technical reshaping of labour, sociality and subjectivity. Tiqqun's «cybernetic hypothesis» argued that «at the end of the twentieth century, the image of steering, that is, management, became the cardinal metaphor for describing not only politics but also all human activity» (2020). From this perspective, a cybernetic understanding of life might be precisely what grounds a full socialisation of value relations. Because capital can apprehend life only as labour, direct valorisation historically required the formalisation of life as labour time through the abstraction of value. As already discussed, this enabled the conceptual discretisation from which the industrial modality emerged through real subsumption (Marx 1976). But for valorisation to extend beyond the industrial machinery and pervade the social factory, another type of abstract operation is required, whereby the whole social field is refigured as a communication network. The diffusion of surplus value production across everyday life is enabled precisely by these conditions of knowledge: as the supposedly frictionless transmission of information becomes a governing principle of life, all

social relations can be understood in terms of information processing. Thus, just like existing forms of work are re-framed as communication, all communicative acts can be re-made formally as exchange and materially as labour — and as such valorised.

Furthermore, if the social field can be apprehended as an activity system, subjectivity itself is re-conceptualised as a network of informational states, as a component of such a system. While Claude Shannon's mathematical theory of information and Norbert Wiener's study of communication in organic and mechanic life had been formulated with certain caveats, these specificities are widely disregarded in the application of the cybernetic logic to social modelling — as noted in various cultural histories of cybernetics, information theory and their afterlives (Hayles 1999; Gleick 2012). The result is a generalised reduction of social life to a system of binary input/output interaction, where «only what can be configured as a switching circuit exists» (Kittler 2017).

An example of how this logic was integrated by neoliberal socio-economic thought is the theory of human capital, developed among others by Theodore W Schultz and Gary Becker in a series of essays throughout the 1960s, culminating in Schultz's 1971 book *Investment in Human Capital* and Becker's 1976 *The Economic Approach to Human Behavior*. In his lectures on neoliberalism as a «global claim» and a «method of thought», Foucault reflects on «the epistemological transformation produced by neo-liberal analysis» of economic processes and human behaviour. While classical economic theory, following Adam Smith, focused on the mechanisms of production and exchange, neoliberal thought puts labour back at the centre of its economic analysis. However, Foucault notes how labour is not conceptualised as labour power that is sold to capital invested in an enterprise, but rather as «capital-ability» which can generate an «income-wage», «so that the worker himself appears as a sort of enterprise» (2008, p.225). The particular aspect of neoliberal economic thought is that it doesn't take social processes or even individuals as the most basic elements to understand a system, but enterprises: «an economy made up of enterprise-units, a society made up of enterprise-units, is at once the principle of decipherment linked to liberalism and its programming for the rationalisation of a society and an economy» (Foucault 2008, p.225). From a neoliberal perspective, the direct productive force of the economy is not really labour as commonly understood, but relations of exchange within a network of private enterprise-units. Or rather, labour is understood as not necessarily separate from capital — not as the activity one performs for an employer in exchange for a wage, but as the work on the self one performs «as entrepreneur of himself, being for himself his own capital» (Foucault 2008, p.226). Within this theoretical framework, all activities can be analysed as improving,

preserving or dissipating capital-ability, and all life can be calculated and measured in terms of human capital and investment possibilities. By extension, the whole social field can be rethought as a composition of human capital, where even cultural and education policies are modelled as capital investments. Foucault is interested in how this theoretical perspective represents «the extension of economic analysis into a previously unexplored domain» and therefore «the possibility of giving a strictly economic interpretation of a whole domain previously thought to be non-economic» (2008, p.219). Because all actors are re-conceptualised as decision units, all human behaviour is modelled as a processing of inputs and outputs (Becker 1978). It is precisely through this logic that economic rationality is generalised as the representational scheme of social life, and thus the social field is epistemologically re-made into an informational network of calculating units.

If computation, human behaviour and social life are metaphorically collapsed as equivalent self-regulating calculators — as suggested by Franklin — then all social activity can be refigured in digital terms, as a bundle of discrete processes that can be organised through technical mediation (Franklin 2015). As this cybernetic logic grounds the neoliberal understanding of socio-economic behaviour, the type of abstract discretisation that had historically underpinned direct valorisation is extended to all social life. Within the neoliberal episteme, social activities, perceptive states and desires are no longer understood as distinct from production, but rather immanent to it, as capacities of the individual-enterprise to maximise capital. The individual is figured as noting but a network of these discrete intersecting behavioural streams. Digitality here appears as not only metaphorical but ontological, grounding control as the mode of power of post-industrial societies. The industrial factory was analogical not because it was premised on labour in the form of continuous movement — in fact the Fordist division of labour and Taylorist scientific management are already fundamentally digitising processes — but rather analogical in the social relations it engendered, apprehending individuals, or masses of them, as undivided bodies. By contrast, the machinic surplus value of immaterial labour is not the expression of the analogical individuals and masses of industrial enclosure, but rather of the networked *dividuals* of control societies described by Deleuze (1997; Deleuze & Guattari 1983). The body of workers is made discrete first in the sense that the mass is atomised, then at the level of individuals, which becomes *dividuals*, divided within themselves in discrete components, and whose digital subjectivities are modulated through apparatuses of capture and valorisation (Deleuze 1997). If the formal discretisation of life had been fundamental to industrial valorisation, then the generalisation of cybernetic logic in neoliberal socio-economic thought

enabled a reconceptualisation of all social activity as information communication, which served as the basis for the extension of valorisation to the whole social field.

This section surveyed different accounts of how social cooperation, through real subsumption in capitalist production, becomes not only conceptually digital, but also qualitatively informational — a tendency which only intensifies with the growing centrality assumed by knowledge work and the tertiary sector within post-Fordist economies. It is from this socio-economic context that the digital economy emerges, and begins integrating the abstract networks of immaterial labour into concretely digital forms. Describing «free labour» as the cultural and technical activity that animates value production in the network society, Tiziana Terranova notes how «the internet highlights the existence of networks of immaterial labour and speeds up their accretion into a collective entity» (2004, p.84). Production in the digital economy has less to do with manufacturing masses of finished products than with capturing these continuous processes of creative activity and media consumption that are channeled through the internet. This capture of immaterial labour as a key source of value in the network society foregrounds «mass intellectuality» as a «quality and a distinctive sign of the whole social labor force in the post-Fordist era» where «all the more generic attitudes of the mind gain primary status as productive resources» by remaining embodied in the diffuse workforce of the social factory, never fully crystalised in fixed capital (Virno 2001). If this mobilisation of general intellect through networked information technology was already manifest at the turn of the millennium, the development of digital infrastructures in the following decade concretised the machines of capture and modulation under the oligopolistic power of the platform economy.

The management of neoliberal subjectivation: hope, self-reflection, «assetisation»

The industry narrative around platform labour emphasises individual empowerment and self-enclosed user profiles. However in any platform's actual functioning workers seem to be addressed not so much as self-contained individuals, but rather at the level of sub-dividual or pre-individual productive capacities — at the level of a dividual economy. In his study of the relation between production, subjectivity and technology, Lazzarato reads Deleuze and Guattari's concept of «machinic enslavement», explicitly borrowed from cybernetics, to understand how capitalist machines function through parallel processes of social subjection and machinic enslavement. He explains how «subjection operates at the molar level of the individual (its social dimension, the roles, functions, representations and affections)» while

enslavement «consists in mobilizing and modulating the pre-individual, pre-cognitive and pre-verbal components of subjectivity, causing affects, perceptions and sensations as yet unindividuated or unassigned to a subject, etc. to function like the cogs and components in a machine» (Lazzarato 2006). This mobilisation of subjectivity is already a key feature of post-Fordist socialised labour. As discussed above, the cybernetic logic absorbed in neoliberal thought enables to conceptualise the subject in a networked digital form, as calculable and valorisable human capital. This is evident in ideas such as those of the «knowledge economy» or the «reputation economy», where one's education or cultivation of personal relationships become akin to investment in capital assets (Gandini 2016; Powell & Snellman 2004). The immaterial labour of the self-entrepreneur involves precisely the production and strategic deployment of human capital in the form of embodied performance and affective states. This condition is typified by Foucault's description of the *governmentality* of neoliberal subjects, by which they produce themselves as actors in their own exploitation, so that domination is effected through one's own subjectivation. Crucially, Foucault understands neoliberalism as a form of rationality, which operates not as a transcendental external structure acting *on* the social, but *immanently to* the social assemblage — as a mode of subjectivation (Deleuze 1988; Foucault 2008).

The type of subjective and psychic investment mobilised by the self-entrepreneurialism of platform labour is closely linked to the hope of bettering one's working conditions. According to Gray and Suri, *hope* is a constant expressed by all the workers interviewed in their five-year study.

> *«They hope to use on-demand jobs to control when they work, who they work with, and what tasks they take on. They hope to stay close to their families. They hope to avoid long commutes and hostile work environments. And they hope to gain experience that refreshes their resume or opens a door to new possibilities. Also true is that many saw few other options for themselves or their families.» (Gray & Suri 2019: xxvi).*

Hope appears fundamental to workers' ongoing investment in their own exploitation[34]. A 26 year old Londoner interviewed by Channel 4 talks about a personal trajectory that is not uncommon to hear in discussions between platform workers; that of leaving a stable retail job hoping for more flexibility and autonomy, only to then realise that making ends meet through

[34] This dynamic resonates with Lauren Berlant's idea of «cruel optimism»: the attachment to an idea of a possible desirable future that one maintains even when that possibility begins appearing as either impossible or not actually desirable (Berlant 2011).

full time gig work can be quite taxing, «I got fooled by the fact that they say you can make so much money, that you can work when you want, how you want, whichever way you want» (Channel 4 2023). The self-management of one's personal investment, the idea of deciding whether to accept a poorly paid delivery, or one that might take you far out of your area, is always based on the more or less conscious hope that another opportunity is coming, that the algorithmic choreography will work in your favour if you push a little harder, that another order will appear on screen. This type of hope and self-investment seems to run across a wide range of different working positions, from the *entreprecariat* to the early career scholar, to the platform working class. As Kylie Jarrett puts it «in digital media industries, hope is a management tool.» (2022).

Together with subjective investment and hope, fundamental to the auto-regulation of self-entrepreneurial subjects is also a certain quality of «self-reflection associated with "reflexive modernity," which sociologists such as Giddens, Bauman, Beck, and Lash describe as the nature of the post-Fordist environment» (Jarrett 2022). Jarrett notes how this constant reflexivity is historically gendered and how the embodied performance of a desirable identity reflects feminised cultural behaviours. Already in the Cyborg Manifesto, Haraway had argued that within the «world-wide working class» of the «New Industrial Revolution […] work is being redefined as both literally female and feminized, whether performed by men or women. To be feminized means to be made extremely vulnerable; able to be disassembled, reassembled, exploited as a reserve labour force; seen less as workers than as servers» (Haraway 1991, p.166). This deskilling and restructuring of work have been studied through frameworks historically employed to analyse domestic labour, which become particularly useful to understanding the digital economy (Jarrett 2015). Significantly, domestic labour as well as other jobs done mainly by women are often characterised by many of the qualities generalised in post-industrial immaterial labour, such as «affect, care, love, education, socialization, communication, information, entertainment, organization, planning, coordination, logistics» (Fortunati 2007, p.144). This feminised character of post-Fordist work thus extends from the workplace to general social life, and to forms of subjectivation as both are increasingly mediated by ubiquitous of communication technologies. Thus, the self-reflexive performance of total availability — in different forms and to varying degrees — becomes more or less implicitly demanded of the social media user, the gig worker, the click worker, but also of the creative freelancer, the early-career scholar, and the white collar tech worker. In light of this, Jarrett reflects on how the position of the "Young Girl" identified by Tiqqun as a paradigmatic status of contemporary labour subjectivity, has been mobilised in feminist cultural studies beyond the dismissive and patronising tone of its initial formulation

(Tiqqun 2012). In fact, this vulnerable condition also articulates forms of subaltern agency and is not trapped in an inescapable logic of commodification. Rather, it is precisely «the contradictions that the "Young Girl" exists within – both object and subject; both active and passive; both observed and watchful» that «offer a way of understanding the absorption of life into labor» (Jarrett 2022). Challenging an orthodox Marxist framework of commodification, Jarrett — among others — understand the investment of subjectivity in digital labour not so much as a process of commodification but rather as one of «assetisation» — a term used describe a re-orientation of labour subjectivity away from the immediate wage and towards an appreciation of human capital assets, whereby the worker assumes the political form of «investee» (Birch & Muniesa 2020; Feher 2018). The metaphor of the commodity seems increasingly inappropriate to describe «the types of incorporation of worker subjectivity into capital that we see in digital labor», as workers' productive capacities are not so much sold to a company as stabilised objects, but rather channeled through digital marketplaces for valuation (Jarrett 2022). Within this paradigm of assetisation, labour makes itself open to be tapped into and exploited by platforms, while at the same time articulating modes of subjectivation that integrate the opportunism of the labour force, the enslavement of their social capacities, and the mediation of platform technology.

During my fieldwork as a click worker, I became aware of how my embodied affective and perceptive capacities had become assets that could be valorised through digital platforms. A large part of the work I carried out through a major micro work platform was part of a "Universal Human Relevance System", a platform-within-the-platform dedicated to data labelling tasks aimed crowdsourcing the human capacity to recognise the contextual relevance of information, in order to assemble datasets for future use in AI applications. Here, the capacity to recognise and express emotions, to understand the context of an information, to distinguish a blurry image or decipher a smeared text scanned from a page, are all articulations a certain set of latent assets identified by the AI industry; the embodied collective ability to express "human relevance". However, assetisation is not exclusively conductive of extraction, but constitutes also an ambivalent condition. It's interesting to go back to the example of Karya; the Indian startup giving people in disadvantaged rural communities access to good earnings for doing micro-work in their native language of Kannada, which is rare online and therefore valuable to AI companies for training their models (Perrigo 2023). Here, knowledge of Kannada assumes the status of a contingently valuable asset, precisely because of the marginalisation of those who speak it. The fact that people also maintain the right to earn from future uses of the data they produced, seems like an attempt to experiment with value distribution over time, granting workers some sort of subaltern agency within a position

of economic disadvantage. As highlighted in previous sections, even mobility — as an individual's ability and disposition to move around — becomes directly assetised by way of platform mediation. At a broader scale, the cases of migrant workers subjected to overlapping regimes of precarity and exploitation, have shown how migration itself can constitute an act of investment in one's assets, in the potentially valorisable human capital of the migrant self-entrepreneur.[35]

The concrete ensemble of platform labour: interfaces, abilities-machines, modes of subjectivation

Platform mediated marketplaces emerge as key channels to activate the latent human assets distributed across the social factory. In the platform-ed ecosystem of flexible labour, self-enterprises are entangled in value production not just through the mute compulsion of market relations and disciplinary apparatuses, but rather through modes of subjectivation. In fact, subjectivation is integrated with the individuating platform ensemble, through platform mediation. The deployment of one's resources and abilities requires interaction with screen interfaces, by which the body of the worker becomes attuned with the asignifying semiotics of algorithmic machines. Users' self-reflexive gaze is mediated by these same patterns of interaction, as they experience their own metricated self and embodied performance through digital interfaces. As this collective practice becomes an integral component of the digital economy, social cooperation and modes of subjectivation are integrated with the individuation of the platform and its functioning schema.

To think about how labour subjectivity is structured through interactive media technologies, it is interesting to briefly look at the work of Karin Knorr Cetina on financial trading, an occupation which interestingly is also taken by Lazzarato as a paradigmatic example of contemporary labour subjectivation. Knorr Cetina argues that financial markets are «exteriorised» on screens, which assemble the dispersed relations by which one could «experience» the market into one disembodied symbolic space. Through this space traders are interconnected both to the markets and to one another. This exteriorisation makes the market «fully available» as a separate entity «framed by the boundaries of the screen, which also serves as a medium for transactions» (Knorr Cetina & Bruegger 2002, p.163). This integrated entity changes the structure of relationships that workers have with the market and between

[35] The contradictions inherent to the model of assetisation will be discussed further and critically thematised in the last chapter of the thesis, developing the idea of *platform pragmatics*.

themselves, as «traders are now able to simultaneously position themselves inside the market in the sense of becoming players in its overlapping networks, and to relate to the market on screen as an exteriorized other, a sort of master-being that observes all transactions and includes their contextual conditions and motivations» (Knorr Cetina & Bruegger 2002, p.164). This framework is based on the intuition that people relate to some technical objects not only as instruments or as «accomplishers» of tasks, but also as reflexive experiencing entities. Specifically Knorr Cetina takes the information systems embodied on screens, as devices of «appresentation» — a term she borrows from Husserl to suggest how screen devices take the dispersed and abstract entity of the market and render it «response-present» and available to interaction (Knorr Cetina & Bruegger 2002, p.163). By this process, traders' «continuous sensory attunement» to what she defines as a «synthetic situation» becomes a prominent feature of their technologically-mediated professional culture (Knorr Cetina 2009).

However, following this reading, it is interesting to consider interactive devices through Bolter and Grusin's formulation of «remediation» as a defining feature of digital media, which they see as also remediating the self, making it virtual and networked (Bolter & Grusin 1998). Sherry Turkle similarly looks at how through our relationship with screen interfaces, computation became not just an instrument, but a broader component of our psychical and social life, transforming our sense of self by making postmodernist simulation into a material experience (Turkle 1995). This re-mediation of social experience by computational media works through a seemingly contradictory double logic: the coexistence of «hypermediacy», where the medium makes the user aware of its mediating presence, with «immediacy», where mediation operates transparently to immerse the user in the experience represented (Bolter & Grusin 1998). A similar logic is at play in technologically mediated work. On one hand, the worker is immersed in the mediated experience of labour, sensorily attuning to the work process as a synthetic situation dynamically unfolding around them; on the other, they frontally interact with a clearly exteriorised technological other, a user interface issuing instructions, requests and stimuli, errors and unilateral decisions, and presenting a metricated rendering of their embodied activity.

As a rider on one of the major delivery platforms, my activity was captured and fed into the platform infrastructure to be algorithmically processed and organised, so that the

appropriate informational streams are then fed back to my screen interface.[36] By way of a diffuse and networked process of interface, my body is immersed in the rhythm of mediated labour. When I opened the app and "went online" I was effectively entering a marketplace, making myself available for the allocation of a job. The app enabled me as a user to explore the different "boosts*"* associated with various areas of the map, which indicate where the pay is going to be calculated with a higher multiplier at different times.[37] These types of incentives can also be explored through the "opportunities" section which shows the boosts forecasted for different areas throughout the whole day — and usually at least the day after. At certain times, the app suggested specific "quests" which usually offer fixed rewards — for example £5 — on top of the regular pay, for completing at least a certain number of trips during a certain timeframe.[38] During my ethnography, navigating this virtual marketplace as a rider, I could decide where and when to invest my energies, which is to say how to best deploy my assets. On the basis of this, I could make my own forecasts and calculations, for example about which times of the day and areas of the city could be more profitable, how to pace myself, how to distribute work across my schedule. By engaging with the marketplace through the interface, its informational streams, its incentives and forecasts, as a self-entrepreneur I developed a self-reflexive praxis, by which my free time, my energy levels, the strength in my legs, my willingness to face certain weather conditions, all become potential assets to valorise on the marketplace. Discussing the sensitive topic of working in the rain, a Discord user announces «[the platform] put a boost on for my area because of it» and a colleague comments «Rain kills the vibe. If I'm doing [work for the platform] for a long amount of time I want to be as comfortable as possible», to which a third worker responds «I don't pay attention if I'm comfortable or not, I just focus on doing orders. People tip more and more often as well if they see you soaking wet and feel sorry for you, especially elderly.»

---

[36] Crucially, the communication between embodied and disembodied processes isn't limited to the interaction of the worker-user with their device, but is extended to the invisible transmission of information across other networked interfaces, or across a meta-interface — a term Christian Ulrik Andersen and Søren Bro Pold use to describe how interfaces have moved from being localised in individual devices to an omnipresent process embedded in the background of everyday life (2018). This process will be discussed in more detail in the following chapter.

[37] Boosts generally start at 1.1x or 1.2x and increase depending on how busy a certain area is expected to be at a given time.

[38] The app also allows users to review their performance through information that is publicly displayed on their profile, such as their average rating and specific bits of feedback which customers can choose after receiving the order, from a list of pre-formulated compliments or negative notes — "friendly service" or "an item was damaged".

Here even a clearly adverse condition can at least serve as a temporary enhancer of one's capital-ability.

Over time, as worker-user of the platform, I developed a calculative gaze, simultaneously directed at the marketplace — scouring for opportunities and rewards — as well as at my own life, evaluating whether a long late shift on a rainy night, or a long cycle to a far away area, could be profitable enough to maybe take time off the following day. This calculative behaviour developed in a reflexive engagement with the marketplace, both as an immersive symbolic environment and as externalised self-reflection. The screen interface orients the mind, decisions are formed in interaction with it, my cognitive and emotional states as a worker continuously attuning with the platform.

My experience as a platform worker, both as a rider as a performer of micro-tasks, led me to consider how a certain mode of subjectivation is produced in this affective and cognitive attunement between workers and devices. While Knorr Cetina works with a Lacanian notion of the self as a structure of lack and wanting that is mirrored or corresponded by the incompleteness of screen display — Lazzarato, who also takes financial traders as a fully realised example of contemporary labour, considers instead subjectivation in machinic terms (2014). Here, discretised components of human subjectivity — like cognition, attention, perception, memory — combine with machine acts of partial subjectivation or «proto-subjectivation». In fact, machines can produce «enunciations» through which «they suggest, enable, solicit, instigate, encourage, and prevent certain actions, thoughts, affects or promote others» (Lazzarato 2014, p.97). These communicative acts can make visible flows of information that resonate with subjective desire, in such a way that human and machine productive potentials function as components of an integrated whole. The political importance of this recognition lies in the suggestion that not only mathematical models, diagrams and networks, but also corporate interests, business cultures and economic schools of thought, are integrated and develop functional synergy as components in labour subjectivation. Here, mediation seems to participate in the individuation of platform labour as a concrete ensemble integrating technical forms, social mechanisms, and modes of labour subjectivation.

This integrated mode of functioning appears to express — or realise — what Foucault understood as the neoliberal theory of work — previously reviewed. Crucially, through a critical reading of the technical functioning of platform systems, the next chapter will discuss how this paradigm is only upheld by the symbolic arrangements of platform labour — thought the fetishistic model of the "gig" — and does not correspond to the actual material operations of service coordination. However for now, it's interesting to consider how the neoliberal

paradigm of human capital and *homo economicus* are integrated in the concrete economic arrangements of platform labour — and to think about the political contradictions this generates.

Within platform labour, workers-enterprises function as networks of «abilities-machines», capable of generating a potential «earnings stream» over their lifespans[39] (Foucault 2008, p229). Thus the subjectivation of platform labour appears to produce a «machine-stream ensemble» (Foucault 2008, p225). It is interesting how the industry narrative around gig and sharing economies similarly presents the platform as bringing entrepreneurship to the masses, as an opportunity to convert one's surplus of time, skills and resources into extra income — or if one has *enough* time and valuable *enough* resources, into their main income (Botsman & Robers 2010; Mulcahy 2016). As a courier, my capacity to cycle became an asset, an ability-machine that, through the platform, could be plugged into the marketplace and connected to a potential earnings stream. In one of my first acts of self-reflection, as soon as I realised that most riders were using electric bikes, I decided to further invest in my asset, upgrading by ability-machine by way of a lithium-ion battery. This is a key investment, frequently discussed in online forums — the main points being how to make it worth it, and the cheapest ways to get one. As electric bikes tend to be quite expensive, another rider-enterprise points out to me that most people are renting them, but because bike rental companies charge you extra if you plan to use the bike for delivery work, it's better not to tell them — in the end they really have no way of checking.[40]

A central and seemingly contradictory aspect of platform labour has to do with the flexibility and relative autonomy that workers are granted. In fact, workers' autonomy is often not in contradiction with more intense subjective investment, but rather presents the ideal condition for a full assetisation of the self. An interesting case is that of people who not only work various platform mediated jobs, but also develop side hustles on different platforms that are more or less connected to their main or initial gig. In my exploration of the cultural context surrounding gig work, I came across Atlanta, a young gig worker from a coastal town near Brighton, who quit her job at the airport in 2021 to devote herself to full time delivery work. Atlanta works on the three major UK delivery apps, plus a smaller one, and is extremely active online, simultaneously running: a Facebook group for delivery workers; a YouTube channel documenting her deliveries, with hundreds of videos and thousands of

---

39 as opposed to a notion of labour force that is commodified and sold to an enterprise at market price.

40 Anyways, anyone who really makes a decent living out of riding seems to have at least a motor scooter.

subscribers[41]; another less popular YouTube channel documenting her travels; and an OnlyFans account[42]. On her Instagram and TikTok[43], she posts about work but also about her private life, and promotes her various channels and accounts. Atlanta delivers either by car or electric bike, and usually films with a GoPro camera strapped to her chest, and a larger one mounted on her passenger side. She is occasionally accompanied by her father, her partner or a friend. Her weekly videos take the forms of vlogs documenting her work routine; in the typical relaxed and familiar tone of a streamer or vlogger, she talks through events as they happen, gives the viewer a view of her screen as she sees it and casually comments on the boosts, opportunities and orders coming up on the interface. Her chest camera also shows her point of view as she rides on the streets. Her videos can take the form of challenges[44]; diaries of her trying out different solutions or new features introduced by the apps[45]; reviews and opinions on gear and equipment[46]; chronicles of misfortunes and bad shifts[47]. Some of the most watched also take the form of tutorials and explanations related to issues like insurance or how to do taxes as a self-employed worker[48]. In some of her most viral posts on TikTok, she interprets the trends and formats that are currently popular on the platform to show off her earnings[49] or document particular events[50]. Atlanta is a particularly prolific but not isolated

---

41 https://www.youtube.com/c/AtlantaDelivers

42 Interestingly, Atlanta recently started promoting her new Patreon subscription, where she posts exclusive weekly delivery videos, by saying that if she reaches 100 subscribers there, she could quit her OnlyFans account.

43 https://www.tiktok.com/@atlantadelivers

44 «£200 DELIVERING IN BRIGHTON! 18 HOURS DELIVERING?!» «£50 IN 3 HOURS CHALLENGE!» «24 HOUR DELIVERY CHALLENGE! Delivering non-stop»

45 «CAR VS SCOOTER - Uber Eats New Pay Structure, Just Eat Double Pick Ups» «Delivering in 2022 - is it worth it? £15 an hour?» «DON'T MAKE THIS MISTAKE!»

46 «ESKUTA VS EBIKE!» «2022 Deliveroo Kit and Bags - Car & Scooter! Never spill a coffee again!»

47 «I'M BANNED FROM MCDONALDS!» «CRASHED INTO WHILST DELIVERING!» «£3 AN HOUR?!»

48 «Delivery Insurance 2022 - everything you need to know!» «Self-Employed Tax Explained»

49 Captions like «How much I made delivering on 4 apps 10am-4:40pm» or «How much I made delivering bank holiday Monday 3-10pm on 3 apps!» are at the top of the screen as she performs a choreography with her hands and the earnings of the day on different platforms rhythmically appear on the screen.

50 «Triple Uber Eats Order» «NIGHTMARE DELIVERY»

example of gig workers extending the potential of their ability-machine through other platforms.

As I look for tips and guides on how to approach the job, a lot of the material I come across is produced and narrated by other gig workers. Many of them share content about their work on social media and content platforms like YouTube or Patreon. Similarly to Atlanta, most people try to attract viewership by offering advice, information, entertainment or just content and companionship. Among those who manage to build a community, it is not infrequent to promote or directly sell products, gadgets, services, or mentorship. In a way, what Atlanta and others try to do is fully valorise the control they have over their assets. In fact, the time one invests in waiting around for an order does not count as remunerated labour time for platforms, and even as workers are engaged in an actual delivery, the platform doesn't have the power to limit or discipline anything else they might be doing at that time. Therefore, one's labour time can be simultaneously open to potential valorisation through different types of platforms. The potential earnings of an eventful or prolific workday can be amplified even further by way of filming, editing and sharing content about it. The lifespan of that activity and its potential to generate earnings can be expanded by viral circulation — for instance through the monetisation of users' attention according to YouTube's advertising model. Even a quiet and unproductive shift, a bad event, a mistake, if appropriately channeled through content production, can still have the potential to generate extra earnings through this secondary investment on another platform. If labour time was only commodified and sold to digital platforms, this wouldn't really be possible, or not quite as easily. It is up to the worker-enterprise to leverage their autonomy and flexibility and fully exploit their human capital and the potential value of their assets.

One of the most powerful and defining features of the whole platform labour ensemble seems to lie precisely in its plural, flexible, generative character. Different forms of abilities-machines can be connected to different platforms, and as one's entrepreneurial sensibility develops, it becomes clear that most aspects of life can produce a machine-stream. The mere fact of having lived in a place for a long enough time might produce a valuable asset, in the form of one's knowledge of the city. For instance, this is the case when a platform like Airbnb offers «locals» the opportunity to «connect to the economic opportunities of tourism» and «fund your future on your terms» by designing and hosting «experiences» where they guide visitors through some presumably "authentic" activity in their local area (Airbnb). Here, the mere condition of being a "local", of having lived in the same place for enough time, produces a potential ability-machine.

At this point, the mode of subjectivation mobilised by platform mediation seems to integrate the socialised productive capacities of a flexible and precarious labour force with the techno-economic forms emerging from a concretisation of cybernetic logic, neoliberal through, and managerial practices. The technical ensemble of the platform by this process activates a network of more or less latent abilities-machines and potential earning-streams. Having thematised the individuation of platform labour in relation to socio-technical forms and modes of subjectivation — what seems important going forward for a critical understanding of platform labour, is a critical study of the daily operations of this schema. This becomes in fact the key site where platform power operates in its technical, economic and discursive dimension, as well as the field where political conflict and class composition is articulated.

Platform mediation at work: algorithmic management, signal transmission and inferential knowledge

The aim of this chapter is to take a closer look at how labour is technically mediated by platform technology, understanding this mediation not just as a digital abstraction and representation of physical activity, but as a material and socio-technical process. As thematised in the previous chapter, platform mediation functions as a concretisation of certain knowledge practices and divisions of labour, but also of modulative control as an abstract diagram that through platform infrastructures becomes immanent to social environments. I will discuss this by looking at a complex object: the coordination system of a digital platform for food delivery, which constitutes a prime example of contemporary algorithmic management.

Through networked algorithmic architectures, management becomes a pervasive process, to some degree impersonal and increasingly automated. By its application in management, software comes into contact with events, behaviours and bodies that exist on its outside. In order to do this, it needs certain ways of knowing and interacting with the world and its relations. I will discuss how these ways of knowing and acting characterise the mode of power of platform technologies in relation to labour. By combining the methods of critical theory, cultural and media studies with those of ethnography and observant participation, my aim is to study the complex object of algorithmic management as a social process, a media system and a cultural artefact. A key focus of this discussion will be the materiality of what is often addressed as abstract, and the interplay between digital formalisation and the heterogeneous material processes that are mobilised in order for computation to assume its powerful effects. I will do this by employing the frameworks provided by critical studies of digital mediation, software studies and cybernetic thought, as well as by tracing the genealogies of some key technical developments in recent history.

The discussion will start from my ethnographic observation of how labour is managed and coordinated across the urban geography. The anecdotical account of my experience as a courier in London, supplemented with insight gathered from workers's online conversations, will connect with other points of inquiry. Specifically, a central element will be the close reading of a few technical documents, filed patents and product presentations from one of the

major labour-mediating platforms. This, more than trying to produce a self-contained and neatly replicable exercise in research methodology, works as a way for me to move towards a critical understanding of platform mediation and of the social and political implications of this emergent reconfiguration of labour relations. Importantly, as discussed in the previous chapter, these changes are not happening in some exclusively technological realm and thus cannot be studied simply at the level of technical or formal arrangements, but rather need to be addressed as a concretely integrated ensemble of socio-economic, cultural and technical forms.

The chapter can be roughly divided in three parts. The first two are dedicated to analysing and discussing different aspects of the coordination system, taken as a case study into how digital platforms manage and mediate labour. In the first section, I will thematise algorithmic coordination as a mode of management based on predictive steering and distributed perception. I will look into the genealogies of machine sense organs to understand how they evolved from clockwork mechanisms to interactive media, and discuss how the ambient effect of ubiquitous interfaces enables seamless signal processing across the platform environment. The second third of the chapter will look in more detail at the ways of knowing mobilised by the coordination system, discussing how these emerge from the operations of sensors, transducers and wireless transmission, and how specific types of inferential and probabilistic knowledge are produced from noisy observations. I will try to understand the relation between labour and these technical processes from a non-deterministic perspective, in order to thematise a certain dissonance between the material functioning of contemporary technical systems and the way in which this functioning is taken up by the hegemonic economic and discursive forms of platform labour. The final section of the chapter is dedicated to a discussion the political implications of the case study in relation to a broader critique of platform labour. Specifically, I will argue that the open and modulative character of platform coordination highlights a certain form of material co-operation from below, which is rooted in indeterminacy, experimentation and human/nonhuman connection. A critical understanding of how platforms mediate these operations leads to a critique of the "gig" as the fetishistic device by which platform labour is made to appear as individualised and competitive, grounding the appropriation of the value produced by the unrecognised labour of a self-organising assemblage. I will lastly address the critical question of how the potential expressed by such co-operative ensembles remains subjugated to proprietary accumulation.

Platform coordination

For the on demand workers of delivery platforms, weekend nights are essential occasions for putting together decent earnings. During weekdays, making close to minimum wage is seen as an almost unachievable goal, given the decreasing pay rates and general lack of orders, often understood as direct consequences of an excess of workers on the platforms, at least since the pandemic. Because of these conditions, most people tend to work extremely long shifts, 59 hours being the weekly average among full-time delivery couriers, and 65 among taxi drivers (International Labour Organisation 2021). Within the weekly schedule, weekends tend to be the busiest times and therefore offer not only a better chance of getting orders, but also higher incentives in terms on pay. Part-time workers who use platform labour to supplement the earnings of a main occupation also tend to work during weekends, investing their free time trying to put together extra income as efficiently as possible. In one of the group chats I was part of during my research, a Discord user explains their weekly routine to a new joiner who is asking about the possibilities for making minimum wage at different times of the week: «I make less than minimum wage during weekday and above minimum wage on Friday and the weekend. At the end of the week my average is around minimum wage, most of the time a bit above like £11 or £12 an hour».

Because the demand for food delivery tends to be higher during weekend nights, platforms' multi-sided coordination mechanisms are designed to make sure that enough workers are active online and on the streets to satisfy this demand, and that especially the areas of the city that are forecast to be the busiest are well served during peak times. Some platforms would ensure this strategic availability of their workforce by leveraging a straightforward disciplinary dynamic: essentially forcing workers to take long weekend shifts, by making the possibility of working during the following week conditional to the acceptance of these time slots. However, in recent years law courts started ruling against this system by fining platforms for formally claiming the freelance or "independent contractor" status of their workers, while in practice imposing tight managerial constraints over their work, *de facto* realising a condition of almost permanent subordination while avoiding the social security costs usually required for stable employment (Lomas 2022). In the meantime, an alternative managerial framework has been increasingly refined by other platforms — one perhaps closer to the original claim of the gig economy — whereby workers are actually granted the autonomy to decide when and where to work, operating within a system of economic incentives that presents them with opportunities for different earnings at certain times and

places. This automated structure of incentives simply aims to encourage or “nudge" workers to make themselves available at certain hours and locations, through the automated deployment of boosts, opportunities and challenges, based on computational forecasts of future supply and demand of work. Here, workers are not directly forced into any schedule or commitment. They are simply left to navigate the virtual marketplace of opportunities presented by the platforms, and make their own calculations, determining their private economic trade-offs and defining their personal business models.

Who’s driving? A Friday night quest across south London

In my experience, only mild boosts are offered during the week, generally 1.1x and 1.2x multipliers around office districts at lunchtime, or in busier areas in the evening, which seem to mainly serve as generic indicators of where orders are going to come from. Opportunities start getting more interesting around Friday afternoon, with boosts getting up to 1.5x during peak times. Around 5pm on Friday, I usually receive a notification informing me about the opportunity of a “quest”. A quest is not necessarily a boost, but usually takes the form of a challenge that I can complete to get an extra reward on top of regular fees and multipliers; for instance, between 6pm and 10pm you can earn an extra £4 for completing three deliveries, after which you unlock another part of the quest, usually another £4 for three more jobs, then £5 for the following three, and so on. So on a Friday afternoon, I embark on this quest — determined to make the most of it. It takes me about half an hour to reach the nearby area of Peckham and ride around the high street before I get my first order. In about an hour I complete the first three, all from fast food outlets in the Peckham and Camberwell area, making over £20 between fares, tips and quest reward — which is exceptional. A key feature of the app is that, upon receiving an order, it only shows the location of the restaurant and the fee for the trip, but not the delivery destination, which is only made visible once the courier picks up the food from the restaurant. So as I accept a delivery, I don’t have a clear idea of where I am going to end up by the time it is complete.[51] The first part of the quest pushed me to the west end of the area, on Coldharbour Lane. The map shows a higher boost on the neighbouring zone, and since I am already basically at the border, I decide to cross over, moving west into Brixton. As I approach Loughborough Junction looking to continue the quest, a £7 pound order comes in, which I instantly accept, pick up from a pie shop by

[51] This is not consistent across all major platforms, nor across different countries. In fact, the visibility of fees and destination varies between different platforms and different countries, and it also tends to be updated from one year to another.

Brixton Market and go on to deliver, crossing Brixton Hill as Coldharbour Lane becomes Acre Lane. At this point, after each delivery I am trying to strategically head back towards my area, but every new order ends up pushing me in the opposite direction — something that I can't foresee as I receive the notification and accept the order. The whole movement is quite dynamic and hard to approach with intentionality; the restaurant is usually just a few minutes from me, plus I'm constantly in between stages of the quest, with new rewards always one or two trips away. On top of this, I feel like I am on a good streak at this point, and that turning down orders or going offline might throw me off. In a way, it's my limited foresight, the uncertainty of what comes next, that is keeping me available and keen on this quest. I pick up what seems to be a whole family dinner from a crowded Caribbean take away near Kings Avenue and deliver it to a large housing estate building. Later, after an endless wait at the restaurant, it takes me an almost equally long cycle to deliver a double order from a McDonald's in Clapham. Around 11pm I am exhausted, have completed multiple quests, making more than in the previous three days combined, and ended up about a one-hour unpaid cycle away from home.

This chapter aims to connect this type of observation of location specific gig work with other critical points of inquiry into how platform mediation is deployed across the urban geography. Specifically, an interesting analysis can be developed by carrying out a close reading of two patents filed by one of the major gig work platforms, as well as of related product presentations. My aim is to study them through theoretical frameworks coming from digital media studies, and putting them in dialogue both with my auto-ethnography and with other accounts gathered from workers' online discussions.

The anecdotical account I just laid out already highlights some key tensions. Firstly, platform mediation clearly exceeds the model of a neutral market mechanism inter-mediating between different actors. The coordination of requests by consumers-users and the provision of labour by providers-users is modulated by corporate interests, which are abstractly outlined in the platform business model and enacted by its concrete infrastructure. The coordination between consumers, workers and platform architectures happens through complex structures of interaction, which require interfaces connecting the different parts and material ways of carrying their communication. This interactive system mobilises different ways of knowing, ways of perceiving, of counting, and various cognitive processes for estimating reciprocal actions and re-actions. In fact, these processes call for different entities to create abstract models of other entities, which entails not only the capture of information, but the

construction of representations from these inputs. Lastly, these representations need to become functional and capable of affecting change within the real they seek to represent.

Algorithmic management: service coordination as predictive steering

A patent filed by Uber Technologies in 2019 describes a «trip inferences and machine learning» system to optimise dispatch and delivery times (Waliany et al 2019). The document outlines a comprehensive method for jointly executing a software program through a network of computing devices — defined as a «machine». The method comprises «receiving, at a network system, location and motion data from a plurality of mobile devices of a plurality of service providers», generating inferences on the state and activities of these service providers, using these inferences to determine optimal dispatch and delivery times, and on the basis of this, assigning the gig to the service provider who is best positioned to complete it (Waliany et al 2019, p.14). This coordinative process takes place within a networked environment, comprising a «service coordination system» that is «communicatively coupled via a network» to requester client devices and provider client devices, which host and execute, respectively, requester and provider applications (Waliany et al 2019, p.2). The service coordination system features what could be seen as three sub-systems: a «routing engine» calculating routes, ETAs[52] and costs; a matching system that tracks data from devices, learns and draws inferences from it to determine optimal dispatch conditions; and lastly a series of databases related to: map and topological data, place data to supplement it, records from past trips, and data about providers-users and consumers-users.[53] Machine learning and prediction engines operate across all of these components, which can reside in the same machine but also «on separate remote machines that communicate with each other via a network» (Waliany et al 2019, p.9). As a customer places an order on Uber Eats, what happens is that their requester client device transmits a request to this networked coordination system, which proceeds to calculate ETAs to the selected restaurant for each service provider within a threshold distance, and select one on the basis of comparisons between their ETA and the estimated time when the food will be ready. The goal is to address not the nearest provider, but the one whose estimated arrival at the restaurant is the closest to the time the order will be ready to deliver. The system tries to minimise unproductive waiting times, during which the courier is already

[52] ETA: estimated time of arrival.

[53] See in the Appendix: the diagram of the Service Coordination System and the associated networked environment, taken from the patent (Waliany et al 2019). (Fig. 3)

engaged in a paid gig, and thus not available, yet not *actively* delivering. Once the optimal provider is selected, the system transmits an invitation to their client device.

Already at this point, it's interesting to think about two distinct but often integrated processes that appear fundamental to this ongoing coordination of bodies and devices: that of prediction, aiming to forecast the likelihood of *future* events; and that of real-time inference, the probabilistic estimate of the *current* state of events. Both are computational processes, carried out by processing data coming either directly from sensor devices or retrieved from databases. Across both processes, the application of machine learning seems to have gotten increasingly pervasive. This means that programs concerned with formulating predictions from data patterns become able to train themselves and adapt over time to the data they analyse, thus progressively attuning their inferential reasoning to changes in patterns (Mackenzie 2017). In Uber's patent for trip inferences, machine learning is applied mainly for estimating the current state of trips, by combining real-time data coming from devices with historical data on past trips. However, reports show how the company has been actively scaling its machine learning operations by building an internal platform for «ML-as-a-service», which enables any team within the enterprise to operate machine learning solutions (Hermann 2017). As a result, Uber has been deploying machine learning models as an end-to-end process: from managing data centre facilities to developing self-driving cars, from personalising the customer app experience to constantly recalculating ETAs for drivers and couriers (Hu et al 2022; InfoQ 2019). The importance of ongoing prediction to platforms' control over labour is especially evident in what Uber calls «spatiotemporal forecasting»: the process by which the platform is constantly modelling and predicting the supply and demand of labour in space and time — already introduced in the previous chapter. Spatiotemporal forecasting leverages both past behaviour and real-time metrics to predict consumer demand and workers' availability at different locations and moments in the future. This future-oriented modelling enables to forecast imbalances between supply and demand of service across space and time, in order to pre-emptively incentivise or «encourage» workers to make themselves available beforehand in busy locations (InfoQ 2019).

This configures a cybernetic type of control environment: a social field is conceptualised as a network in which individualised agents can be modelled as decision-units, intersections of decisional streams. Within such an environment, control operates by steering these individuals, addressing them at the level of *dividual* behavioural variables, towards decisions that are in line with system optimisation. As argued in the previous chapter, postwar cybernetic logic was absorbed as a grounding conceptual element of neoliberal economic and

social thought, which now appears solidified in the concrete functioning of digital platforms.[54] Crucially, a cybernetic apparatus enables power to operate by reducing direct coercion, replacing the imposition of rigid norms with the flexible steering of uncertainties, so that governance is dispersed into an ambient presence, operating increasingly impersonally and automatically (Tiqqun 2020). This is for instance the case when digital platforms choose to not force shifts onto workers, as such rigid prescriptions can be directly contested by legal scrutiny, and instead establish an environment in which it is precisely workers' autonomy from disciplinary command that works as a function of governance and control. A key political implication of this understanding of power is the possibility for strategies of antagonism that go beyond — obviously not against — those of extending legal recognition, or struggling for opacity against surveillance. Thinking critically about the socio-technical arrangements of labour, and specifically about the role of information, interaction and prediction, can offer useful insight in this sense.

Antoinette Rouvroy and Thomas Berns describe algorithmic governance as a mechanism that aims to «model, anticipate and pre-emptively affect possible behaviours» and that operates in three stages (Rouvroy & Berns 2013, p.10). The first is the automated collection and storage of data, harvested as a «trace» of relations between entities, which is «stripped of the context in which it arose» (Rouvroy & Berns 2013, p.6). The second is the automated processing of these quantified traces to identify correlations between them, not in order to verify or validate pre-formulated hypotheses, but rather to «enable the production of hypotheses based on the data themselves» (Rouvroy & Berns 2013, p.7). Lastly, the use of this statistical knowledge to anticipate behaviours. They argue that while the statistical calculation of previous forms of governmentality, as analysed by Foucault, addresses populations at a disciplinary and subjective level, algorithmic governmentality operates in a dividual register, focusing not so much on the subject but on the relations forming with/in the environment (Foucault 2008; Rouvroy & Berns 2013). By capturing and processing traces of these relations, the probabilistic knowledge underpinning algorithmic prediction aims to detect propensities: the likelihood to become real that is inherent in all possibilities (Hansen 2015, p. 120). This inference of propensities operates immanently to the system of behavioural incentives that coordinates labour across the platform environment. In fact, the personalisation of opportunities and incentives by the platform is based on the automatic inference of each worker's propensity to perform certain actions, drawing from observed past behaviour and detected states at a given moment. Many have noted how such mechanisms of

[54] In fact, the imposition of a regime of seamless communication onto social relations is fundamental to the logic of platform environments.

anticipation and steering tend to short-circuit individual deliberation and autonomous self-determined desire (Chun 2016; Stiegler 2016) — which are also fundamental qualities of the idealised liberal subject *homo economicus*. But this is precisely because algorithmic coordination does not operate at the level of autonomous deliberation. Rather, as suggested by Rouvroy and Berns, the algorithmic steering of propensities seems to function though «machinic enslavement» — theorised by Guattari and developed by Lazzarato — whereby affects, perceptions, and reflex responses to stimuli are directly integrated with asignifying semiotic systems, to function as component parts of a broader assemblage, in a *machinic* fashion (Deleuze & Guattari 1987; Guattari 2012; Lazzarato 2014).

Capturing a complex problem: platform ways of knowing

A key analytical framework for studying capital's control over labour is that of the appropriation of social knowledge — in Marxist terms — or of the transmission of information from workers to a technical system, which enables a certain mechanisation of this knowledge and ultimately its weaponisation against labour. As already mentioned, even the earliest industrial machines have been understood in terms of crystalised knowledge derived from workers, as a stabilisation of pre-existing divisions of labour, or as power that is abstracted from social cooperation and concretised in automated machines. This creates the illusion that knowledge of production can be derived from pure science, or from the intellectual faculties of management, rather than from workers' collective labour, so that production can appear to function *as if* it was independent from labour (Marx 1976, Pasquinelli 2015, Simondon 2012, Sohn-Rethel 2021). Alquati's famous account of how «valorising information» is extracted from the bodies of living labour and used against them as «control information» describes a bureaucratic factory apparatus already cybernetic in its functioning (Alquati 1962). However, in such theorisations, knowledge-information is abstracted and stabilised through routine bureaucratic procedures, and updated according to management cycles still calibrated on the all-too-human temporality of the industrial age. On the contrary, within contemporary platform ecosystems, the speed and frequency of information exchange and reciprocal sensory activation between workers and machines is so high that interaction appears continuous and seamless, suggesting an almost full integration and co-extension between human and nonhuman perception. However, this is not truly the case. Because computation cannot *directly* apprehend analog materiality — as human sensation would — automated perception requires a set of technical procedures dealing with sampling, filtering and quantising in order to capture continuous phenomena and make them

digitally available for abstraction, formalisation, and symbolic manipulation. It is worth briefly considering in what ways computation came to mediate labour and production, to reflect on how the development of computational media intensified the entanglement of living labour with fixed capital.

A brief history of sense organs and machines: from clockwork mechanisms to interactive media

During the 20th century, a series of technical developments contributed to the progressive transformation of industrial machinery from fundamentally closed mechanical calculators into sensing machines that were open to interaction and communication with the surrounding environment. David Noble's work on the social history of industrial automation carefully documents the early developments of computer-based control in industrial production. From the 1920s, continuous-process industries such as petrochemicals, electrical power, gas and synthetic fibres, were undergoing a shift from production in discrete batches to continuous-flow operations. This required new mechanisms for dynamically monitoring and adjusting variables such as temperature, pressure and flow rates, that were too complex for simple human oversight and manual control, and demanded unprecedented devices like new sensors, effectors and actuators (Noble 2011). In the 1930s, the electrical power industry, a kind of continuous-flow operation itself, also gave rise to the mathematical modelling of complex systems and network dynamics which laid the ground for the advances in electronic communications and servo-mechanisms developed during the Second World War (Noble 2011). A decisive impetus to the automation of measuring, monitoring and control in the factory came with the introduction of analog computers in electrical power and petroleum refining plants in the mid-1950s, and with the diffusion of electronic digital computers by the following decade. Computers were first used in «open-loop» control systems: connected to sensors and measuring devices throughout the plant, they monitored all processes, logged data, performed calculations and printed instructions for human operators on how to make adjustments to operations (Noble 2011). By the mid-60s, the most advanced plants controlled most of their operations through «closed-loop» feedback control systems, where computers were not only linked to sensor devices, but also to servo-control mechanisms, so that the necessary adjustments would be made automatically. In the 1970s, industrial processes as well as entire plants were being specifically designed «around the instruments»; to allow for better applications of computer control (Noble 2011). Describing the automatic machines of such industrial systems — and of the military applications for which many of these technologies

were originally developed — Norbert Wiener notes how what sets them apart from older automata and «clockwork machines» is the «sense organs» that open these systems up to receiving input from the outside: «we deal with automata effectively coupled to the external world, not merely by their energy flow, their metabolism, but also by a flow of impressions, of incoming messages, and of the action of outgoing messages. The organs by which impressions are received are the equivalents of the human and animal sense organs» (Wiener 1961, p.42).

Historically, the function that enabled this interactive exchange between computing machines and the external world is the «interrupt» function (Yuill 2008). From the early days of «batch computing», when computers executed a single program at a time from start to finish according to top-down programming, a new paradigm of interactive computing emerged in the late 1950s, enabling computer processors to receive external signals while running. Compared to the method of polling, where the computer periodically checks if any external signals have arrived, with interrupt «the signals are handled whenever they arrive, 'interrupting' the processor in whatever it is doing, and giving some control over its activities to an external agent» (Yuill 2008). Interrupt became the basis of operating system design, enabling interaction between the central processing unit and all external devices and sources of input, as well as contingent events and errors in the system's internal coherence — thus establishing real-time computing. We can already note how this movement from batch computing to real time computing seems to echo the shift from discrete batch production to continuous-flow operations already undergone by continuous-process industries, whose automatic control systems were in turn further developed by this new capacity of computers to dynamically perceive external reality. With the advent of graphical user interfaces in the 1980s, human-computer interaction was already becoming sensorial.

> *«The interrupt fundamentally changed the nature of computer operation, and therefore also the nature of the software that runs on it. The interrupt not only creates a break in the temporal step-by-step processing of an algorithm, but also creates an opening in its operational space. It breaks the solipsism of the computer as a Turing Machine, enabling the outside world to 'touch' and engage with an algorithm […] The interrupt connects the data space of software to the sensorium of the world.» (Yuill 2008)*

The link between computation and sensation might seem contradictory. After all, as illustrated by Brian Massumi, sensation is the material being of the analog, while the digital is constituted by numerically based codification (2002). However for my research,

understanding the digital as mere reduction or simulation, as a disavowal of embodiment, or loss of some essential quality associated with analog sensation, would be falling into a trap. In the same way as the power of scientific abstraction to act on its substrate shouldn't be overestimated or seen unidirectionally, it's important to understand the material processes of codification that enable relationships between digital abstraction and analog matter, from a non-reductive perspective. Drawing from Simondon, Yuk Hui considers computation as the milieu of individuation for networked digital objects and agents (2012; 2015). Expanding on Stiegler's idea of *grammatization*, Hui describes the digital — which he refuses to reduce to mere code — as a different mode of managing data. In comparison with the analog, where data is perceived through the sensorial as a mode of co-existence of man and nature, in the digital milieu data undergo a material transformation as «transmittable and storable computer information» (Hui 2012). Through computational abstraction, physical objects materialise as digital ones. Actions and events become communicative acts that are encoded, transmitted and processed as networked computational objects, within the protocols that constitute their milieu (Hui 2012).

By way of computational perception and interruption, fixed capital integrates interactive media processes, or rather is *activated as* digital mediation. As such, it doesn't simply subject workers to pre-programmed mechanical rhythms, but mobilises sensation and cognition across the human and nonhuman, intensifying their entanglement in ways that are more similar to the processes of interactive media forms, than to the mechanical ordering of the early industrial age.

Ambient interfaces and seamless signal processing

In the platform milieu, computation needs methods and procedures for capturing and somehow making sense of reality in almost real-time, which entails certain ways of knowing and sensing the real world. Going back to Uber's coordination system, the patent states early on that «modeling the real-world logistics that go into a food delivery trip is a complex problem», and proceeds to describe the specific ways in which the system tackles this problem, by deploying signal processing and statistical models (Waliany et al 2019, p.1). The ultimate purpose of the system, the selection of the optimal provider and their dispatch at the appropriate time, depends on the detection of their current states, and the prediction of their ETAs. These are both statistically inferred by processing the data that the coordination system receives «from a plurality of mobile devices of delivery providers» (Waliany et al 2019, p.6).

Data is constantly transmitted and processed via a network that couples the service coordination system with all consumer and provider devices. Across this networked environment, the communication between the applications hosted on mobile devices, and the various components, engines and databases of the system, is enabled by ubiquitous processes of interface. Here, interface is not a localised thing but a shifting apparatus or, in Galloway's formulation, an «effect»: a process that produces and populates two distinct material states, and functions as a threshold between the two by encoding and re-coding entities (2012). By this interface effect, signal coming from devices is transmitted, processed, encoded, and located in a symbolic system of relations — so that matter assumes computational form. The plurality of mobile devices across the networked environment establishes the interface as an ambient presence. This means that workers' experience of software and computation extends beyond the direct interaction with screen surfaces. In fact, the ambient interface captures flows of signal and data not just from user interaction with mobile applications, but also from other networked interfaces and APIs. This constitutes what Andersen and Pold describe as a «meta-interface», combining user-device interfaces with signal-computer interfaces (2018). This networked architecture is designed to make interaction as discreet as possible, to realise «an embedded prophesy of pure, unnoisy, and seamless signal processes» — an electronic symbiosis between computation and social relations (Andersen and Pold 2018, p.22). While the screen might constitute the localised «liminal boundary» by which the user experience is enacted, ubiquitous computing diffuses interface effects and interrupt functions as environmental presences by which «other, far more distributed, forms of software operate in a much more porous situation» (Yuill 2008). It is by these operations that computational sensing and software interaction are embedded in the background of everyday life, and it is precisely this embeddedness that constitutes the material architecture sustaining geographically tethered platform economies.

The anticipative power of algorithmic control works by weaponising what Bernard Stiegler called «grammatization», a process describing the technical discretisation by which memory — wether cognitive or muscular, consciously or non-consciously accessed — is exteriorised and re-coded into digital objects and material supports, so that it can be functionalised within a modulative control apparatus (Stiegler 2010). Within an environment of diffuse signal processing such as that of a delivery coordination system, ambient interfaces and mobile sensing devices significantly expand the range of events that can be grammatised and become object of control.

Platform ways of knowing, part 1: sensors, transduction, transmission

Another key issue directly addressed by Uber's patent for trip inferences and service coordination is that of understanding «precise interactions» and obtaining «concrete information on the state of a delivery» — in other words of finding ways for a computational system to detect what's going on in the physical world with a certain degree of precision, to construct accurate models of reality (Waliany et al 2019, p.3). This is a fundamental process for platform mediated production in general, and for the specific case of labour management discussed here — and it is the focus of this section of the chapter: how do computational infrastructures perceive reality, what kind of knowledge does this perception produce, how is this knowledge operationalised to control labour, and in what ways do these control mechanisms enable, intensify or reconfigure the exploitation and subjugation of labour? Therefore, first this part will discuss how physical activity is encoded into data. Then, the following will look at how statistical knowledge of reality is produced within digital platforms. Lastly, I will discuss some of the implications of these processes, considering how addressing them from a media studies perspective can be useful to the study of labour and its politics.

One of the main problems with producing informational models of reality is harvesting data that is as accurate, representative and usable as possible. In the case of Uber's patent, the main challenge is posed by the insufficiency of GPS signal for generating such models, which is mainly due to its «noisy nature» and to users not having a constant and reliable «line of sight to active satellites». Therefore, while GPS signal can constitute a basic indicator of location, it needs to be «augmented» with additional data from motion sensors and with «activity recognition» (Waliany et al 2019, p.4). This means that, within the service coordination architecture, data from devices is channeled via a tracking system into the matching system, which processes this data through a machine learning engine, so that «location data, motion data and activity data work in tandem» to produce concrete statistical knowledge (Waliany et al 2019, p.3). The next section will cover how activity recognition works — how models of activities are generated and combined with map data, place data and historical data, in order to predict the optimal allocation of tasks and dispatch times — but first it's interesting to focus on how this data is harvested and encoded.

In the coordination system described, motion and activity data are primarily derived from accelerometers and gyroscopes (Waliany et al 2019, P.4). These sensors are usually integrated into an inertial measurement unit (IMU): a component in smartphones fundamental to most location-based and movement-based applications. An IMU typically consists of three

accelerometers and as many gyroscopes, plus often a magnetometer. Using micro-electro-mechanical systems, these sensors generate a change in electrical voltage proportional to the detected external forces applied to the device. Accelerometers and gyroscopes transduce this voltage into electrical signal, whose varying amplitude measures, respectively, gravitational acceleration and angular velocity, with respect to the three axes of a Cartesian coordinate system. Additionally, the magnetometer detects variations of magnetic field with respect to earth's magnetic north. Within the unit, the signal outputs from these sensors are processed, to correct for noise and errors, and combined through a sensor fusion algorithm to generate motion-related data measuring the velocity, direction and orientation of the movement applied to the device (Gajjar 2017; García at al 2020). The resulting sensor data can be used by a variety of programs and applications, hosted and executed either within the device or on other networked computers, to infer and classify user activity — as I will soon discuss (Zhuo et al 2020). But first, in order to process and transmit information across digital communication networks, smartphones need to encode the analog signal from the IMU into a digital format, usually employing analog-to-digital converters. Such converters encode analog signal into a digital form by sampling it — dividing a continuous wave into uniform discrete intervals — then filtering out undesired noisy frequencies, and lastly quantising it: reducing the potentials of its continuous form to a limited set of possible values (Miao et al 2016). Once encoded, this digital signal data is modulated into an electromagnetic carrier wave producing a new signal which is transmitted and routed over a wireless network infrastructure (Mackenzie 2010; Miao et al 2016).[55]

As I move around — cycling towards "boosted" areas on my map, waiting outside of restaurants, avoiding construction work or double-parked cars, pulling over to re-assess a suggested route, adjust my smartphone holder or drink from my water bottle — the sensors within the IMU in my device detect any tilts, shakes, rotations, spins, or changes in magnetic charge, which they transduce into signal. These transductions are then digitally encoded and modulated into wireless signal, which is transmitted across the ambient interfaces of the networked coordination system. My behaviours, movements, twists and turns, are all subject to grammatization before they can even be grasped as fully realised decisions or actual events. They are broken down, transduced and exteriorised as micro-acts, digitally encoded and mobilised in transmission — probably already producing effects across the system before I

[55] Modulation here is used in its most strictly technical sense of combining encoded information with a carrier signal in order to transmit that information — or as the patent explains, «modulated data signal means a signal that has one or more of its characteristics set or changed in such a matter as to encode information in the signal» (Waliany et al 2019, p.8)

can even fully articulate my intended move. Furthermore, all information received from the provider application, «indications of current speed, acceleration/deceleration, events, stops, and so forth», are being stored in trip records and provider records, within databases that are «communicatively coupled» with the matching system (Waliany et al 2019, P.11). This means that, beyond my individual behaviour, and the instant temporality of real-time transmission, signal from all workers' devices is encoded as digital memory, which is constantly re-called to act back on the unfolding reality. This takes the cybernetic modelling of material and social relations to its extreme consequences — not only physical and social reality are enfolded into information systems, but also electronic and mechanical relations, the energetic movement of matter at a micro scale, are all processed as informational inputs within the steering apparatus of algorithmic governance.

In their everyday navigation, geographically tethered platform workers relate to the environment not only by their own sensation, but also by platform mediation. As I sense the environment around me and engage with its contingencies, I am also *being sensed*, not so much as a whole, but as flecks and fragments of movement, that are transduced and encoded to produce inferences of my activity. As I try to predict imminent unknowns, predictions are being made *about me*. These micro-encodings and statistical reconstructions of my embodiment are also acting back on the environment around me in a real-time feedback loop. My activity and work is therefore not only subject to surveillance, but always mediated and co-structured with these technical processes. Because of this, I experience the technical management of my work as part of my engagement with the environment. In fact, my interaction with computation is not so much dependent on screens, which are only one of the many interfaces for my presence in space and time, as digital mediation is activated all around me. By a ubiquitous interface effect, the analog and the digital function as fluidly integrated realms. Within this socio-technical frame, geographically-tethered platform workers operate not in a disembodied realm of information, or in hallucinatory virtual simulations, but rather in what Katherine Hayles would call a «condition of virtuality», characterised by the material

interpenetration of physical objects and informational patterns (1999).[56] This paradigm materially entails the encoding of bodies within digital communication systems — which happens through micro-sensing, transduction, signal processing and transmission.

Describing how the coordination method is materially executed across a «machine» — a network of computing devices that individually or jointly execute software and programs — Uber's patent explains how the different component parts of the network «may communicate information via a transmission medium» or «signal medium», where such terms «shall be taken to include any form of modulated data signal, carrier wave, and so forth» capable of encoding and carrying information as they are «transmitted or received over a network via the network interface device» (Waliany et al 2019, p.7-8, 10). Here, the technical system seems to be materially constituted by transmission and signal modulation. It is interesting to think about this through Anna Munster's discussion of signaletic movement as a fundamental mode of contemporary technicity. Building on Adrian Mackenzie's account of transduction — as the process that articulates borders between bodies and machines, between the social and the technical — Munster argues that «our experience of contemporary technicity is always in process before the labour of codification» and involves «other modes of materiality than just those of software» (Mackenzie 2002; Munster 2014 p.151). In fact according to Munster, the basic constitutive movement of contemporary technicity, since at least the end of the 19th century, is not that of code as much as that of signal. Because of its material properties, signal always exists in transmission and in multiplicity. In the case of the coordination system, signal flows all across the networked environment: from sensor transduction, it is modulated in carrier waves, processed by the matching system, and also used to communicate to consumer and provider devices. Significantly, the integration of workers' bodies into software is mediated by this multiplicity, as signal «passes through and around us, integrating us into its circuits […] transmitted through relays that are not entirely encoded nor entirely under human

[56] Mark Hansen individuates the paradigm of «mixed reality» as the «contemporary phenomenological dimension» of this condition of virtuality (Hansen 2006, p. 21). By the ubiquitous effect of «a nonencumbered interface», this dimension of mixed reality «can be accessed through embodied perception or *enaction*» — which is the perceptually guided engagement with contingency by which an organism couples with an environment, described by chilean biologist and cybernetician Francisco Varela (Hansen 2006, p.4-5, Hayles 1999, Varela et al 1992). However, this environmental enaction not only constitutes the medium by which one accesses mixed reality, but is also *itself* mediated by digital technologies, producing what Hansen calls «bodies-in-code»: not a purely informational body, but «a body submitted to and constituted by an unavoidable and empowering technical deterritorialization—a body whose embodiment is realized, and can only be realized, in conjunction with technics» (Hansen 2006, p. 20). Thus, by this process, digital technologies mediate individuals' enactive being-with both each other and the environment.

control» (Munster 2014, p.153). Because the technical is necessarily accessed through sensation, and this sensation is in turn necessarily mediated by technics, the assembling of a technical system jointly mobilises human and nonhuman perception. Therefore, the aesthetic experience of platform-mediated life doesn't resemble a loss of corporeality in favour of disembodied digitality, but rather «a sense of being in the midst of transmission, buoyed by a network of multiple signal flows, subject to fluctuations, transitions, instabilities» (Munster 2014, p.154).

The execution of programs across the networked machine depends significantly on transmission and signal media. In fact, it is through these processes that the assemblage of computing devices, sensors and databases comes together — transforming «the general, non-programmed machine into a particular machine» (Waliany et al 2019, p7). This means that the platform comes to mediate labour precisely by way of this openness of computation to signal transmission, and its capture and encoding in data infrastructures. Munster proposes to think through the «transmateriality» of digital media, in order to consider technical systems beyond their «performance of operativity», as matter in movement, «in the nexus between the asignifying and signifying; in the possibility of modulating signal as it becomes transmissable» (Munster 2014, p.158-159). From this perspective, we can see how technical ensembles emerge by capturing and modulating the asignifying potential of matter to actualise it in signifying regimes. They depend on transduction; the junction between asignifying signal-matter and signifying signal-code, which also joins human and nonhuman perception (Mackenzie 2002). But because signal exists only in multiplicity and transmission, digital technology does not univocally subjugate materiality to abstraction, uncontested deterritorialisation, and real-time domination. Rather, contemporary media are constituted through signal modulation, thus retaining energetics and instability at their core (Munster 2014).

Having considered this, it becomes crucial to ask: how is all this instability of signaletic matter actualised in signifying computational regimes? What kind of knowledge and what forms of reasoning are produced from signal within platform systems? Signal, like data, is not "raw" material, a natural "datum", or found *as is*. Both are products of social relations, and in the case of platform labour, these are relations of production. This is important for thinking about platform labour as articulated through data practices, knowledge practices, and practices of signal transmission occurring across humans and nonhumans. To understand how these integrated practices become subject to platform valorisation, it is important to consider how

transductions, modulated signal, and data produced *from* labour, become functional to control *over* labour.

Platform ways of knowing, part 2: noisy observations, inference and probability

In order for the platform to enact its cybernetic governance on the labour it mediates, a computational method needs to be in place to construct models of real world events. It's on the basis of these models that predictions and decisions will be formulated. Uber's patent for trip inferences lays out some of the key methods by which the data harvested from workers' activity — through transduction, modulation and transmission — is used to produce models of «precise interactions» and obtain «concrete information on the state of a delivery» (Waliany et al 2019, p.3). The data aggregated from GPS and IMU sensors within smartphones is used for «activity recognition»: the inferential estimation of real-time activity from sensor data. The recognised activities are then consolidated by the tracking system where, processed through a «machine learning engine», activity data is used to generate «trip state models»: real-time probabilistic models of the activity of a plurality of service providers (Waliany et al 2019).

Within the patent document, a «data flow diagram»[57] provides a breakdown of the different processes involved in channeling sensor data through various components of the coordination system (Waliany et al 2019, p.5). The data that is first aggregated on mobile devices includes GPS location data, motion data from IMU sensors, plus any data from other activity sensors integrated within the device, like step detection sensors. Then, shorts bursts of these aggregated sensor data are processed by an «Activity Recognition API», which formulates inferences, also using machine learning models, aimed at classifying the detected activity according to a series of «activity types». In an «example embodiment» — meaning a hypothetical concrete scenario in which the method may be executed — described by the patent, the activity recognition API of an Android device qualifies detected activities as indicative of possible states of the user at that time, classifying them as either: standing still, moving on foot, walking, running, cycling, moving on a vehicle, tilting, or performing an «unknown» activity (Waliany et al 2019, p.5 Fig.3). Depending on example embodiments, the activity recognition API can be hosted in the provider's device — as it seems to be the case with Android devices — or in an external system like a cloud-based application, in which case the API operates directly «on top» of sensors, formulating predictions of detected activity

[57] See in the Appendix: the Data Flow Diagram taken from the patent (Waliany et al 2019) (Fig. 4)

types and transmitting them to the tracking system. Alternatively, the API can be hosted by the tracking system itself, where it receives «raw» sensor data transmitted from mobile devices (Waliany et al 2019, p.4-5). In either case, activity inferences and classifications are formulated and consolidated as «trip-level data» within the tracking system, where they are processed through a machine learning engine to generate a «trip state model»: a «sequential model capable of inferring a sequence of discrete states from a sequence of noisy observations» (Waliany et al 2019, p.5).[58]

Through this networked data practice, the platform produces a certain knowledge of reality, drawing from a plurality of aggregated sensor data. This knowledge is formulated by using statistical models and machine learning to calculate the likelihood that different workers are in certain states or classes of activity at a given time. These «discrete states» are not directly witnessed by software, but probabilistically inferred from «noisy observations» (Waliany et al 2019). What the patent calls noisy observations are transductions of material forces detected from micro-electromagnetic sensors, encoded into signal and transmitted over unstable wireless networks that, as noted by Mackenzie, are always open to cross-signalling and interference (2010). As Munster's work also highlights (2014) — while technological systems are often depicted as *aiming* to produce knowability for operational efficiency, the signaletic movement at the core of their operations always tends toward instability. Because networked systems materialise out of these turbulent transmissions, they produce calculative spaces characterised by what MacKenzie might call «intensive movement» (2010). These are spaces that, from a computational standpoint, exist in constant change, and therefore cannot be mapped in fixed or scientifically "certain" terms, but can only be *guessed at* in probabilistic ways. In fact, the way in which algorithmic intelligence apprehends these intensive movements in real time is by patterning — iteratively formulating inferences from patterns in data — and hypothetical reasoning; computational processes which also, by their probabilistic nature, maintain indeterminacy at their core (Parisi 2017; 2019).

To further understand the role of probabilistic reasoning within algorithmic management, we can follow the steps of the data flow outlined in the patent for trip inferences, and see how machine learning engines continue working on the trip state models. Generally, these inferential models, produced by activity recognition APIs, are joined in the matching system

[58] The sequentiality of the model here also determines the fact that «inferred discrete states are temporally related», meaning that the current inferred state of activity necessarily conditions the modelling of the immediately subsequent inferred states (Waliany et al 2019, p.5).

with historical data about restaurants[59] to estimate possible waiting times. Then, in order to predict times of travel and arrival, these estimates are combined with another stream of data coming from a «routing engine», a component of the coordination system which has more to do with the navigation of space. The routing engine combines information received from providers' devices with data retrieved from various databases. The implications of database access for the management of labour will be discussed in the next section, but first it's important to focus on the two main tasks that the patent assigns to the routing engine. One is generating routing data, which is used to guide providers to pick up and delivery locations, and the other is predicting, for each worker, an estimated time of arrival (ETA). The calculation of ETAs is a key process by which the platform's knowledge of space is operationalised, and it's crucial to the algorithmic coordination of labour across the city. Commenting on how geographical features are factored into the calculation of ETAs, a Discord user notes: «Maybe it takes incline into account on cycles too. I've had orders that are closer but up a big hill have a longer ETA than further ones on flat land». ETAs are also crucially used to calculate fares and determine the allocation of gigs.

However, the patent for trip inferences doesn't go into too much detail about how ETAs are calculated by the «ETA module» within the routing engine (Waliany et al 2019). Interestingly, a more recent patent, filed by Uber Technologies in 2022, suggests that this method has been updated with a deep learning model called «DeeprETA», aimed at refining the «naive ETAs produced by a route planning algorithm». In fact, according to the patent, standard routing engines usually compute ETAs by dividing up the road network into segments, taking into account traffic, accidents and weather conditions to estimate travel times for each segment, and then using «shortest-path algorithms» to calculate optimal routes and derive ETAs. However, this poses certain limitations «with respect to real-world planning scenarios typically encountered in ride-hailing and delivery» (Hu et al 2022, p.1). As put by Uber's engineering blog: «as we all know, the map is not the terrain: a road graph is just a model, and it can't perfectly capture conditions on the ground» (Hu et al 2022). Moreover, as traditional routing engines predict ETAs based on the best available routes, they are not really fit for managing real time contingencies; like predicting the actual routes that couriers will choose, or factoring in the uncertainty of their decisions, the possible mistakes, as well as the variables associated with different tasks — for instance, a courier picking up from a restaurant and a driver picking up a passenger will travel differently even on the same path.

[59] which includes their location, variations in demand at different times, and other variables like estimated time for parking.

The DeeprETA system aims to improve on these limitations, by training a machine learning model to operate «on top» of road network data, using historical and place data in combination with real-time signals from workers' mobile devices.[60] The processing of this data through deep learning models enables more accurate and dynamic predictions of ETAs and «real-world outcomes» (Hu et al 2022). Because map models can't really capture physical conditions on the ground, the data harvested from the environment produces a computational milieu for deep learning algorithms to train and develop probabilistic models of reality. This entails formulating hypothetical estimates of real conditions and proceeding to calculate and compare the likelihood of each possibility, assigning different "weights" to different potential truths. Interestingly, while in the patent for trip inferences machine learning components employed probabilistic models based on either hidden Markov chains or Recurrent Neural Networks, the more recent DeeprETA system integrates a transformer model (Hu et al 2022; Waliany et al 2019). This is a particularly influential deep learning architecture, generally employed for natural language processing, that in recent years accelerated the development of "generative pre-trained transformers" (GPTs). Transformer models facilitated this acceleration in deep learning by replacing sequential-step procedures for processing inputs with the learning mechanism of «self-attention»; which enables the parallel computing of multiple encodings within the same step (Vaswani et al 2017).

Looking into architectures like the transformer model shows how machine learning does not simply establish a representational relation between computation and physical reality — whereby relations between things would just be rendered in the form of data models. Rather, statistical reasoning creates new and dynamic relationships between data. For instance, within DeeprETA, the different «features» of the trip — any of the characteristics associated with it: its location, the time of day, the motion state of the worker at a given time, or weather and traffic conditions — are represented by vectors; data encodings which are traditionally processed in sequence. The self-attention mechanism charts these vectors into a matrix dataset, where they are put in comparative relations to one another. Through this layer, the system «can bake the understanding of all the temporal and spatial features into the one feature currently being processed» and thus produce «re-weighted» features as an output (Hu et al 2022). Here, the data is open to experimental reasoning, as hypotheses are made about possible relationships between data; between features and events. The probability of these hypotheses is calculated, and on the basis of this, knowledge is produced about actual relationships between things in the real world. An example of this would be: for a trip

[60] See in the Appendix: a diagram of the DeeprETA model, taken from the patent (Hu et al 2022) (Fig. 5)

associated with certain features — let's say "rainy weather" and "late night" — certain hypotheses about the relation between those and other features are made — for instance how different providers have performed under similar conditions, or what route decisions they made in similar occasions in the past — and depending on the probabilities associated with these relations, certain times of arrival will be predicted. This means that, for providers in certain states and with certain past data, the most likely ETA, for a trip with certain features, will be calculated. On the basis of such estimates then, certain decisions are made, and certain "real-world" relations are determined — for instance the assignment of a job or the activation of certain incentives.

Developments such as those described by DeeprETA highlight the pervasiveness of learning models within algorithmic management. Because of this, the study of platform mediated labour requires a thematisation of how probabilistic knowledge and hypothetical reasoning operate at the core of labour management and its predictive steering of workers' propensities. More broadly, this perspective is also interesting for studying power relations within technical systems, as it understands digital technologies as rooted in instability, rather than programmed against it. This seems at odds with more deterministic notions of technology often reflected in critiques of digital labour, where computational mediation is framed as inherently conductive of discipline and foreclosing of possibility. Crucial to the concept of digital mediation I use in this project is instead the idea that contemporary media systems — by their reticular and ambient presence, their integration of human and nonhuman capacities, and the indeterminateness of their reasoning — might produce different forms of individuation. From this angle, computational media might be positioned not necessarily *against*, but somewhat *in resonance* with critiques of technologically advanced capitalism. The final section of this chapter tries to think through this resonance in order to understand the relation between fixed capital and living labour within the platform environment.

However, before proceeding in this direction, it is necessary to consider the relation between machine learning and labour, at least in some general aspects. Specifically, it's important to clarify that the ways of knowing discussed thus far might be largely automated, but are definitely not *autonomous* from various forms of labour, on which they crucially depend for their ongoing operation. Discussing how these forms of labour materially sustain platform intelligence will also be useful to outline how the operations of lean platforms are grounded in a particular model of the relationship between automated machines and human labour.

Platform intelligence depends on labour

Once again, it's useful to take the coordination system described in the first patent as a starting point. Both the matching and routing engine — as well as the DeeprETA model described by the second patent — combine real-time data on workers' activity, with data retrieved from databases (Hu et al 2022; Waliany et al 2019). These include: map databases storing road network and topological data; place databases supplementing such maps with locations, names and identifiers of streets, restaurants and shops; history databases recording information from past trips, including routes taken by workers, traffic patterns, reroute incidents, and previous trip state models; lastly, user databases storing records from both service provider and consumer applications (Waliany et al 2019). The diversity and complexity of this data shows how the ways of knowing mobilised by digital platforms do not just depend on the real-time capture of signal-data. Considering for instance how platforms know and perceive urban space, it is important to highlight the role of labour as a fundamental source of this knowledge, in at least a few ways.

In all of the different databases I just mentioned, data from workers' activity is stored as memory of past work, and it is routinely retrieved and fed back into inferential engines and learning models, to refine predictions. However, workers crucially contribute to producing knowledge of space not only with records of their past behaviour, but also through the active contribution prompted by the app's interface, which regularly asks for feedback on routes and navigation — something that is also in workers' interest to provide, in order to improve their experience. For example, commenting on the quality of algorithmic routing, responding to other workers' discontent with the un-smartness of suggested routes, a Discord user recounts how their platform

> *«had started directing drivers to go through a bus gate to this particular area in my zone. Ever since they introduced the navigation feedback that you can send in app while on trip, I've been reporting it as an illegal turn every time I get a delivery there, noticed today that the fares and directions to that area have changed back to normal and just got a notification from the app that the reports I made had "helped them improve their navigation". Nice to know it actually works».*

Furthermore, workers sustain the platform's intelligence and understanding of urban geography also with their embodied capacity to navigate spatial contingencies. By this I mean that workers are continuously filling in for the gaps, imprecisions or inefficient decisions of algorithmic management. Every time the platform ignores a blocked road, an impractical or

dangerous passage, or cannot conceive of a simple time-saving solution, workers' astuteness and experience come into play. Especially for workers on bikes, the city can be navigated in agile and versatile ways, shifting between roads and pavements, cutting corners, discovering and taking shortcuts to shorten their route or avoid traffic. This is part of the co-extensive regime that platform mediation establishes between platform vision and human eye, computational and muscular devices, human and nonhuman intelligence. Importantly, by doing this, workers take on all the risk that comes with the pursuit of time-efficiency, as this type of initiative is not openly encouraged but only mutely incentivised by the platforms.

Lastly and significantly, in order to "know" urban space, a platform doesn't just depend on the workers it directly manages. In fact, its ways of knowing the real world also crucially depend on the machine learning capabilities deployed at scale across the platform's coordination system — and therefore on the training data that these capabilities emerge from. For instance, a significant share of place data, specifically names and visual identifiers of streets and shops, are produced through image recognition models. At a 2018 international software conference, Uber's head of machine learning operations discussed a key move for the company: a shift from relying on Google Maps to building their own mapping infrastructure. This involves employing an open-source street map as a base, and layering additional «evidence» on top of it. This evidence is collected by sending camera-equipped cars around cities to take pictures of buildings and street signs, all tagged with GPS coordinates. The company then uses machine learning models to find names and addresses within these geotagged pictures, via «text extraction algorithms» that pull text out of images, so that street and restaurant names can be stored into a place database (InfoQ 2019). Importantly, text recognition and extraction here depend on natural language processing capabilities, that are not derived from science or programmed into machines, but rather trained on datasets.[61] These datasets are assembled from the perceptive and interpretative labour of ghost-workers, who produce, clean and validate data across the globe (Gray & Suri 2019). During my experience on micro-work platforms, every time I deciphered a smeared font from a poorly scanned page or a grainy photograph, every time I was asked to outline the contours of a street sign within a picture, my own capacities for recognition and interpretation were being deployed for the purpose of training an algorithm to separate information from noise, readable matter from superfluous entropy. My instinctive capacity to mentally separate

[61] Documenting their work on AlphaGo as «the first artificial agent that is capable of learning to excel at a diverse array of challenging tasks», DeepMind researchers explain how a successful use of deep learning in a complex environment requires the learning agent to «derive efficient representations of the environment from high-dimensional sensory inputs» (Mnih et al. 2015, p.529).

two slightly overlapping characters in a text, directly contributed to the capacity of a platform's ML engine to extract the name of a shop from a picture taken by a camera-equipped car.

Automated machines and living labour: platform coordination as an embodied assemblage

In recent years, many critiques of artificial intelligence have focused on how automated learning models are grounded in the extraction of various types of human labour and material resources. Matteo Pasquinelli and Vladan Joler trace the social origins of machine intelligence in a certain techniques for the mechanisation of reason as well as in the extraction of knowledge from social cooperation (Pasquinelli & Joler 2021). Similarly, Kate Crawford maps out the fractal and multi-scalar forms of extractivism mobilised by the AI industry, «one that reaches into the furthest corners of the biosphere and the deepest layers of human cognitive and affective being» (Crawford & Joler 2018). This line of work crucially highlights how technological systems can only act *as if* they were capable of autonomous intelligence, while actually depending on the ongoing invisibilisation of labour and natural resources (Atanasoski & Vora 2019; Crawford 2021; Gray & Suri 2019). While such extractive dynamics are certainly fundamental to the contemporary tech industry, technological systems cannot be exclusively reduced to the exploitation of labour and «cheap nature» (Moore 2018). Looking into the socio-technical and epistemological specificities of automated learning, authors like Mackenzie interestingly consider machine learning as a knowledge practice; a discursive operation that produces a complex space of knowing, not only though pre-established techniques of mechanisation, but by the integration of multiple practices, material processes and abstractions, that jointly produce a systematic machine (Mackenzie 2017). Approaching automated learning in its multiplicity — including but not limited to extraction — machine intelligence can be understood as integrating human and nonhuman cognition through statistical calculation, weaving together a variety of capacities for perception and reasoning. The aim is to construct models for predicting and classifying relations among things, people and events.

Another conceptual schema often reproduced in critiques of platform labour opposes the disembodied mastery of algorithmic management to a labouring body subjugated and animated by this inhuman power, which is therefore engulfed in the binary choice between either resisting command and escaping surveillance or giving in to the machine. While the

power dynamics at play in the platform economy are certainly imbalanced, the deterministic character of this framework is at risk of reproducing precisely the body/mind dichotomy that critical studies of technology seek to problematise. A closer look at the functioning of platform infrastructures — such as the coordination system, its mechanisms of inference and prediction, and the transmission media of platform environments — shows how the operations of these systems are not reducible to the digital domination of analog substrata, or the mathematical determination of inert bodies. Rather, the operations of platform labour seem to depend precisely on the dynamic interaction and co-extension of human and nonhuman, abstract and concrete. Delivery couriers' capacities for perception, learning and navigation are intimately integrated with those of the platform. Even micro-workers — while their labour constitutes a clear site of extraction — are routinely re-integrated into "the loop" of machine learning, whereby learning cycles truly cannot function without new data, cleaning and validation contributed by human operators. Even reciprocal support and informal training between workers appear as a necessary component of the labour process, that is strategically externalised and unrecognised within lean platform models.

From this perspective, the platform appears not so much as an abstract intelligence subjugating a collective body, but more as an assemblage of computation and perception. The intelligence of its operations emerges precisely through its continuous self-organisation and engagement with contingency. The histories of cybernetic thought and machine learning share a common concern with how organisms can develop through embodied interaction with their surroundings. Chilean biologists and cyberneticians Humberto Maturana and Francisco Varela use the concept of «structural coupling» to describe how living systems develop by way of environmental interaction (Maturana & Varela 1980). In her reading of the history of cybernetic theory, Katherine Hayles notes how, while the fist-wave cybernetics of information theory tends to obscure embodiment in favour of the formal manipulation of symbols, the focus of second-order cyberneticians on autopoiesis starts displacing consciousness and emphasising embodiment. However, Hayles also notes a certain solipsism in the circular processes of autopoiesis, where interaction is understood as the system's response to a triggering external event. It is Varela's later work in *The Embodied Mind* that expands the scope of autopoiesis, marking a shift to third-wave cybernetics. Varela's idea of «enaction» sees an organism's active and perceptually guided engagement with the environment as fundamental to its development (Hayles 1999; Varela et al 1992). Following third-wave cybernetics, the research and development of artificial life was historically modelled much more around biology than consciousness, as in the case of Rodney Brooks' «Situated AI», where the artificial system doesn't need a conceptual model of the external world to then act

upon, but instead learns through environmental immersion and direct interaction. Here, computation isn't centralised in one processing unit, but distributed across a networked body of sensors and effectors (Hayles 1999). From this displacement of consciousness in favour of embodied interaction, Hayles develops the idea of nonconscious cognitive assemblages, which disentangles cognition from higher-level thought and refigures it as a process of continuous environmental interaction, embodied in a distributed relational body, that includes humans, nonhumans, and technical devices (Hayles 2017). Following Maturana and especially Varela, nonconscious cognition seems to emerge from «the sensory surfaces and motor abilities that connect the organism to the environment» (Hayles 1999, p.156).

In light of this, we can advance a cybernetic understanding of the platform ecosystem as an embodied assemblage. The ways of knowing discussed in the first part of the chapter can be understood as generative processes of perception and cognition; the self-organising mechanisms by which platform systems channel intensive movement through networked interaction. Here, the joint activity of geographically tethered workers and their sensing devices, plus that of click-workers training AI to separate signal from noise, produces the ambient perceptron through which the platform couples with the environment. The platform does not emerge from managerial techno-science, but from the collective labour of human and nonhuman perception.

Implications for a critique of platform labour

«I'm convinced the algorithm has some element of randomness to it.»
(Discord user)

Thus far, this chapter has mobilised critical media studies and cybernetic thought in the close reading of a technical object that I believe provides an interesting case study into the functioning on contemporary platforms. Looking closely at what enables their functioning, I tried to problematise deterministic notions of platform labour, and understand it instead as a socio-technical phenomenon grounded in the intensive movement of transmission, in the indeterminacy of inferential reasoning, and in the symbiotic coupling of human and nonhuman. The aim is to explore how contemporary technical systems might exceed their

functionalisaton within capitalist accumulation, and perhaps express some potential dissonance with the economic forms they are taken up by.

What I wish to discuss in this final section of the chapter is how, within platform labour, the operations of technical assemblages don't necessarily reproduce the hegemonic political and cultural models to which platforms are anchored as business entities. Specifically, I am interested in three aspects: how the platform mediation of labour does not operate through technocratic discipline and subjugation of embodiment to abstract calculus; how its mode of governance is not prescriptive or aimed at reducing uncertainty, but rather generative and open to randomness; and lastly how its technical functioning doesn't correspond to the model of individualised competition that platforms reproduce at an economic level. These aspects carry at least a few interesting political implications regarding: the contemporary relation between predictive fixed capital and living labour, the post-anthropocentric or cyborg character of labour, and the composition of a platform-mediated working class. My argument is that contemporary technical systems already express a model of material cooperation from below, across human and nonhuman capacities, which is rooted in indeterminacy, experimentation, and transindividual connection. While this model clearly isn't actually realised by the current political arrangements of the platform economy, it still persists within socio-technical forms as a charge of potential. Interestingly, I think this potential resonates with political critiques that challenge the currently enforced model of labour relations. I will lastly discuss the critical point of how this potential and cooperative energy remains subjugated to corporate accumulation.

The platform as an «open machine»: modulation of randomness and predictive fixed capital

The research carried out for this project was an opportunity to observe the ways in which the platform "knows" reality, how decision-making emerges from these ways of knowing, and how these mechanisms are deployed for managing labour. Platform perception is not certain but probabilistic, as knowledge of reality is inferred from noisy observations. As described in the patent for the coordination system, the aim of trip inferences is precisely establishing «separation boundaries between change points» amongst noisy observations (Waliany et al 2019, p.5). Then, the discrete features inferred from noisy observation produce the milieu for further prediction. Here, layers of algorithms recognise patterns, learn from them, and make

hypotheses about relationships between data vectors. This predictive activity serves as the basis for marketplace forecasting and for the coordination of labour in space and time.

A critical reading of this architecture as fundamentally grounded in intensive movement, randomness and distributed interaction, brings me to question a common trope through which the technological mediation of labour is often understood — one which reproduces a clear dichotomy between mind and body. From this perspective, algorithmic intelligence acts as an abstract mathematical engine that forcedly animates a passive and subjugated body; that of a population of workers who serve as the living appendages of the managerial brain, or as the inert resources from which knowledge is extracted and crystalised in machinery. The reading of platform labour developed in this chapter looks instead at this environment as an embodied assemblage of perception and calculation, distributed across human workers, sensors, computational devices, mathematical architectures and data storage. I don't mean to argue against the point that human labour is regularly exploited and invisibilised by platforms to sustain an illusory notion of machine autonomy or efficiency — a line of critique developed by the work of many in recent years (Atanasoski & Vora 2019; Benanav 2022; Casilli 2020; Crawford 2021; Delfanti & Frey 2021; Gray & Suri 2019; Pasquinelli e Joler 2021). On the contrary, I think that questioning a notion of algorithmic management as disembodied, and re-positioning it within a nonconscious assemblage helps the recognition of the inherently collective character of value production. In fact, a critique of how this collective quality is dissimulated by the techno-cultural apparatuses of platform labour, points to the key intersection between a critique of technology and one of labour. Therefore, recognising a fundamentally collective, intensive and non-deterministic element at the core of platform systems inevitably poses the question of what potential lies within technological mediation and how it is currently functionalised to regimes of accumulation. The challenge for techno-political thought then becomes — in Simondonian terms — how to express this potential through different forms of participation in the «schemas of action» of technical ensembles (2017).

For most of the 20th century, industrial labour was subject to the paradigm of scientific management, famously developed, at least conceptually, by Frederick Taylor.[62] Its principles became a mainstay for the techno-scientific revolution of the Fordist factory. The cornerstone

[62] In over two decades of research and experiments between the end of the 19th and the early years of the 20th century, Taylor pioneered the introduction of slide rules to manage the work of metal craftsmen. By the time this method was fully developed, it had already been made largely redundant by the transfer mechanisms and flow methods of the Fordist assembly line. However, its methodological principles remained central to management thought and practice.

of scientific management was the «the accurate and scientific study of unit times» (Taylor 2017, p.58), which extended the breakdown and mathematical rationalisation of labour — already fundamental to the emergence of the industrial modality (Marx 1976; Pasquinelli 2015; Simondon 2012) — to all the activities of workers, making them mechanically organisable by fixed managerial principles of optimisation and efficiency. The purpose of this abstraction was the progressive transfer of knowledge previously possessed by craftsmen to a management apparatus, which became increasingly capable of determining time allowances, pay bonuses, and rhythms of work. Romano Alquati characterised the Taylorist factory as an already conceptually cybernetic machine, where workers' micro-decisions and know-how are measured as «valorising information», rationalised through a bureaucratic apparatus, and deployed by management as «control information» to govern labour and production (Alquati 1962). The point of scientific management is to appropriate this knowledge through technocratic abstraction, so that industrial production can function *as if* it was autonomous from labour. Analysing the division between intellectual and manual labour, Alfred Sohn-Rethel noted how Taylorism produced a sort of «managerial fetishism» whereby the intellectual activity of management is seen as directly deriving from techno-science rather than produced by workers' embodied knowledge (Sohn-Rethel 2021). However, crucially, in the industrial bureaucratic apparatus, the measurement of workers' activity and the governance of the labour process are not truly integrated processes. Scientific management «is construed without consulting or watching the worker, even for new jobs which have never yet been practised» and therefore «the concepts of time and motion used in its job analysis are technological categories and no true terms of human labour at all» (Sohn-Rethel 2021, p.155).

Looking at the management of platform labour, the circulation of knowledge and information can be understood from a different perspective. Living labour is not stripped of all knowledge by way of techno-scientific mediation, as in the intentions of Taylor and its followers. In fact, management does not operate as an abstract apparatus determining labour from above, but rather as a distributed function immanent to the assemblage of workers, devices, signal and computation. Knowledge is never fully extracted and crystalised so that managers can vertically impose on labour a division of time pre-defined by purely technological categories. Rather, information exists in transmission and circulation, not so much as a fixed thing, but as a generative process affecting change within the system. Valorisation is not so much about workers' prior knowledge or skills, as much as about their ability to adapt to unknowns, interpret context and develop their «abilities-machines» (Foucault 2008). The point — borrowing terminology from Deleuze and Simondon — is that instead of imposing form upon matter — moulding — platform

coordination operates as a control apparatus: workers' free movement and autonomy is modulated as a flow of dividual traces — through transduction, patterning and prediction — in order to perform a self-regulatory function. Value production within the platform environment depends precisely on the joint capacity of workers, devices and algorithms to process contingency and self-organise. If anything, the continuity with Taylorism consists not so much in the appropriation of information or in the deterministic relation of management to the labour process, but rather in the control of connection. What I mean is that the true political power of scientific management lies in its de-composition and re-composition of labour. Because the inherently collective character of workers' knowledge is the medium of their co-operation — the real power of production — management seeks to control this medium of co-operation, and deploy it as a vehicle of control. Similarly, within platform coordination, control acts not so much on discrete bodies, but on the relations and connections between them, on the patterns between events, and on the transformations that one thing can effect on another.

Following this understanding of control in socio-technical systems, a digital platform doesn't necessarily resemble a prescriptive bureaucratic apparatus, or a homeostatic machine that automatically corrects deviations from pre-programmed objectives. While the understanding of algorithmic governance as a mode of anticipatory power, as formulated by Stiegler or Rouvroy, is useful to the study of platform control, their characterisation of this as a preemptive system that aims «to minimize or eradicate uncertainty» seems reductive (Rouvroy & Berns 2013, p.11). In contrast, the work of authors like Hui or Parisi and Dixon-Román on contingency and indeterminacy, is informed by a Simondonian perspective that sees advanced technical systems as «open machines», where the human acts as an organiser and interpreter between networked technical objects (Hui 2015, 2019; Parisi & Dixon-Román 2020; Simondon 2017). Within open machines, individuation and information take place across an ensemble of technical objects and human connectors within an associated milieu (Simondon 2017). From this perspective, platform power is not dependent on determining or limiting possibility, but rather on its openness to indeterminacy, on the valorisation of contingency and the continuous integration of new abilities-machines. Within this open environment, fixed capital operates way beyond the knowledge crystallised in it. In fact, machine learning seems to equip the platform management infrastructure with an immanent, nonconscious form of thought. This is grounded in the inferential modelling of uncertainty — of what is not yet known — through the iterative patterning of randomness and noise. Luciana Parisi and Ezekiel Dixon-Román highlight how the shift of predictive control systems towards the constant algorithmic re-estimation of data seems «indicative of an epistemological

transformation in modalities of know-hows; that is, of methods or procedures that aim to abstract indeterminacies in predictive functions», and how this process shows «the tendencies of predictive intelligence to enter a space of futurity» (Parisi & Dixon-Román 2020). Here, workers' activity is not mechanically ordered, but rather organised through a speculative process creating new relations between the data harvested as a meta-product of their labour. This seems to configure «an extended structure of fixed capital, where value accumulation is increased, accelerated, and diversified according to the statistical systems of prediction» (Parisi & Dixon-Román 2020).

Within the coordination system, each worker's performance, and their affinity or aversion to certain types of trips, inferred from their behaviour, is put in relation to the estimated features of different trips at different times. A Reddit user explains how algorithmic management has learnt that they have a high propensity to accept long trips, and that on the basis of this, the system tends to offer these orders to them *first* and at a lower rate: «I like doing the long ones, but I'm thinking the algorhythm *(sic)* should provide more incentive, here's what I've noticed. Machine learning Frank[63] knows to offer them to me first because there 's a high chance i will accept, this means I'm being offered the longest for the lowest price». The learning and prediction of acceptance habits by algorithmic management is not used to necessarily impose certain rhythms of work onto providers, but rather to valorise the diversity of their propensities — to optimally integrate different abilities-machines. This crucially stimulates workers-enterprises to create autonomous ways of generating income, inventing new modes of self-exploitation. For instance, as discussed in the previous chapter, workers seek for extra earnings through creative practices like multi-apping, or producing a surplus of content about their work that they can try to monetise via other platforms. Importantly, this pragmatic inventiveness does not happen in a vacuum, but integrates with different states of precarity: for instance that of the student facing rising living costs, of the precarious and under-employed, of the 9-to-5 worker supplementing their main income through platform work, of the undocumented migrant working on a sub-rented account. These workers are not all forced into the same rhythms, but rather incentivised to develop their own business models and pragmatics through to their independent calculations. I argue that platform valorisation operates precisely through this heterogeneity and this capacity to integrate difference and randomness at its very core.

[63] Frank is the name by which people refer to the algorithm of one of the major platforms.

Dead time and ambient labour: a critique of the "gig"

Another set of considerations I would like to draw from the research presented in this chapter is about how the technical functioning of platform coordination doesn't correspond to the model of individualised competition that is instead celebrated and reproduced by the current economic-discursive arrangement of platform labour. In fact, the daily operations of platform mediated labour seem to present a model of human/nonhuman cooperation from below that contradicts this model. This contradiction suggests a certain «misunderstanding of the machine» at the core of platform labour, something that Simondon individuates as a root cause of alienation — which is never only the alienation of the worker, but also of the technical object itself (Simondon 2017).

In the extended structure of fixed capital that characterises platform environments, computation affords new kinds of automated agency and productive capacities. In fact, software is not only an increasingly capable actant itself, but also imbues objects and materials with the capacity to extend the productive capacities of labour. For instance, the material capacity of a sensor to transduce the force of movement into electromagnetic charge is activated by software mediation to produce the computational ground for the coordination of the whole labour process. Here, through the transduction of sensors and the encoding of software, the micro-acts of a single worker are connected to all other tilts, rotations, hesitations, intuitions and mistakes happening across the platform environment. By this connection, collective randomness and noise is re-made into patterning material, as an essential component of valorisation. In addition to this, the data produced by mediated activity enters in a recursive relation with the same material reality it is meant to represent. In fact, mathematical models cease to be merely representations of reality in formalised language, and become themselves reality-making forces. Now, it is important to acknowledge that statistical calculation has always affected reality[64]; however, the experimental reasoning of learning models, together with the decisional and executive power increasingly granted to automated computation, enables software to cut into reality in a much more direct, granular and dynamic fashion, compared to the past. By this process, technical objects augment human activity, by affording productive capacity to states of stasis and other passive, idle and otherwise unproductive activities.

Thus far, this chapter characterised the platform environment as a system of intensive movement, material transformations and indeterminate states. This might suggest an experience of platform labour defined by frenetic dynamism and constant stimulation,

[64] as shown for example in Fuller and Harwood 2016.

something fast-paced, thrilling, perhaps even exciting. While this might be the case at the micro-scale of electromagnetic signal and unstable transmission, at a merely human level the most defining experience of platform labour is undoubtedly the intense tedium of waiting time. In fact, besides some brief bursts of adrenaline and the instant dopamine rush accompanying order notifications, everyday labour is made of the mundane rhythms of cycling around the same routes, waiting in the cold outside the same restaurants, checking the apps in a nervous autonomous reflex, standing in line and absent-mindedly staring at the screen of the fast food kitchen — piles of thermal bags on the floor, bits of small talk — waiting for an order code to appear.

Importantly, all this waiting time is unremunerated, either because of its idle and non directly productive character, or because it is framed as a necessary investment by the enterprise-individual for seeking the gig: understanding marketplace dynamics and making themselves available, positioning in the optimal state to receive work. All this unpaid time, during which workers are technically at work — they are "online" on the app and data is being harvested from their activity — but not formally engaged in a delivery, is referred to by Uber drivers as «dead miles». According to research, this can take up to two thirds of the entire workday (Rosenblat 2019) — and in my experience as a courier, I would say that a similar estimate is accurate if not optimistic. Research also shows that workers on web-based platforms similarly spend over one third of their time seeking work, navigating the online marketplace, reading instructions and understanding tasks (International Labour Organization 2021). During this unremunerated yet still platform-mediated time — which we might refer to as *dead time* — workers are making their own calculations and engaging with the surrounding environment, in some way investing in their abilities-machines waiting to connect to some earnings stream. At the same time, they are producing traces and flecks of activity through their devices. These dividual data streams feed into the inferential and learning architectures of the platform, directly grounding the coordination of labour, and therefore crucially contributing to value production. While at an individual level there might be no significant knowledge to extract from this idle time, at the aggregated level every micro-action, change of direction, device interaction, or one's mere presence in space and time, produces valuable information to the coordinations system.

Lean platforms often insist in presenting themselves as if they were purely tech companies — and not labour market brokers — especially to investors and financial markets.[65] However,

[65] This narrative contributes to their financial valuations, as it promises to harness the network effects of multi-sided marketplaces to create rapid growth trajectories, facilitated by lean platforms' nimble organisational structures.

many have argued that platform economies are characterised by significantly new arrangements of value production, which are not completely concealed within the firm, but distributed across their marketplace environments, or extracted from the social relations they mediate — which is to say from some form of labour (Casilli 2020; Jarrett 2022; Srnicek 2016). This is true for the free labour of users, but also to a certain extent for platform-mediated labour that is formally recognised as such. In fact, while multi-sided coordination is presented as a neutral mechanism of inter-mediation between consumers and providers — supply and demand — the study of coordination systems shows how they entangle labour in self-regulating choreographies that are fundamental to production. The ambient labour of *dead time,* that grounds the self-organisation of the coordination systems, is strategically unrecognised by platforms. While uncompensated labour has existed in numerous forms within industrial modernity, this mode of dividual labour stands out to me as occupying a significant share of the workday, at least for something that doesn't have to do with reproduction, and whose performance is made necessary in order to access paid work.[66] Significantly, it is through computational mediation that this time, and this activity, becomes productive, while the platform's economic and symbolic arrangements obfuscate it and render it into a site of appropriation. The main political implication of this is individuating the recognition of this activity — especially in its ambient, transindividual and non-anthropocentric character — as a site of conflict over *what* has value and *who/what* produces it.

The patent for service coordination acknowledges that the decisions the systems makes have «a significant impact on a number of trips that each delivery provider can complete, ultimately impacting their earning potential» (Waliany et al 2019, p.3). The distribution of opportunities within platform labour, specifically its criteria, methods and consequences, have been a key object of political struggle and critical scrutiny. An important body of work over the last decade analysed the power asymmetries between workers and algorithmic management (Armano et al 2022; Cant 2019; Rosenblat & Stark 2016), the "black-boxed" character of these systems (Pirone et al 2022; Zehle & Rossiter 2016), as well as the arbitrary and unilateral decisional power afforded to automated decision within the platform labour (Mazali & Gay 2022; Veen et al 2020; Woodcock & Graham 2020). However, the relation between the technical functioning and the economic configuration of platform labour seems to

[66] This type of uncompensated labour might resemble the commuting time sustained by workers who can't afford to live in particularly large cities, or to the time precarious workers spend applying for jobs, putting together proposals or developing their portfolio — and might resonate with what Ivan Illich called «shadow work», although that seems to me a broader definition (Illich 1981).

highlight a more fundamental critique, which is a critique of the "gig" itself as the individualised packet of labour time that serves as the economic basis for the wage, qualifying what *counts* or *doesn't count* as labour time.[67]

If we understand platform-mediated labour power not as a mass of mechanised bodies determined by abstract management science, but rather as a self-organising embodied assemblage, we can think of the ambient coordination of labour as already collective. In fact, through the mediation of open machines, the *dead time* of platform workers materially contributes to the management of their own labour, to the coordination of the whole platform service, and thus to value production. Historically, as shown by marxist feminism, the appropriation of the value produced by unwaged and vulnerable labour sustains the productivity of waged labour formally recognised as such (Federici 2012; Fortunati 2007; Haraway 1991). The platform economy highlights to what degree contemporary labour is feminised — in the sense of made vulnerable or «cheap» (Jarrett 2015, 2022; Moore 2018) — by extending this dynamic through its value-oriented technical systems. Significantly, this is not only the case for the free labour of users, where metadata from social relations is made productive by multi-sided, attention-based business models. What I am arguing is that, within formally recognised gig work, the productivity of the time that *counts* — the "gig" — depends on the time that *is not counted*; on *dead time* as the the unrecognised collective labour by which workers take part in their own self-management, through platform mediation. By dissimulating the actual functioning of labour coordination, the "gig" model grounds the appropriation of the value produced by this labour, while upholding a fetishistic representation of platform labour as essentially individualised and competitive. The fetishistic function of the "gig" reiterates a trick that is as old as capital: that of making collective productive power appear *as if* it was possessed by capital.[68] In fact, labour — and the knowledge and data derived by it — are inherently collective, and it is precisely because they are made to appear as individualised, that they can be selectively remunerated, and their value appropriated. The gig model obfuscates the technical reality of labour, which reveals its inherently collective character. Here, the onto-formative power of the platform, to qualify the relations it mediates, becomes central to the question of what is counted and what is not.

---

[67] I argue that the power to qualify what *counts* within platform labour depends on a servo-instrumental model of the relationship between labour and technology, which will later be discussed.

[68] «Productive power developed by the worker socially […] appears as a power which capital possesses by its nature - a productive power inherent in capital» (Marx 1976, p.451).

Post-anthropocentric value production

Another consideration similarly inspired by marxist feminist perspectives has to do with the post-anthropocentric character of value production and labour. Understanding algorithmic management as embodied across an assemblage calls for a recognition of how the human worker — a historically produced category — may not be the sole protagonist of management and labour *tout court*, albeit still a key part of it. If capitalist accumulation requires the invisibilisation of collective cooperation as essential to value production, then the nonhuman component of this cooperation needs to be recognised. As noted by environmental critiques of capitalism, accumulation also operates as an ecological regime, where the exploitation of human labour is linked to the more fundamental appropriation of «cheap natures» that are located and reproduce themselves outside of the direct value relation (Moore 2018). The intensive extraction of non-renewable resources and minerals sustaining global technological infrastructures highlights their environmental implication (Crawford 2021; Cubitt 2017), and a certain continuity between technics and geology (Parikka 2015), articulated across ecologies of residue and waste (Gabrys 2011), as well as dispossession and colonial violence (Haraway 2015; Yusoff 2020), not to mention the control of borders and the governance of global reproductive cycles (Mezzadra & Neilson 2017). The exploitation of labour appears distributed across all layers of this planetary stack,

> *«from indentured labor in mines for extracting the minerals that form the physical basis of information technologies; to the work of strictly controlled and sometimes dangerous hardware manufacturing and assembly processes in Chinese factories; to exploited outsourced cognitive workers in developing countries labelling AI training data sets; to the informal physical workers cleaning up toxic waste dumps» (Crawford & Joler 2018).*

The implications of these planetary regimes of exploitation and accumulation resonate even at the micro-scale of the processes observed in the case study of this chapter, as exemplified by the centrality of metals to the operations of sensor devices, and of lithium-ion batteries to the functioning of smartphones. True value production and circulation appear to depend on an inevitably post-anthropocentric labour-energy power.

While not being a central tenet of this project, an idea of labour-energy as a cyborg activity, de-centred from the human, helps a critique of technology and labour move past both

anthropocentric intentionality and mechanistic determinism. This might highlight the limits of the subject category produced with the traditional idea of labour.[69]

Thinking through Simondon: technics, labour and the question of potential

Questioning anthropocentrism might be a starting point for challenging labour as the humanising activity that produces the category of the worker, by at once severing it from the world and positioning it against it, forcing it at the same time into an instrumental relation with technics. This idea can be understood through Simondon's thinking on technics, labour and individuation, and especially through the work done by Muriel Combes in connecting his main works and highlighting their political implications. To Simondon, the crisis in the relation between humanity and technics stems from an opposition between culture as meaning and technics as mere utility, used to impose form upon matter, which grounds the contemporary misunderstanding of technicity. This configures machines as instruments for the technocratic domination of nature, which implies domination by those who own materials and control forms, over those who don't — that is the labourers, who have to apply form to matter by way of instruments whose technical operations they can neither regulate nor fully understand. This paradigm of industrial labour reduces the technical object to an instrument for the human domination of nature, while at the same time putting the worker in a similarly instrumentalised position. This is the source of a double alienation, of the worker and of the technical object itself, as the relation between humanity and machines is engulfed into a master-servant, domination-submission dynamic (Simondon 2017). However, technicity — especially the advanced technicity of technical ensembles — is not exhausted in the utility of technical objects, but constitutes a reticular mode of collective being, mediating the relations between human, environment and technical world. Simondon calls technical activity a relation to the technical — and through it a connection to nature — that exceeds the instrumental

[69] While the notion of labour had already been extended beyond the individual worker within post-workerist Marxist theory — through concepts like that of the socialised worker, immaterial labour and mass intellectuality (Lazzarato 2006; Negri 1988; Virno 2001) — the influence of this line of critique maintains a central tension in the opposition between «living» labour and the crystallisation of «dead» labour in machinery — so that labour remains an essentially human and somewhat humanising prerogative, opposed to instrumental rationality (Pasquinelli & Joler 2021). Addressing the relation between technology, labour and capital, Haraway's *Cyborg Manifesto* is explicitly skeptical of Marxist analyses of labour as a human prerogative, focusing instead on co-constitutive connections between human and nonhuman (1991). The cyborg body constituted in these connections has unstable boundaries. Unlike the human, it is not exceptional, severed from the world, but makes and organises itself with the world of nature and technics (Haraway 1991).

model of labour. Connecting this insight with Simondon's theory of individuation, Combes shows how, through technical activity, individuals and technical objects can realise their share of pre-individual potential through collective becoming. This not-yet-individuated potential — pre-individual and «more-than-individual» because «common» to all entities — constitutes an «energetic» potential, that mediates the transindividual process of collective individuation, driving invention, change and collective action (Combes 2012). Interestingly, Simondon's thought is mobilised in both Mackenzie's work on transduction and Munster's concept of transmateriality. To Munster, transmateriality is the metastable process through which matter-signal is modulated, and it denotes the potential to become of contemporary technical ensembles, actualising toward collective individuation. According to both authors, through transduction and modulation, the energetic potential of human and nonhuman bodies can conjoin in novel ways. Media objects can develop beyond their instrumentalisation as communication devices, and unfold towards new mediated environments, enabling new perceptive and aesthetic arrangements (Mackenzie 2002; Munster 2014).

This is a fascinating line of thought on how technical activity could enable new socio-technical relations beyond the logic of accumulation — potentially liberating productive forces from labour, and the technical object from its instrumental dimension. However, the model of technology currently expressed within the platform economy seems to hinder this mobilisation of potential, limiting technical systems to the reproduction of an inter-individual sociality which encloses individuals in their function to capitalist accumulation. Following these speculative threads, it's important to avoid considering this potential of technicity as an unproblematic or self-actualising force. Specifically, I do not mean to adopt a naively "left-accelerationist" view of the historical development of technical forms, whereby a certain potential for communism inherent in capitalist technology will teleologically actualise through increasingly autonomous social cooperation. Similarly, a political project centred on re-appropriating or reclaiming technology may not *by itself* be conductive of liberation — for labour or from labour.[70] The speculative question of potential is interesting as a method for continuous problematisation. How is the potential we recognise in technically-mediated collective relations subjugated to proprietary accumulation? Through what kind of socio-technical and discursive apparatuses? Going back to the case study of this chapter, if platform labour functions through the productive and self-managing capacities of an energetic

[70] Obviously the type of political subject instrumentalising technology does matter, and if the governing logic of socio-technical assemblages was not the axiomatic of capital, but for instance the state or a revolutionary bureaucratic class, the conditions of labour would surely change, but not *necessarily* towards liberation.

assemblage, then how is value production individualised, and on what basis are wages selectively paid? If the intelligence of production is not truly in corporate hands, but rather embodied and collective, how is it enslaved and made to appear as abstract? How is the potential and intelligence of contemporary socio-technical life metabolised by the market-oriented oligopolistic power of the platform economy?

The User and the "used"

> *«It has long been assumed in the Western world that technologies are basically tools, means to ends decided in advance by those who make them and put them to use. Whatever the particular purposes for which they are designed and employed, the overriding rationale has always been the effort to secure and extend the powers of those whose interests they are supposed to serve. And their interests have in turn been defined as the exercise of control over something variously defined as nature, the natural, the rest of the world. This crude model of the user and the used has legitimized the scientific projects, colonial adventures, sexual relations, and even the artistic endeavors of the modern world. It continues to inform the deployment of even the most complex machines.» (Plant 1997, p.77)*

Through the discussion of the case study, this chapter highlighted a certain dissonance between the technical functioning of platform coordination and the economic model which this functioning is taken up by. To understand this not as simple dissimulation, but as a contradiction that is fundamental to how production operates in technologically advanced capitalism, it is useful to think through Lazzarato's work on machines and subjectivation, which draws its key conceptual tools from Felix Guattari. In their analysis, production involves the joint operation of two apparatuses: social subjection and machinic enslavement. The former produces individuated subjects, by assigning symbolic positions within a social division of labour, and includes the way in which neoliberal subjects produce themselves as human capital, enterprise-units, or self-exploiting subjects. The latter is the mode of control by which dividuals function within cybernetic socio-technical machines. While dividual enslavement doesn't have an individuated subject as a referent — but rather an assemblage of sub-individual affects, forces and machines — social subjection produces a subject precisely in relation to an external object they can make use of, like a service or a device (Deleuze & Guattari 1987; Guattari 2012; Lazzarato 2014). The economic model by which capital pays

for labour power follows social subjection, as wages correspond to the availability of individuated subjects to sell their labour. However, what capital actually buys through this model is access to the integrated productive capacities of a collective assemblage. Therefore, capital does not simply extract a surplus from labour time, but exploits the real productive power of the machinic assemblage. In Lazzarato's analysis, surplus value derives from this *qualitative* difference, between the subjection of workers to individualised positions and the enslavement of a complex of human and technical capacities (Lazzarato 2014). The model of platform labour similarly operates by compensating workers for their "gig" as individuated subjects — users/providers — while actually exploiting the dividual labour through which they participate in service coordination, for instance during dead time. It is precisely the control of connection and co-operation enabled by platform mediation that grounds the exploitation of this qualitative difference, between the performance of individuated users-providers and collective ambient labour.

A critical point of this project is looking at how the hegemonic apparatuses of platform capitalism subjugate collective productive forces to proprietary accumulation. I suggest that a key process by which this is achieved is the ongoing production of individualised subjective positions, foreclosing the possibility of new transindividual relations. And because of the centrality of technological mediation within this study, a position that seems particularly significant is that of the received universal subject of technology, which is the User. By User I mean the historically constructed position of the consumer, master and operator of media technologies; the position we occupy most in most occasions when our labour, leisure or consumption is technologically mediated. However this position is not univocal or static, but rather discursively articulated in two seemingly contradictory yet complementary conditions. On the one hand, this is the position of the autonomous and self-determined master of technological instruments — the User proper. On the other, subject to this condition are also the behaviourally conditioned, the addicted, the exploited or *instrumentalised* — the "used". Through this duplicity of the User position, we can think about how, for someone to access the instant gratification of the user experience, someone else has to wait; for one to enjoy the convenience of seemingly enchanted platform services, the labour of others has to be made vulnerable and unrecognised. A discussion of the historical, discursive and technical production of the User position, in this duplicitous dimension, will be the topic of the next chapter.

The User position, instrumentality and platform pragmatics

The previous chapter focused on the socio-technical schema by which the coordination system of a delivery platform exploits a certain unrecognised mode of collective labour, while upholding the fetishistic device of the "gig" as an individualised measure of work. In the last section, this was connected to a critique of the instrumental model that subtends the relation between labour and technology. The figure of the User was individuated as fundamental to reproducing this model and sustaining the selective recognition of collective and social labour.

Therefore the aim of this chapter is twofold. First of all, to develop a critique of the User as the universal subject of media technologies, and specifically understand how the user position of platform services is produced in relation to a condition of instrumentality and affectability, introduced in the previous chapter as the "used" condition. I will argue that this constitutes the removed and unacknowledged foundation sustaining the autonomous subject of both media technologies and labour, particularly under platform mediation. However, I will also clarify that this vulnerable and instrumentalised condition of platform labour is not one of total subjugation, nor is it completely emptied of agency and vitality. Therefore, the second half of the chapter will discuss a variety of practices by which, from a "used" position, living labour appropriates, interprets and contaminates the logic of platform control.

In order to develop this critique of the User, the first half of the chapter will discuss how certain anxieties and ambivalent feelings around the relationship between labour and technology are rooted in the historical association of automata with devalued modes of labour. Specifically, drawing from feminist studies of technology and critical race theory, I will show how through this association with devalued modes of labour, technology is itself discursively racialised and gendered, while vulnerable workers are culturally assimilated to machines. This will be useful to understand how both the universal subject of technology — the User — and that of labour — the Worker — are constructed in relation to models of instrumentality and to the differential allocation of agential capacities. Lastly, this section will illustrate how platform mediation re-programs a historical framework of servitude into the user experience of platform services.

Following this thematisation, the second part of the chapter will try to question the positive connotation of the self-determined worker-subject, as opposed to instrumentalised and

feminised labour. In order to do this, I will draw from Veronica Gago's study of neoliberalism from below and an autonomist Marxist understanding of post-Fordist labour to develop the framework of "platform pragmatics", as a proposal for understanding the mode of subjectivation of platform-mediated labour. Lastly, I will try to understand the implications of this for the class composition of platform labour. Specifically, I will look at how the appropriation and internalisation of platform logic by workers produces, on the one hand, instances of antagonism along traditional geometries of the labour-capital conflict, but also, on the other, forms self-reflexive opportunism that, despite not directly steering platform labour towards emancipation, keep it clear of complete capture and possibly searching for breaks.

A critique of the User

From the observation of algorithmic management within the networked environment of a delivery platform, discussed in the previous chapter, a critical point emerged that seemed to me particularly interesting. This has to do with a certain dissonance at the core of the model of platform work. In fact, while the overall coordination of the service technically depends on a nonconscious embodied assemblage of workers, devices and computation, the job is still economically configured as a series of individualised gigs carried out by inter-connected users — essentially isolated and in competition between them. Here, the discursive device of the "gig" seems fundamental to the selective recognition and thus to the partial compensation of platform mediated labour. My reading of the patent for the coordination system showed how it significantly leverages the micro-activities and the apparently idle states of workers — what I referred to as "dead time": the waiting time during which couriers wait for the system to assign them a delivery that will count as remunerated labour time. The activities of workers during this time are sensed and processed as data by the computational architecture of the platform. This algorithmic apparatus constantly formulates inferences about this data, which are then used for forecasting and automated decision-making regarding the optimal distribution of labour in space and time. However, because workers are only paid for their engagement in individual delivery jobs — *gigs* with fixed remuneration — all this time and

this activity is not counted as work by the platform. It is not acknowledged as productive, as essential to service coordination and value production, and thus not remunerated.

That of unremunerated waiting time is obviously a particularly frustrating aspect of the job. Discussing earning possibilities, a Discord user laments that «fees should really follow min wage at least. [The platform] only cares about how much you earn while on an order not when you're waiting around». In a conversation, on the same server, about the common impression that pay rates have decreased in the past year or two, a worker comments that pay wouldn't even be so much an issue if most of the job didn't consist in unpaid waiting time: «Honestly idc about the "low pay". I just want orders and not waste 20-30 min between orders. They accepted way too many riders cuz for them they don't care anyway, they pay a small fee to the rider who made the delivery if there's 99 other riders who are waiting for orders they don't have to pay them». This is a recurrent point in many conversations at work; earnings are bad because there is «too many of us» — an older worker says shaking his head at a particularly crowded waiting room in the McDonald's on Rye Lane. The negative impact of over-hiring on average earnings seems to be common sense, following basic supply and demand dynamics. Whether it is «Brazilians», migrant workers or just new people on e-bikes, most workers seem to have clear idea that the platform doesn't care about anyone's earning possibility, it just needs a crowd of people and it needs to keep them waiting and available. As this chapter will cover later on, in my ethnographic experience, these don't tend to be politicised discussions, but very pragmatic ones. People are looking for ways to cut down on waiting time or for tactics to make this time "count", to make it productive in some way, on their own terms. Workers reason in group, some ask for advice, others share their experiences, deductions or results, drawing from — and contributing to — a collective vernacular knowledge of the platform, the marketplace, and work in general. A new joiner on the Discord server, frustrated by waiting times, asks: «Does cycling back to a "main area" (where most restaurants are) after completing a delivery actually help in getting one faster? Sometimes I'm waiting 20-30 min between deliveries and nothing shows up». Another one gives their interpretation of map indicators: «the "this region is busy" (when the tiles are dark) is pure BS on both [Platform1] and [Platform2]. They just automatically change color on certain hours. While its true that in the evening there are more orders than afternoon/morning, its not "busy" when a rider has to wait 40 min for an order». But the inactivity of waiting time also presents an opportunity for differentiating earnings-streams. Most people resort to the use of multiple apps at the same time, which requires a certain ability to make calculations and estimates about one's simultaneous presence on multiple marketplaces, a sensibility to the overlapping rhythms of

work that necessarily develops with time.[71] As one Discord user suggests, «Multi-app is a nice way to cut out the wait time between jobs which is the biggest earnings loser in this work. And if you are good you can sometimes stack the orders and do a couple at once to really push the earnings up».

These pragmatic approaches will be further discussed later in the chapter. What is interesting right now is thinking about how all this unpaid waiting time constitutes not only the main social setting of platform labour — the moment were workers socialise, and the space for their private tactics and calculations to develop — but also significantly the infrastructural and material backdrop against which the user experience of the customer exists and on which it depends. Collective waiting time — the unremunerated boredom, the idle calculations and scattered sociality of platform labour — constitute the off-stage and out-of-sight background to the User protagonist and their experience. This is fundamental to the convenience of platform services, to the immediate satisfaction promised by the interface, to the pleasure that comes from seeing a command — given through the haptic surface of a screen — executed by an almost enchanted movement of goods; an invisible choreography of cycling bodies, sensing devices and algorithmic sorting, all directed toward the comfort of the domestic space.

However, the customer is not the only user of the platform; both service consumers and service providers are qualified as users and occupy user positions. Service providers are not employees, but self-entrepreneurs, and the platform is their tool for accessing the marketplace of gigs, for opening their assets to potential earnings-streams. Therefore, their relation to the platform is also that of *user* access, of the *user* profile, and the *user* interface. But still — the relations of users-providers and users-consumers with the platform and to each other are not balanced nor symmetrical. As already discussed, the ways in which workers access the labour marketplace through platform infrastructures are themselves based on a fundamental contradiction or dissonance. In fact, while digital platforms come to mediate labour in its collective, indeterminate and therefore generative dimension, the economic model of platform labour seems entirely based on assigning workers to an individualised symbolic position: that of enterprise-units of human capital, in competition between them — that of *homini economici*. As argued in the previous chapter, the model of the gig is essential to the exploitation of this qualitative difference; between workers' performance as individualised service providers and the collective labour they participate in through platform mediation.

[71] Personally, my attempts at it were not very successful, but I was also particularly careful about not having my account de-activated, which would have jeopardised my research.

While from a purely technical standpoint the platform integrates workers as components of the assemblage, they are still socially addressed merely through pre-configured user positions. The value produced in the space of this difference, naturalised and invisibilised, becomes automatically an object of proprietary accumulation.

Platform mediation enables precisely this trick: mobilising transindividual productive forces[72] while simultaneously upholding a reductive and individualistic economic rationalisation of labour. I argue that — a key process by which this is achieved is by the continuous production of the universal subject position of what Neda Atanasoski and Kalindi Vora label as «technoliberalism» (2019). In their work, this expression identifies the «political alibi» by which technological development is presented as a promise of human emancipation, that in reality obscures the unequal power relations underlying contemporary capitalist production, and actually works to reaffirm and extend differential conditions of exploitation (Atanasoski & Vora 2019). I am using technoliberalism here to describe the master discourse around the contemporary condition of technologically mediated labour. What I want to highlight is that the received subjectivity of platform services, the seemingly transparent and neutral User position, reproduces an idea of autonomous personhood derived from the liberal notion of "humanity", which is historically constructed in relation to the hierarchical sorting of not-quite-human others into positions of limited autonomy and only partial self-possession. By this extension of traditional humanity into the technologically accessorised *User* of technoliberalism, the governing logics of race and gender are re-inscribed into the form and function of platform infrastructures. Thus, these logics are recursively activated in the platform mediation of labour — and specifically of forms of labour that were historically relegated to subalterns, and have been progressively extended to differentially feminised and proletarianised workers. The User of platform-ed services occupies the historically constructed position of the consumer and operator of media technologies, the source of command and volition for which the platform infrastructure is set in motion, and whose desire it aims to satisfy. However this position is not univocal or static, but rather articulated in two seemingly contradictory yet complementary conditions. On the one hand there's the User proper, the self-determined master of technological instruments, as just described. But in order for the User to access instant gratification, someone else has to master the art of patiently waiting. For one to enjoy the convenience of seemingly enchanted platform services, the labour of others has to be made vulnerable and unrecognised. Platform technologies come to mediate precisely this duplicity of the user position, the specular production of the User —

[72] What Geremy Gilbert might call the «common ground» (2013) of platform production.

the universal subject of liberal technologies — and the "used" cyborg body whose time and energy are instrumentalised.

Those who wait

Working as a courier while I was living in South East London, I spent quite a bit of time outside the McDonald's on Rye Lane[73]. Given how many workers gather around it, it doesn't really work as an instant source of orders, but at least a somewhat reliable one. Especially around lunchtime and in the early afternoon during weekdays, when all surrounding areas tend to be quiet, it is not worth cycling around too much, and so many end up just waiting around their local fast food restaurants. At the corner of Rye Lane, a small community of couriers populates the little grove on the side of the shop, waiting to be addressed by one of the apps they are active on. About half of them, like me, are loners; they arrive, some park their bike and others remain on their seat hoping for a short wait, they say hi when new people stop next to them, occasionally exchange a few words, but most of the time just mind their own business, text, scroll through their phone, or refresh the app. The other half tend to form small groups; most of them seem to know each other, a few are not on vehicles which suggests they are not really at work but just passing time; some come and go and seem to live nearby, many could be from the African-Caribbean or Asian communities of the area. Most of them are on electric bikes, some on rented ones, only a few have regular bikes. Those on motor scooters stand on the opposite site of the small street and tend to be busier, frequently coming and going into the restaurant and then off to deliver. With time I begin recognising some people who tend to be there on most days, especially two men who helped me during a moment of small crisis with a missing order on one of my first days, and from whom I get at least a gentle nod. Even those who are not actively on their phone always hold it in their hand, some keep it in a holder attached to their wrist. When the order finally comes, one quickly goes in and heads to the waiting room. Here, another stage begins, another wait. This time always keeping an eye on the screen mounted on top of the counter overlooking the kitchen area. The screen shows the status of orders identified by an alphanumerical code, while another set of screens, facing the kitchen staff, displays the other side of the same dataset: which orders need to be prepared, in what order, and which ones are ready to deliver. The

[73] Rye Lane is the main high street of Peckham, a traditionally working class area of South London that has undergone a process of overall regeneration and gentrification over the past two decades. It is one of the most ethnically diverse areas of the UK, about half of the population being black, mostly of Nigerian or Afro-Caribbean descent.

composition of the kitchen staff seemed to me quite similar to that of delivery workers — a relatively young and ethnically diverse working class — only with a much higher presence of women. This workforce is frenetically at work, and usually functions like a well-oiled machine, while on the couriers' side of the counter, there is not much going on; some people are more patient and just lean against the wall in silence, some are on their phone, others are more talkative. Some tend to get impatient if they feel they've been waiting too long and try to get the attention of the kitchen staff. At times the two parties can figure out together if something is not going as planned, but most of the times the kitchen staff can only tell the courier what they already know: they just have to wait. This interaction over the orders' counter is a specific manifestation of the interface between two key parties of the platform system: the service provider and the "third party", the restaurant. They directly face each other and have some understanding of their reciprocal tasks. Usually they work well together and there's only rarely tension. In some places the staff is kind and welcoming to couriers, while others might have less accommodating policies: for example smaller restaurants might ask riders to wait outside or refuse to let them use the bathroom. It is in fast food restaurants that this interface is by far most visibly and intensely at work. At peak times, restaurants without a dedicated waiting room can have most of their shop floor occupied by queues of couriers and piles of their thermal bags, with regular customers remaining as a minority, in a space that seems configured not so much for the public, but more as a component of the platform's diffuse service line. The intersections and continuities between the fast food industry and platform labour — which unfortunately I haven't had the chance to investigate extensively — seem to present interesting dynamics in terms of the integration of technical functions of production into a continuous system, as well as in relation to class composition.

However this industrious service line remains well out of sight for the only party of the platform system not addressed by this specific service interface: the user, whose demand sets the whole mechanism in motion and whose satisfaction is the ultimate aim of the entire process. In his work *The Server: A Media History from the Present to the Baroque*, Markus Krajewski examines our current relation to information communication technologies through a media archaeology of service society, connecting some historical aspects of subaltern service to the media-technical objects of the digital information age. In this work, Krajewski identifies some of the core features of «subaltern serviceability»: one is a certain paradoxical requirement to be constantly at work while remaining as invisible as possible, another is what he calls «the noble art of waiting» (2018). I would like to thematise the importance of subaltern waiting time, and of the unseen character of this waiting time, as key dynamics

through which we can understand the User position in its relation to platform services, as both technological entities and labour assemblages.

As already mentioned, what I am referring to as the User and the "used" are two seemingly opposite positions that are specularly produced, where the exploitation of the latter seems instrumental to the autonomy of the former. However the relationship between the two can be rather ambiguous and contradictory. It is not traced along the lines of class difference, whereby a hypothetical middle class of users would make "use" of a working class. It doesn't even correspond to a global north/south divide, as platform mediation reproduces the relationship between User and used at multiple scales, beyond that of a global division of labour — for example even within the same individual. In fact, the User/used relationship doesn't even correspond to the division between customer and provider in platform infrastructures. Workers themselves are in a certain sense both users and used: they occupy an agential position of mastery over their technological instruments — they are *users* of platform services — and at the same time are assigned to an instrumentalised condition, by which their desire, affects and capacities are at least partially influenced by the behavioural design mechanisms of platforms — they are integrated as components of machinic enslavement at a dividual scale. From this contradiction, following Simondon's thinking on the double nature of alienation, we can understand labour as the process by which the worker has to fulfil their needs by dominating inert nature through the technological instrument, being at once themselves instrumentalised — forced to work as part of the machine — and exploited as part of nature (2017). In this sense, it is the process of labour, in its technologically mediated dimension, that produces the duplicitous condition of the user. Therefore, it becomes necessary, within a critique of platform labour, to think about how the universal subject of labour and that of technology are historically produced in relation to each other.

The threat and promise of labouring machines

Public discourse around technological development reveals some ambivalent feelings around its relation to human labour. This is evident in how the putatively disruptive effects of innovation are interpreted in either techno-enthusiastic or techno-phobic tones. Over the past one or two decades, developments in digital platform technologies, so-called "smart" connected devices, and artificial learning models have been routinely received as either game-changing innovations or speculative bubbles, viewed by some as carriers of new potential for

technologically-mediated cooperation, and by others as mere updates to old mechanisms of exploitation and impoverishment of human sociality.

The idea of a “sharing economy” has been a central to the public understanding of a series of technologies and business practices emerged in the context of the platform society (van Dijck at al 2018). Initial enthusiasms greeted the sharing economy as the apical point of the participatory culture of Web 2.0 (Botsman & Robers 2010). The platform was established as the go-to metaphor for a neutral space of dis-intermediated connection and socialisation, an instrument of user empowerment by which people could freely trade and exchange informational goods, as well as their surplus of time, resources and skills (Bruns 2008; Gillespie 2010). The conjuncture between the infrastructures of the sharing economy and advancements in data analytics and in the automation of learning, has been described by founder and chairman of the World Economic Forum Klaus Schwab as a «Fourth Industrial Revolution», characterised by the emergence of new business models based on the increasing integration of human intelligence and digital technologies (2016). Similar claims have been made by economic and social theorist Jeremy Rifkin — a key advisor for the European Union’s “Third Industrial Revolution Smart Europe" plan to address economic and climate crises by promoting digitally integrated marketplaces. Rifkin’s theorisation of a «zero marginal cost society» proposes that the inherent entrepreneurial dynamism of competitive markets, by driving productivity up and marginal costs down, is liberating the production of goods and services from traditional market forces themselves. According to him, the combined transformative forces of digital marketplaces, “Internet of Things” and crowdfunding models would be bringing about a hybrid economic system where the power of «collaborative commons» seamlessly integrates with the capitalist market, progressively emancipating human productivity from ownership and employment, moving towards the liberation of creativity and intellect from the constraints of wage work (Rifkin 2013; 2015).

In contrast with such enthusiastic readings of technological development, there is a looming anxiety that before — or instead of — emancipating human work, new technologies will replace human work*ers*, producing a mass displacement of jobs that, unless countered with appropriate redistributive measures, will result in widespread impoverishment (Frase 2016). This type of ambivalence toward an imminent machine substitution has been a recurrent trait of the discourse around industrial automation. In 1946, Fortune magazine published «The Automatic Factory», a highly influential article announcing that «the threat and promise of laborless machines is closer than ever» (Fortune 1946; Noble 2011, p.67). The article was accompanied by «Machines Without Men», a proposal by two young Canadian

researchers, who had worked on the wartime developments of continuous-process control and radar technology, to transform the assembly line of the industrial factory into a cleanly automated and continuously operating machine. Their new approach to machinery design based on control technology would result in a «new industrial revolution» thanks to the «untiring» operation of new electronic devices which included: information processing sensors, carriers and computers, as well as the machine control units which converted this information into servo-mechanical commands to manufacturing machinery (Fortune 1946). This would constitute a closed-loop feedback system of continuous control, whereby the factory would operate automatically, and human work would be confined to management and engineering. According to this proposal, unlike the earlier industrial machinery which relegated humans to unskilled labour, this new electronic technology would allow an up-skilling of production workers to new techno-scientific positions, which would be accompanied by shorter work weeks and higher wages, similarly to previous proposals made by Frederick Taylor or Thorstein Veblen (Noble 2011; Taylor 2017). Already here, the assignment of automation is to take on tasks that are deemed undesirable; to help humanity realise its full potential as the master species who creates and commands — and doesn't have to lower itself to the drudgery and toil of unskilled labour.

The tone of this attitude towards automation echoes in the recent discourse about the promises and threats of artificial intelligence. However now, it is not only physical and manual work that comes under threat of automation, but also the more intellectual and creative tasks that used to be an exclusive prerogative of the "human". If on the one hand, the generative capacities of large language models like Chat GPT promise to materialise our dreams and enormously expand human creative powers, they also confront us with the threat of AI models rivalling human creative capacities like writing and image making. This threat fuels an anxiety regarding job displacement that was already expressed a decade ago by Carl Benedikt Frey e Michael Osborne, who famously estimated that almost half of US employment had a 70% risk of being computationally automated in the matter of a few years (Frey & Osborne 2013). Furthermore, a growing body of critical research over the last decade has highlighted how the development of putatively *intelligent* artificial systems depends on the constant extraction of knowledge from human «ghost work», on unrecognised user labour,

as well as on rare minerals and natural resources (Crawford 2021; Grey & Suri 2019; Pasquinelli & Joler 2021).[74]

Enthusiasms and critiques around platform labour have developed along similar lines. As already mentioned, the industry narrative of the platform economy promised to liberate the forces of social cooperation through smooth inter-mediation, whereby each individual's surplus of time and resources would be mobilised as a common productive resource, democratising access to work while fostering economic empowerment and workers' autonomy (Botsman & Robers 2010; Bruns 2008; Rifkin 2015). However, numerous critiques of platform labour have interestingly focused on how the coordination of digital platforms seems to reverse the emancipatory promises of automation: in other words, it is not unskilled physical labour that is automated away from the human, but rather high-skilled managerial tasks. The organisation of labour, historically a prerogative of the human intellect embodied by "Man", is increasingly carried out by impersonal algorithmic calculators, while humans are not only left to the drudgery of undesirable work, but also subjected to the inhuman rhythms demanded by a faceless algorithmic boss (Aloisi & De Stefano 2022; Armano et al 2022; Benanav 2022; Into the Black Box 2022; Rosenblat 2019).

Rather than addressing these sets of questions at face value, it might be interesting to consider critically some of the assumptions underlying this type of discourse around technology and labour. Across most of these positions, the historical assignment of automation seems to be that of freeing the human from undesirable tasks. In light of this, techno-anxieties tend to manifest when machines threaten to replace us in the domains we deem as exclusively and distinctively *ours*, or to limit our autonomy and agency. This highlights how the hierarchical relation between humans and technology is linked to a certain division of labour. As this division is troubled, questions arise about what the structuring principles of this relation are, about what kind of tasks are an acceptable target for automation, and why. Considering these questions, the contribution of perspectives coming from critical race theory and feminist studies has interestingly problematised this compound of fantasies and anxieties around technology and labour, for instance by asking how this hierarchical relation and this division of labour are historically and discursively produced. I find these critical approaches to the question of technology, labour and humanity particularly

[74] While this line of critique highlights a crucial extractive dynamic at the core of the oligopolistic project of the AI industry, in some way it also provides some categorical reassurance: machines will never be truly autonomous from us humans. Wether through our volitional prompt or through the exploitation of our labour, we are indispensable to this mighty machine; we survive as the cultural specie.

useful to understand the ambivalent dimension of the user position in the context of platform-mediated labour.

Technology as embodiment and signifier of devalued labour

"We are not robots"
Amazon workers' protests motto

In relation to the promise/threat of automated technologies to replace human workers, Neda Atanasoski and Kalindi Vora note how historically «the tasks deemed automatable, including manual labor, blue collar factory work, and reproductive and care work, were regarded as unskilled and noncreative — work that could be done by the poor, the uneducated, the colonized, and women» (Atanasoski & Vora 2019, p.2). What this highlights is that technology historically comes to automate labour that is already culturally devalued, and replace workers that are already made socially and economically vulnerable. In the industrial age, this dynamic might have differentially invested the work of non-whites, of women, and blue collar workers. If automation now threatens to replace knowledge and creative work, or even some managerial functions, it is because these jobs have also already been made increasingly vulnerable. From the postwar promise of an automated factory, to the outsourcing and delocalisation of the 80s and 90s, up to current-day precarious work and platform-mediated labour, the fundamental logic doesn't seem to have changed much: the distinction between skilled labour and disposable labour still undergirds not only the hierarchical relation between the human worker and the machine, but also the ordering of different types of workers. As technological substitution seems to follow the proletarianisation and feminisation of labour, only those whose work remains unthreatened are — at least temporarily — reassured of their fully autonomous status, which is evidently constructed in relation to the devalued work of others. Those who remain fully human workers, out of the reach of automation, are at least on the "right" side of the instrumental relationship. They might be subjugated to the wage relation, but they are more masters than slaves — we might say more Users than used. In order to question, or try to rethink, this positive determination of the worker-subject against the slave-object, it is necessary to understand how this threat of proximity to the instrument, of similarity to the technical object, is discursively and historically produced.

The connection of automation to devalued labour is significant because technologies occupy a dual role as both representations and effectors of power relations. Technologies

emerge as manifestations of the latent inequalities and desires that shape the existing socio-economic conditions of work, and that for instance produce certain types of labour as a devalued and therefore exploitable resource. As suggested by the work of Simondon (2017), and analogously by Deleuze (1988), technologies emerge through the concretisation of certain resonances and synergies between technical and socio-cultural forms. Similarly, we've seen how media can be understood as contingent stabilisations of an ongoing process of mediation between social, technical, economic and psychical aspects of life (Kember & Zylinska 2012). Such perspectives suggest that media technologies do not transparently express the intentions of those who engineered them, nor reveal some threat that is inherent to their technical being, but rather concretely emerge as a synthesis of the social and cultural conditions under which they have were produces.

In light of this, we can understand automata simultaneously as signifiers of devalued labour, representations of workers, and as workers themselves — produced by a synthesis between socio-economic conditions, practical possibilities afforded by technical elements, and culturally specific imaginaries. If certain types of labour are associated with devalued workers at a given time, it is the vulnerability of those workers that will make their labour a viable candidate for technological replacement. However, as highlighted in the work of Atanasoski and Vora, the promise of automated technology acting as a «surrogate» for undesirable work only hides the fact that the relation of surrogacy often works the opposite way; meaning that the function of a technological infrastructure becomes not that of actually fully replacing workers, but rather of obscuring their labour so that it can be more intensely exploited and used as a temporary placeholder for future automation (2019). By this surrogate effect, technologies come to embody devalued labour while vulnerable workers come to be associated with automata. Although automation is often framed as a threat to the human, it actually sustains and reproduces a narrow notion of humanity. As argued in the work of authors like Atanasoski and Vora and Louis Chude-Sokei, our idea of technology develops also in relation to race, gender, and human difference in general (2019; 2015). In fact, if the figure of the fully human subject is understood in opposition to devalued labour, it is because their autonomy depends on the servitude of unfree workers, of wives, and of the proletarianised who inherit this racialised and gendered labour. As automata come to embody and signify this division of labour, technology can only become itself discursively gendered and racialised in the process.

Devalued labour as otherness: technology and racialisation

In *The Sound of Culture*, Chude-Sokei shows how western ways of understanding and imagining technology are historically intertwined with the construction of race, and specifically derived from the scientific and technical developments that accompanied imperial expansion and came to a stabilisation in the 19th century. «Being that two of the most pressing concerns in the nineteenth-century transatlantic world were industrialization and slavery, it should be no surprise that each would allude to or depend on the other» (Chude-Sokei 2015, p.2). A large body of scholarship around the paradigm of racial capitalism has prolifically conceptualised how the global engineering of the industrial revolution is entrenched with the history of the modern slave trade (Ferreira da Silva 2007; Robinson 2000). This is particularly useful to the study of labour and technology. In fact, the slave trade has been understood as a network of technologies that was fundamental to the economic structure of modernity (Browne 2015; Weheliye 2014). Within this framework, the technical organisation of enslaved labour, such as that of the plantation, can be seen as pioneering modern patterns of subjectivation through labour that would become central to the industrial modality (Baptist 2016; James 1989; Wynter 2003). Because the contemporary idea of technology has been historically articulated in relation to race, «it's no accident that questions of whether or not slaves had souls and could think, had intelligence, or were mere mimics continue to be guiding questions in how technology has been framed, from eighteenth-century automata to artificial intelligence» (Chude-Sokei 2015, p.4).

That of de-humanised labour appears as key historical analogy for automated machines, going back to what according to many is the first use of the word "robot" in the English language, introduced by Karel Čapek in the 1920 play RUR, adapted from the Slavic word "*robata*", meaning forced labour or intense toil (Rhee 2018). Interestingly, because all slaves both define and challenge the master position, the servitude of robots and automata was always accompanied by certain racial anxieties regarding a machine uprising. In fact, already in RUR, a caste of enslaved robots rises against their makers and overthrows them, in an allegory that even features human abolitionists trying to progressively turn the robots into waged workers with voting rights (Rhee 2018). Following from this entanglement of technology, race and devalued labour, industrial automation also develops in a more or less explicit dialogue with racial metaphors. Pioneer cyberneticist Norbert Wiener — while criticising the cult of progress prevailing among some of his peers, as something that would only expand the systematic exploitation of workers and natural resources — also characterised automatic machinery as a form of labour that «has most of the economic

properties of slave labor» (Wiener 1961, p.37). While on one hand machine analogues of slave labour could free «humanity» from the «need of menial and disagreeable tasks», they could also endanger the position of human workers, as any labour that that accepts «*competition* with slave labor […] accepts the conditions *of* slave labor, and *is* essentially slave labor» (Wiener 1961, p.37; emphasis added). Here, the threat coming from a mechanical other seems not so different from that historically posed to the fully human worker by those who have been racialised as others — and by no coincidence. In fact, the categories of the master and the slave, the human agent and the passive instrument, appear as structurally inseparable, and mapped on more fundamental subject-object dualisms. The human user of instruments is produced as the bearer of certain autonomous qualities only in relation to the lack of these qualities in less-than-human others. Within this discursive construction, racialisation operates as «a conglomerate of sociopolitical relations that discipline humanity into full humans, not-quite-humans, and nonhumans» (Weheliye 2014, p.3).

The racialised imagery projected onto machines is reflected in the instrumentalised view of those who are assigned to the devalued labour that machines come to embody. As a result, the fully human subject has a similar relation to both. In fact, the human worker always seems to be confronted with some potential threat coming of less—than—human others, whether it is slaves, factory automata, cheap delocalised labour, or algorithmic intelligence. Because of this, that of being fully replaced by machines is only one part of the danger posed by the proximity with devalued labour: the other is the almost equally dramatic position of being subsumed by machines. Wiener's anxiety about machine competition echoes in more recent concerns around the threat posed by delocalised labour to the western working class — and significantly in the preoccupations highlighted by some workers' conversations towards migrant workers. It also echoes in the general discourse around the threat of algorithmic technologies to platform workers: being assimilated to the devalued labour of machines or racialised others is a condition of in-dignity, de-humanisation and loss of autonomy. The motto accompanying the unionisation of Amazon workers' in recent years speaks clearly: «we are not robots» (Sainato 2019).

However, the dynamics by which new forms of labour are progressively made vulnerable points to the shifting character of the boundary between the fully human and the other. The work of Sylvia Wynter on the co-construction of modern Man and the racialised other, as a process of «bio-evolutionary» selection, suggests that the "human" category is not fixed, but constantly redefined by the western episteme in relation to some defective otherness, so that the less-than-human is only temporarily exterior to the order of Man.

«Seeing that if at one level Man is now defined as a jobholding Breadwinner, and even more optimally, as a successful "masterer of Natural Scarcity" (Investor, or capital accumulator), […] its modes of Human Otherness can no longer be defined in the terms of the interned Mad, the interned "Indian," the enslaved "Negro" in which it had been earlier defined. Instead, the new descriptive statement of the human will call for its archipelago of Human Otherness to be peopled by a new category, one now comprised of the jobless, the homeless, the Poor, the systemically made jobless and criminalized—of the "underdeveloped"—all as the category of the economically damnés (Fanon 1963), rather than, as before, of the politically condemned.» (Wynter 2003, p.321)

In light of this, the narrative of technological innovation propelling technoliberal progress appears to reproduce this relation between devalued labour and technology as one based on differential otherness. Thus «technology is a racial category in that it reiterates use, value, and productivity as mechanisms of hierarchical differentiation and exploitation» (Atanasoski & Vora 2019, p.15). As previously noted, the conditions of vulnerability that, at the times of delocalisation, seemed reserved for the precarious reserve population, have become increasingly common in many western economies. As I argued in the third chapter, these conditions are now stabilised through platform mediation as fundamental characteristic of gig work. The stress I observed among delivery couriers in London towards the competition posed by "Brazilians" and other migrant workers is directly linked to the platform's progressive de-valuation of their labour, to the over-hiring practices that determine longer waiting times in between gigs, and the lowering of pay rates in relation to living costs. Lastly, with the rise of algorithmic creativity, the competition with enslaved automata that Weiner saw as a danger for the industrial factory worker, now threatens a growing share of knowledge and creative professionals.[75] As Chude-Sokei put it, «yesterday's monsters are today's subjects; today's machines are tomorrow's human beings» (Chude-Sokei 2015, p.222).

Devalued labour as otherness: technology and gender

If we understand technological systems as concretisations of social relations of power, technical affordances and cultural formations, we can see how the discursive association of

[75] However, as already noted, these newly automated tasks would not be performed by fully automated machines autonomous from human labour, but still heavily rely on vulnerable and invisibilised workers (Gray & Suri 2019). This will be further discussed shortly by presenting the concept of «surrogate labour» (Atanasoski & Vora 2019).

machines with devalued labour highlights not only the entanglement of automation and racialisation, but at the same time the historical relation between technology and gender.

Already at the technical scale of code and programming, Wendy Chun interestingly highlighted how contemporary computation reifies a gendered division of labour that characterised the history of computer labs. In fact, until after World War II, all computing operations now automated by programming languages, that essentially translate user commands to executable machine language, were carried out by human computers, usually young women with mathematical training, considered better fit for repetitious clerical tasks, while a usually male programmer directed their work. «Programming became programming and software became software when commands shifted from commanding a "girl" to commanding a machine» (Chun 2005, 33). Similarly, tracing the interweaving histories of gender and digital culture, Sadie Plant describes how «immersed in the low status microprocessors of textile production, secretarial work, and the production of miniature components» women functioned, at different scales and moments, as the inconspicuous and unrecognised infrastructure sustaining technological development (1997, p.76).

> *«When computers were vast systems of transistors and valves which needed to be coaxed into action, it was women who turned them on. […] when computers became the miniaturised circuits of silicon chips, it was women who assembled them […] When computers were virtually real machines, women wrote the software on which they ran. And when computer was a term applied to flesh and blood workers, the bodies which composed them were female» (Plant 1997, p.37).*

Interestingly, this proximity to computation highlights the instrumentalised condition of gendered labour as part of a discreet secretarial infrastructure, whereby human and nonhuman computers carry out the menial executional tasks sustaining the command of the male subject of technological power. «He organised, she operated. He ruled, she served. He made great discoveries, she busied herself in the footnotes. He wrote the books she copied them. […] She did the jobs he considered mundane, often the fiddling, detailed, repetitive operations with which he couldn't be bothered; the dirty, mindless semiautomatic tasks to which he thought himself superior» (Plant 1997, p.35-36).

The connection between gendered labour and the digital economy is foregrounded by Kylie Jarrett through the suggestive image of a «digital housewife», mobilised to interrogate the cognitive and affective character of digital labour through some of the frameworks identified for understanding domestic labour (2015). In light of such readings of historically

gendered work, we can understand how platform-mediated flows of command, value appropriation and technological invisibilisation, extend gendered dynamics to crowds of newly feminised workers — as characterised by Haraway; «work is being redefined as both literally female and feminized, whether performed by men or women. To be feminized means to be made extremely vulnerable; able to be disassembled, reassembled, exploited as a reserve labour force; seen less as workers than as servers» (Haraway 1991, p.166).

Statistics from the European Trade Union Institute on the composition of platform work show that women outnumber men in two categories: «remote clickwork» and «on location work» (Piasna et al. 2022). While the latter category includes jobs such as «cleaning», «beauty treatment» and «childmining» which are historically devalued and assigned to literally female workers, the former type of work has a less linear link to gender and feminisation. Although often presented as a form of IT work — almost an extension of the job of the canonically white and male programmer of software systems — platform mediated clickwork mostly comprises micro-tasks falling under the category of *data cleaning*, which entails labelling, annotating and validating data so that it can be correctly used for machine learning and algorithmic training purposes. The work of this distributed crowd of *cleaners* interestingly displays some of the key qualities of both domestic and secretarial work. In fact, the micro-tasks that workers access through platforms like Amazon Mechanical Turk or Clickworker require mostly detail-intensive and repetitive operations which are necessary for — in a certain sense — *raising* and *taking care* of artificial intelligence. This constitutes a complex of perceptive, cognitive and affective labour that is essential to the validity and precision of automated decision making, as well as to natural language learning processes (Giardina Papa 2020; Irani 2015; Tubaro et al. 2020). Although it is routinely and purposefully obfuscated, this is the devalued labour that enables the User of digital services, chatbots, virtual butlers and generative pre-trained models, to have smooth and pleasurable interactions with a domesticated, artificially intelligent *other* — an often female-coded assistant that is capable of interpreting their wants, processing nuance and formulating polite and sophisticated responses.

Looking on the other hand at location-based platform labour, such as that of delivery couriers, the presence of women within this workforce is much less significant, compared to the two categories just mentioned (International Labour Organization 2021; Kampouri 2022). However, I would argue that technological mediation organises the collective labour of couriers according to a similar pattern of serviceable infrastructure. As highlighted early in the chapter, an essential part of the job is mastering the art of patiently waiting for command, and

being kept out of sight while doing so. The platform not only extracts value from collective waiting time — by keeping its productive character unrecognised and thus unwaged — but specifically leverages both workers' collective availability in terms of time, and their pragmatic investment in developing individual strategies for maximising earnings. As I'll discuss in more detail later on, the subjective investment of workers in their individual enterprise is precisely what is instrumentalised by the service architecture of the platform. The collective and messy vitality of this crowd of precarious workers is obfuscated by the user interface, which maintains the appearance of a smooth enchanted machine set in motion only by autonomous User volition.

Personhood vs «affectability» / Autonomy vs instrumentality

At the end of 2022, an advertising campaign for Spanish delivery app Glovo is on heavy rotation on Italian television. The platform enables users to order products, mostly groceries but also meals from restaurants, that are picked up by couriers from the shop and delivered to their doorstep. In the ad, a young man gathered with his friends in the living room, takes out his phone, taps on the Glovo app and is instantly invested by «the power to order anything you want». By effect of this power, in an almost continuous motion with the slide of his finger on the screen, we see him magically levitating in mid air, as his friends look up in amazement. In the next scene, a young woman is in the kitchen, placing an order on Glovo for «some nice sushi to surprise him with a romantic dinner». In a sped-up sequence, she changes clothes and sets the table where her partner is indeed evidently surprised by the appearance of a candle-lit sushi dinner. The epic tone of the ad's soundtrack recalls that of a Marvel superhero movie, and the lightning summoned by the smartphone as the Glovo app starts up seems to hint at Thor's hammer or some other superhuman device. It is a clear, tongue-in-cheek play on «*the power* to order anything you want» — as the final claim of the ad announces «you order, we are going»[76].

If the image of a flexible and empowered workforce was an important trope in the early years of the gig economy, it is the *user* that has emerged as the truly aspirational figure at the heart of the technological imaginary of platformed services. The user is the master whose command sets in motion a whole choreography of enchanted objects, an algorithmically intelligent technological infrastructure aimed at satisfying their desire with magical efficiency. The user experience provides them with the pleasures of remote control and complete

[76] https://www.youtube.com/watch?v=rskajnTmoLs (SpotMania 2022) quotes translated by the author

visibility at the swipe of a finger. In order to do this, the user interface creates a layer of abstraction producing a sense of un-mediated connectivity between the user and the world. This interface channels the desire of the user via pre-configured commands and specific grammars of action, designed to produce a sense of direct control that Wendy Chun describes as «causal pleasure» (2016). Commenting on how graphical user interfaces «enhance the power of the user» by producing a sense of interactivity, Chun draws from the work of Brenda Laurel on «direct manipulation» to explain that

> *«people realize when they double click on a folder that it is not really a folder, and making a folder more "life-like" is not helpful. What is helpful […] is clear causality: events must happen in such a way that the user can accept them as probable and thus narrow probability into certainty. Causality […] ensures universality, ensures that the users will willingly suspend their disbelief. For users […] everything has meaning: there can be no coincidences, only causal pleasure.» (Chun 2016, p.40-41)*

Although platform users do realise at a purely rational level that the platform is not an enchanted object, their interaction with the app's interface still creates a layer of opacity that obfuscates the actual labour involved, producing a sense of direct manipulation and causal pleasure. Through visual cues, touch screens, haptic communication, increasingly natural language, and an overall sense of live response, user command is framed as the autonomous volitional force setting the platform in motion. By this simulation of a causal effect, the user interface stands in for entire layers of human and non-human labour, dissimulated by infrastructural opacity, yet tirelessly at work to sustain the enchanted character of the whole assemblage. The only sign of this labour appears on the "order status" feature of the app, which monitors the courier and shows the customer their position on the map in real time, providing a reassuring sense of complete visibility from above. The interface reassures the user-master that service *is* being executed, and allows them to monitor it while remaining unseen.

In this configuration of command and execution, mastery and instrumentality, and in their paradoxical co-presence and reciprocal invisibility, we can hear the echo once again of the historical protocol of racialisation. This protocol is understood as a set of techniques producing, at once, subalternity and full agency. As characterised by Denise Ferreira Da Silva, modern racialisation constructs «Man the subject, the ontological figure consolidated in post-Enlightenment European thought» as opposed to «affectable things» whose position is intertwined with «the scientific construction of non-European minds» (Ferreira da Silva 2007,

p.xv-xvi). As opposed to affectable others that are always susceptible to «outer determination», the universal subject deciphers the world with «abstract (formal) tools» and in this process «it is not *determined by* nor does it *determine* what it seeks to know» (Ferreira Da Silva 2007, p.47). The effect of modern racialisation then is that of externalising affectability and projecting it onto non-European others, thereby in contrast designating the idealised subject as self-determined and universal. The protocol described by Ferreira da Silva highlights how this historically constructed dualism, between autonomy and «affectability», between self-determination and «outer determination», is fundamental to the logic that allocates agential capacity as the qualifying trait of human personhood. The importance of this tension is evident in how Chude-Sokei thinks about the relation between slave labour and white technology, drawing from the work of Sylvia Wynter and Aimé Césaire on plantations. To them, after the denaturing and erasure of enslavement, black subjectivity is remade in the social machine of the plantation, through the colonial process of «thingification», as an element of production. Here, the labour of black bodies — assumed as essentially alter to reason — functions as prosthetics for white rational intelligence. This for Chude-Sokei constructs a certain modern idea of technological whiteness whereby the "thing-ified" body occupies a hybrid position between human and machine (Chude-Sokei 2015, p.38-42).

To be clear, I am not hinting at any comparison between the conditions of platform labour and slavery. As previously argued, the characterisation of technological mediation as a de-humanising process is precisely something this project aims to problematise and move past. What I am arguing instead is that a certain racialising and gendering schema, through its association with devalued labour, has historically functioned as an aspect of technological development, and thus still subtends the contemporary platform mediation of vulnerable labour. Because of this historical racialisation of technology as an embodiment of devalued labour, the technological surrogate reproduces, in the figure of its User, the self-determinate autonomy of the modern liberal human. The User proper is the expression of full personhood and self-possession, qualified by a «humanistic training in consumerism» (Spivak 2015, p.67). The repressed counterpart of this position, the negative of user autonomy, is the affectable and instrumentalised "used" — which enfolds a devalued cyborg labour power composed of differentially racialised, feminized and "thing-ified" others.

The critical perspectives developed by studies of gender, race and post-humanities are particularly helpful to understand this condition. For instance, the framework of «critical posthumanism» proposed by Rosi Braidotti describes how «the binary logic of identity and otherness as respectively the motor for and the cultural logic of universal Humanism»

produces «universal rationality» on one hand and «disposable bodies» on the other (2013, p.15). «The human of Humanism is neither an ideal nor an objective statistical average or middle ground», but rather «the human norm […] functions by transposing a specific mode of being human into a generalized standard, which acquires transcendent values as *the* human […] posited as categorically and qualitatively distinct from the sexualized, racialized, naturalized others and also in opposition to the technological artefact». This cultural logic produces the human norm as a relation «by which all others can be assessed, regulated and allotted to a designated social location» (Braidotti, 2013, p.26). If the work of Atanasoski and Vora, Chude-Sokei, Wynter and Braidotti shows how the human category functions to hierarchise difference according to historical dynamics of race, gender and class, then we can think of how the contemporary user experience of platform services updates this mechanism by concretising it in a technological architecture, where the seemingly enchanted execution of service depends on the instrumentalisation and invisibilisation of historically devalued labour. This labour is now mediated and opaquely mobilised by platform interfaces, at the touch of a screen.

The User and the Worker

As already mentioned, it is interesting to consider how platform workers occupy both a User and used position. If on the one hand their labour is made vulnerable, instrumentalised, partially unrecognised and thus subject to appropriation by the platform, on the other they also access platform services from a position of mastery, at least in a certain sense. As observed in my research, workers can still combine the use of multiple platforms according to their needs and wants, for instance looking to generate additional earnings-streams, or using navigation and artificially intelligent features of their devices to facilitate parts of their tasks. While couriers use certain platforms directly for earning, they are also positioned as users of various other services that are instrumental and accessory to their gig work, like messaging services through which they chat with other couriers, or electric bike rentals. Because of this, workers also tend to express the frustrations and demands of technology users in their relationship with platform services — for instance regarding the integration of different apps, platforms and devices. This is exemplified by a conversation between three Discord users, about the possible solutions for carrying out work tasks without having to take out their phone — which is often complicated by the use of gloves and phone holders, and makes certain transitions between tasks very unpractical. As one worker laments how they would want apps «to add proper support for smart watches, then you wouldn't have to whip out your phone

when the restaurant wants you to start the order», another one says «there's probably some third party thing to do that but it'd be either zoomed in or just really tiny, would still be very convenient» to which they reply «I already use my smart watch to show the order number sometimes because it's in the notification but that's all you can really do» while a third one adds «my ebike display has the ability to show turn by turn nav, though gotta connect though an app and that just bs to deal with».

This relation, between being a worker and being a user, is an interesting one to question. Because it is by being platform users that people get access to a digital labour marketplace, the position of the User, as the humanist subject of technology, is conflated with that of the Worker, the assumed universal subject of labour. Specifically, by the neoliberal logic concretised in platform economies, labour is not understood *as such*, but rather as «capital-ability»; the capacity of *homo economicus* to generate an «income-wage» as an «entrepreneur of himself» (Foucault 2008). But even before being refigured as an enterprise, the worker is already a historical construction. In fact, post-colonial readings of capitalist accumulation develop a critique of the universalised figure of the "worker" as historically determined, and specifically linked to an idea of abstract value as something that simply comes from labour (Spivak 2015). In reality, within what Cedric Robinson named racial capitalism, the value relation is grounded in the concrete violence of dispossession (Robinson 2000).[77] Here, dispossession isn't relegated to occasional imperialist expansion and doesn't just have to do with primitive accumulation — a phase of dispossession by which modes of production and reproduction not premised on market relations and private property are suppressed, which precedes and establishes the «silent compulsion of economic relations» as the dominant paradigm for a population (Marx 1976, p.899). In fact, different modes of dispossession constitute a dynamic that does not *precede,* but is rather ongoing and fundamental to the value abstraction and therefore to capitalist economic relations. At least since the modern age, the distinction between the subjection of workers and that of the enslaved is marked by a condition of voluntary agreement. While subjection for the enslaved is forced and limitless, for the worker it is consensual, temporally restricted and legally based on a mutually binding contract (Casilli 2020; Krajewski 2018). However, albeit free from direct coercion, voluntary subjection is still premised on differential dynamics of dispossession, which subtend the «silent compulsion» of value relations by keeping the material conditions of social reproduction premised on market dependence (Marx 1976; Mau 2023). In other words, capitalist value production does not simply come from voluntary relations, but it requires

[77] Capitalism cannot function as a «self-equilibrating and self-sustaining system», but only appear *as if* it was such a system (Marx 1976, p.874).

people to be left without any means to meet their needs besides voluntarily entering the labour market, configuring a condition of "soft" coercion similar to what Gary Marx called «mandatory volunteerism» (2006). The work of authors like Ruha Benjamin or Seb Franklin, on the recurring dynamics of race within contemporary technological systems, suggests that a racial schema of dispossession still haunts the labour relations of technologically advanced global capitalism (Benjamin 2019; Franklin 2021).

Interestingly, an important feature of technoliberal systems is what Franklin, drawing from Gayatri Spivak, defines as «differential computation»: the shifting character of the boundary between what is computed in the value relation and what isn't, which appears as a racialised and gendered dynamic (2021). Platform infrastructures enable the increasingly granular mobilisation of the productive capacities of precarious and devalued labour, according to the software logic of on-demand services. By this effect, differential computation promises to extend the autonomy of both the liberal user and the fully human worker to a relative surplus population, that is differently subject to the threat of economic dispossession, by virtue of their integration in platform-mediated value relations. As shown by studies of gig work in the global south, over the last decade — through the global expansion of the Silicon Valley model of platform economies — the comfort and consumption habits historically associated with the white western working and middle class have been promised to new populations of potential platform workers and platform users (Qadri 2021; Qadri & Raval 2021). This suggests that the category of *homo economicus,* re-programmed in the user-entrepreneur of platform labour, is not delimited by fixed boundaries, but always shifting to differentially include or exclude those who had to struggle for the "human" designation, and whose devalued work historically sustained the idea of the liberal worker-enterprise as a free and autonomous embodiment of human capital. This differential dynamic is re-articulated and extended by platform mediation, as the User constitutes an updated position for a technoliberal *homo economicus*, the universal subject of both technology and labour.

Surrogate instruments and User support

This convergence between the universal Worker and the User becomes evident precisely in their relation to technological systems. Because, as we've seen, technology is understood historically both as a metaphor and an embodiment of devalued labour, a key feature of contemporary technological culture is that of the «surrogate effect» mobilised by Atanasoski and Vora, who argue that «within technoliberal modernity, there is a desire to attribute magic

to techno-objects» whereby «labor becomes something that is intentionally obfuscated so as to create the effect of machine autonomy» (2019, p.6). However, they also note how this desire for technological "smartness" «reaffirms post-Enlightenment conceptions of human autonomy, and therefore freedom, as separate from 'things' that are intended for pure use.» (Atanasoski & Vora 2019, p.21). Their concept of a «surrogate humanity» precisely foregrounds how this production of the autonomous human, liberated from undesirable labour and master of his own time, is an effect of a surrogate relation to devalued labour, which is seemingly performed by enchanted technological infrastructures, but actually materially taken on by «servants, slaves, wives, and, later, industrial service workers who perform this racialized and gendered labor» (Atanasoski & Vora 2019, p.19). This is important to the study of platform labour because it establishes a discursive lineage for the surrogate effect: from the dispossession of native bodies instrumental to the production of the fully human, and the fungibility of the slave body standing in for the power of the master, to the disavowal of gendered and racialised labour that supports outsourcing, crowdsourcing and sharing economy platforms. By presenting their user with such seemingly enchanted efficiency, contemporary technological services extend the history of racialised and gendered service labour, and update the mechanisms by which this devalued labour needs to remain unseen in order for the liberal subject to truly appear autonomous and free. «Consumers therefore consume the assurance of their own humanity along with the services provided» (Atanasoski & Vora 2019, p.25). Today, «technoliberal desire extends these structures into the sphere of a growing technical infrastructure of robotics, algorithms, platforms, and interfaces» (Atanasoski & Vora 2019, p.22).

I argue that platform mediation specifically re-articulates the differential dynamics of surrogation and instrumentalisation through the production of newly idealised forms, like the user, the independent worker-enterprise, the community and the enchanted yet servile infrastructure. Within this context — just like the abstract category of the human was historically produced in relation to surrogate labour — the autonomy of the technoliberal User is supported by the obfuscated labour of a "used" working class cyborg, composed of location-tethered service workers, delocalised crowds of click labour, natural resources, and their collective connection as a socio-technical system. Platform mediation re-configures historically devalued service and secretarial work through infrastructures that borrow their logic from networked digital services. The promise of platform labour is to substitute the stable subjection of employment with the human-as-a-service model, by which individuals-enterprises can freely valorise their human capital through virtual marketplaces. However, platform economies once again seem to re-program the dynamics of gendered domesticity and

colonial servitude into a technologically updated infrastructure that mediates voluntary work. Together with these constructions, what is recursively called into action is the servo-instrumental model subtending the relation between labour and technology. Here, workers are produced as mere users of instruments and in the process themselves instrumentalised, while technologies are functionalised as mere inter-mediators between actors — and thus alienated from what SImondon would call their true mode of being, in reticular collectivity (2017).

Technologies presented as enchanted and super-powerful are simultaneously framed as chastened and servile, at once black-boxing the labour that sustains them, and reproducing the historical master-slave dynamic opposing the autonomous human to machines and not-quite-human others, disregarded beyond their capacity to take on undesired labour. Patricia Clough's discussion of affective economies and disposable bodies shows how «some bodies or bodily capacities are derogated, making their affectivity super-exploitable or exhaustible unto death, while other bodies or body capacities collect the value produced through this derogation and exploitation» (Clough 2007, p.25-26). Through this framework, we can read the social, calculative and strategic capacities of delivery couriers as functionalised to the capacity of platform services to satisfy user desire. Similarly, the affective and perceptive faculties of micro-workers are instrumentalised to sustain the enhancement of artificial intelligence. This resonates with the work of Kalindi Vora on outsourced labour as a form of «life support» that is globally channeled from certain segments of population to others (2015). Through a feminist perspective, Vora studies how various forms of outsourcing — from domestic labour and gestational surrogacy to call centres and customer care, up to knowledge work and software programming — function by depleting some forms of life for the enrichment of others. Thus the infrastructures through which this relation is enacted function as a «channel for the investment of one's own vital energy into others» (Vora 2015).

Platform mediated service infrastructures

At this point, it's interesting to consider how platform mediation re-makes service work according to the logic of information communication networks, and how this digital infrastructure, as an interface between service and customers, reproduces historical dynamics of command and execution.

In his media archaeology of modern service society, Markus Krajewski locates that of «the server» as a metaphor and a conceptual figure through which he tries to understand our current use of information communication devices in relation to histories of «subaltern

serviceability» (2018). Although Krajewski's work seems to overlook some of the implications of racialisation in his historical account, I think that following this chapter's thematisation of the racial schemas subtending technoliberal progress, some insights from his research could be useful to my discussion of platform mediated service work. Among the service infrastructures surveyed in his work, Krajewski mentions the design of Monticello, Thomas Jefferson's villa in Virginia, designed by the US president himself thanks to his training as an architect. The structure was part of a five-thousand-acre slave plantation, housing up to four hundred enslaved people at a time, and was not only built by employing forced labour, but also designed specifically to hide workers and servants from the view of the master and his guests. House slaves lived in windowless bunkers situated along the sides of the main building, which they accessed through a system of hidden corridors. The entire infrastructure of service within the villa was designed to enable the work to be carried out almost without any visible attendance of servants. The dining hall featured a range of contraptions and devices — including revolving serving doors, mechanical shelves, «dumbwaiters», lifts and elevators — which connected it to the kitchens and cellars, enabling the delivery of courses and drinks, as well as the removal of dishes, without the need for subalterns to physically enter the room. The purpose was to preserve the comfort of service for dining guests, while preventing eavesdropping and interruptions to the flow of conversation (Hidden Architecture 2021; Krajewski 2018). As the network of service labour is concealed from the masters by a technical infrastructure, servants and domestics are not actually replaced by machines and do not vanish from «table society», but «they are only banned from *the consciousness of the members* of that society». As technical mechanisms stand in for the labour of servants «(table) society is gradually transformed into a sociotechnically mediated community» (Krajewski 2018, p.258-259). Krajewski argues that during the nineteenth century service is progressively transferred to technical media, so that private in-person conversation turns into an impersonal understanding of command, re-making service into a media-technical process. This sublimated form of invisible labour realises a fundamental requisite of modern subalternity; the paradox of attending to command while appearing as physically absent.

In Krajewski's work, this condition of modern serviceability is then retrieved by contemporary software agents, which enable user interaction with digital machines, remaining

constantly at work while concealed from our eyes.[78] Within a typical client-server system, a software agent called "client" operates by presenting a graphical user interface to the customer, which enables them to formulate queries according to a predefined grammar, which the client then transmits as commands to another software agent, the "server" (Krajewski 2018). Key to the architecture of electronic communication services is the idea that «an ideal Server hides the entire composite Client-Server system from the Client and the user» (Sinha 1992). The client-server architecture is fundamental to the entire digital service economy, as well as to the contemporary embodiment of service work in computational machines — which become helpful *others*. Specifically, today's platform society produces a socio-technically mediated community of users through its app interfaces. However, in the context of platform labour, technical architectures don't just mediate the work of software. Not unlike the seemingly automated meals at Monticello, technical infrastructures mediate between the universal autonomy of users and the assemblages of human and technical labour by which service is executed. Interestingly, the user experience of the app reproduces some key qualities of modern serviceability, like discreteness and patience, in its mediating mechanisms between requesters and providers. For instance, through functions like "leave at the door", or by the confirmation codes that couriers need to get from customers in order to validate their delivery as completed, the mutual recognition of service is almost completely removed from face-to-face interaction and mediated by the app. Even the tipping process is integrated by the platform as a step of the ordering procedure, in a way that further minimises the in-person acknowledgement of service. In some way, such features seem to produce a key form of pleasure and comfort that platform services promise to the User. This consists in the completely impersonal, detached and unobtrusive character of service interaction, which appears as a key accomplishment of modern technical mediation, from dinners at Monticello all the way to platform delivery services.

---

[78] As already discussed in the previous chapter, the shift from mainframe computation to personal computers was marked among other things by the development of *interrupt* and real-time computing, which enabled reactive communication between computers and users with no programming skills (Yuill 2008). Key to the development of the personal computer as an interactive communication device was the work of Joseph Carl Robnett Licklider throughout the 1960s on «man–computer symbiosis», which depends on the ability of the user to express commands using some form of direct communication or natural language instead of machine code (Waldrop 2002). These shifts opened to the development of a machine sensorium that the mechanical calculators of the early industrial age lacked, and that became a distinctive feature of contemporary user interfaces and interactive media technologies. The contemporary paradigm of networked computers, fundamental to the diffusion of personal digital services in the 1990s, was finally enabled by development of client-servers architectures at PARC throughout the 80s (Krajewski 2018).

Furthermore, examining the service architecture configured by delivery platforms, it is important to note how — while the work of software *does* embody the paradox of invisible presence highlighted by Krajewski — the software architecture of digital platforms also crucially operates a human surrogate effect in retrieving service labour. We can look back at the architecture of Uber's platform coordination software, illustrated by the patent discussed in the previous chapter. Here, the «client devices», executing either requester or provider applications, turn their graphical interfaces towards their users, granting them a position of agency while a set of client protocols acts as their software counterpart. Thus, the client operates as an interface between user input and server processes. These processes are carried out by the service coordination, predictive and database components of the networked system, which receive user command, as translated from client applications, and execute it. Importantly, this architecture operates to satisfy the customer-requester side, which implies managing and coordinating the work of providers (Hu et al 2022; Waliany et al 2019). As extensively discussed in the previous chapter, the activity and even the mere presence of providers is fundamental to the functioning of the platform's "server" operations, albeit unrecognised as such. Reading this dynamic through the idea of a surrogate effect, it appears clear how the coordination system operates as a surrogate for the collective labour of providers — not to mention the labour of click-workers sustaining its machine learning engines. It is precisely by this effect that platform services appear *as if* they were coordinated by some abstract autonomous managerial intelligence, while in reality obfuscating the fundamental role of unremunerated collective activity and waiting time to the coordination of these systems.

Pragmatics of the "used": self-reflection, opportunism and appropriations of platform logic

One of the aims of this chapter was to individuate the "used" condition as a key trait of platform labour. While this is true for the specific case of delivery couriers, it also highlights connections between various forms of platform mediated labour; starting from micro-work and remote cloud-based work, up to other types of labour within the context of the attention economy, like that of content creators of various kinds. The characterisation of this condition as *used* foregrounds how it sustains the position of the User, critically understood as the

idealised universal subject of media technologies, but also — and increasingly through platform mediation — overlapping with the Worker as the historical subject of labour. As more and more forms of work come to depend on the use of digital platform services, while digital media increasingly become a key way for a precarious global workforce to access flexible earnings, platform labour appears to embody these seemingly contradictory conditions; the empowered autonomous User-Worker, and the used body[79] sustaining them. Digital platforms put their users in a position of power, of access to opportunities, to marketplaces on which they can freely valorise their assets. At the same time, they enslave them to mechanisms of dividual valorisation, and appropriate surplus value from unrecognised collective labour in various forms. The algorithmic intelligence of platform services learns our patterns and tailors the user experience to our most intimate desires — impossible even for the most attentive butler — while setting up a behavioural conditioning system by which our very desire becomes integrated within the platform assemblage to function in a machinic fashion. With various degrees of intensity and in differentiated forms, the double nature of this condition seems to be at play in most of our relations with digital platforms, from those we access as social media users to those we access as formal workers. The "used" condition connects various forms of platform labour, all characterised by an instrumentalisation of affects and capacities, desire and propensities, self-entrepreneurialism and self-exploitation. I argue that this condition is an effect of platform mediation, as a process that concretises pre-existing social dynamics, grounds certain economic and business practices, and activates specific material capacities of technical objects, thus producing a certain socio-technical system, which is that of the platform as a labour infrastructure. Here, platform mediated labour is made vulnerable, configured as an on-demand resource, technically re-composed according to software logic, but also — by this logic — only partially recognised. Its collective and post-anthropocentric dimension is dissimulated, and therefore subject to appropriation and intensified exploitation.

However, reading the "used" condition as one completely emptied of individual agency and political autonomy would be not only simplistic, but also rehashing a trope widely critiqued by many of the works mobilised in this chapter; that by which a certain proximity to the instrument would necessarily equal to a de-humanisation and debasement of labour. Instead, a critical understanding of this condition — of being affected by conditions of outer determination — might present an opportunity to question some of the humanist traits that are often still associated to labour and the Worker, and therefore to think about contemporary

[79] Here I refer to the "used" as a *body* in relation to the embodiment and embodied assemblages thematised in the previous chapter's discussion of the unrecognised ambient labour of "dead time".

modes of class composition for the “used” condition of labour. To explore this opportunity, we can consider how a certain feminisation of labour, and the proximity of workers to instrumental extensions of the platform, may not necessarily entail the ultimate capitulation of labour’s political agency, but perhaps a de-centring of labour from the humanist paradigm of the Worker, configuring a different agential model, which I will discuss through the proposal of “platform pragmatics" as a self-reflexive sensibility through which the “used” experience the logic of platform control.

Platform feminisation

We’ve seen how the “jobholding Breadwinner” of the industrial age has long been turned into an economically “damned” post-Fordist worker, a historical dynamic which platform mediation only comes to re-format and intensify. The vulnerability of this condition is in line with a historical feminisation of labour — as a dynamic that signifies and subtends the exploitation, instrumentalisation and un-recognition of labour, as shown by Haraway (1991), Plant (1997), Chun (2005) and Jarrett (2015; 2022). Thus this tendency, which is also encoded within platform mediation, might be understood through a critical and unorthodox account of such feminised conditions.

We can start from Tiqqun’s famous theorisation of the «Young-Girl» as a technique of the self, as a paradigmatic condition of labour subjectivity in the early 21st century: «society’s final moment of socialization, Empire, is […] the moment when each person is called upon to relate to themselves as value, that is, according to the central mediation of a series of controlled abstractions. The Young-Girl would thus be the being that no longer has any intimacy with herself except as value, and whose every activity, in every detail, is directed to self-valorization» (Tiqqun 2012, p.18). As valorisation finally comes to completely coincide with the social «the Young-Girl appears as the culminating point of this anthropomorphosis of Capital» (Tiqqun 2012, p.18). Tiqqun are careful to clarify that the figure of the Young-Girl is not a gendered concept, inasmuch as «more and more frequently, she is not even female». In fact, this condition can also apply to men, but only as long as they are completely emptied of agency and reduced to a mere vessel for valorisation. At that point, in Tiqqun’s framework, one can no longer qualify as a Worker, as they become consumer society's total product: the Young-Girl (2012). Here, proximity to femaleness — just like proximity to technology in other accounts previously reviewed — represents the ultimate capitulation to value abstraction. The autonomy and capacity to struggle of the male industrial Worker is

completely debased, and the self is reduced to a mere vessel of capital. Tiqqun's reflection on the conditions of living labour in the late post-Fordist era, translated in English and popularised over a decade after its original French release, clearly resonates with current-day anxieties towards digital culture in the platform society. These anxieties have to do with the condition of constant exposure, outer affectability and necessity of performance, to which living labour is subjected by way of ubiquitous technological mediation within everyday life. Kylie Jarrett identifies a certain condition of «self-reflection» — the hyper-awareness of being watched, by which one learns to self-observe from the outside — at the heart of post-Fordist labour, and crucially notes how the embodied performance of a desirable identity and of constant availability is a historically gendered cultural behaviour (Jarrett 2022). This self-reflexive performance appears as even more fundamental within platform economies, where users-workers are constantly exposed to their own valuation and sorting through the algorithmic gaze of digital metrics. Jarrett also notes how the Young-Girl has been mobilised by feminist cultural studies beyond the dismissive tone of Tiqqun's initial formulation, to elaborate how this vulnerable condition actually articulates forms of subaltern agency and is not trapped in an inescapable logic of commodification. In fact, it is precisely «the contradictions that the "Young Girl" exists within – both object and subject; both active and passive; both observed and watchful» that «offer a way of understanding the absorption of life into labor» (Jarrett 2022).

We could say that this feminised dynamic of constant self-reflection operates immanently to the concrete structures of platform mediation, and that its duplicity — activity/passitvity, observed/watchful — is reproduced in the User/used dynamic. In fact, most work in the platform economy is about being subjected to such forced self-reflection and precisely in this contradictory way: competing for visibility while at the same time trying to maintain some tactical privacy. Taina Bucher argued, in her brilliant reading of Facebook's EdgeRank algorithm as a reversal of Foucault's framework of panoptic surveillance, that the algorithmic architecture of digital platforms establishes *not* a mechanism of permanent visibility, but rather a «threat of *invisibility*» as constitutive of participatory subjectivities (Bucher 2012). The sorting and ranking mechanisms of algorithmic systems are a key element of all platform mediated work, and awareness of these dynamics is completely naturalised within everyday working practices, at least as vernacular knowledge. Workers quickly learn that their behaviour is monitored and evaluated, feeding into the sorting of their performance within platform rankings. This is true for delivery couriers deciding whether or not to reject an order at a given time, and equally to Instagram users deciding to post certain types of content — for instance their face — in order to be rewarded with algorithmic visibility. Such behavioural

reward mechanisms are easily rationalised by each individual's pragmatic calculations, while also organically internalised and absorbed under the skin of platform labour. At the same time, it is often in the worker's interest to maintain some degree of privacy and tactical invisibility form the managerial gaze of the platform, for instance not being caught multi-apping, or worse riding on a rented account. Being made visible by algorithmic architectures grants increased access to opportunities, potential earnings, pleasure. Tactical privacy enables to retain some resemblance of autonomy and possibility for indiscipline. It is in this double dynamic that platform mediation enforces self-reflection on labour as a feminised cultural behaviour.

While Tiqqun's theory of the Young-Girl makes an explicit connection to feminisation, many other accounts of cybernetic power or modulative control express a certain fear of a complete loss of individual agency and therefore political autonomy[80] — which is figured as autonomy from capitalist valorisation, from machines, from girlhood. However, as argued in the previous chapter, determination is never fixed within this context. From the technical scale of signal and transmission media, to the social forms of living labour mediated by platform technology, indeterminacy and transindividual connection operate at the core of platform systems. Perhaps the point of a critique of platform mediated labour is not wether agency or the capacity for class antagonism is irreversibly compromised. A critical insight from the study of this field might be that the modes of subjectivation of platform labour appear emptied of some of the traditionally humanist traits associated with the worker. Humanist self-possession is sacrificed for the affectability of a feminised and instrumentalised condition. Loosely paraphrasing Chude-Sokei, yesterday's machines are always becoming today's subjects. The interesting question at this point would be whether this process might free up space for different socio-technical arrangements and class re-compositions.

In her recent and provocative work on femaleness, Andrea Long Chu defines «as female any psychic operation in which the self is sacrificed to make room for the desires of another» which is what makes feminisation diminishing to the self-possessed male (Chu 2019). Feminist readings of technology such as those of Plant, Haraway or Chun reveal how a certain affinity between feminisation and technology is established, among other things, through the de-valuation and instrumentalisation of their labour in relation to a male human subject. However it is precisely by this connection that this feminist technological affinity ends up troubling both the model of subjugation between the instrument and the master, and the

[80] Tiqqun's famous cybernetic hypothesis or some of Bernard Stiegler's work on social network technologies (Stiegler 2013; Tiqqun 2020) — to mention two cases within cultural theory, but popular culture and public discourse are also ripe with examples.

structures of individualised subject identities. I find this particularly relevant to a critique of labour and instrumentalisation. If the autonomy of the individual subject is foreclosed, we can understand the "used" condition of platform-mediated labour as a mode of subjectivation that further de-centres labour from the paradigm of the humanist male industrial worker, positioning it in proximity with instruments, feminised others and nature. If Haraway's skepticism showed that the humanist notion of work forecloses these cyborg affinities, and we can see, through critiques of race and technology, that the User position reproduces a hierarchical notion of personhood, then maybe the "used" condition becomes the key site of labour subjectivation and class composition.

Platform Pragmatics

In order to understand the "used" modes of subjectivation of platform labour, it is useful to start from Veronica Gago's account of what she refers to as «neoliberalism from below» (2017). The work of Gago draws directly from Foucault's understanding of neoliberalism as a form of rationality, that functions not as a transcendental external structure acting *on* the social, but immanently to the social assemblage, as a mode of subjectivation (Deleuze 1988; Foucault 2008; Gago 2017). Starting from the observation of *La Salada*, a massive informal market in Buenos Aires, Gago analyses how neoliberalism in Latin America is articulated not just by the forces of corporations, governments and international finance, but at the same time by the economic practices of vendors, workers, migrants and marginalised people. She explains how what enabled neoliberalism to persist beyond its crisis of political legitimacy, was its integration into popular pragmatics. This situates neoliberal subjectivation in the conjuncture between an exploitative rationality «from above» and a popular rationality «from below», where conformity and disobedience, assimilation and resistance, co-exist. In this process, neoliberal rationality does not determine nor dominate, but is rather appropriated and distorted by those who are assumed to be simply victims to it. By this conjunctural mode of subjectivation, neoliberal rationality becomes immanent to what Gago calls «vitalist pragmatics»; a set of practices and ways of reasoning by which the working class adapts to live with the neoliberal logic. Very significantly Gago shows how this pragmatics emerges from vulnerable and feminised labour, as a reaction to the disintegration of the male paternal figure of the salaried worker. The productive capacity of neoliberal «baroque economies» lies precisely in this «popular pragmatics» (Gago 2017). This framework goes beyond the understanding of neoliberalism as the triumph of *homo economicus* by directly questioning its hegemony, and revealing the productive forces of the social as fundamentally transindividual

in their hybridisation of auto-valorisation and self-exploitation, which exceeds the neoliberal schema of individuals-enterprises. While popular pragmatics do not reveal some innate tendency towards the autonomy of social cooperation, and in some way seem to strengthen a model of utilitarian individualism, they also deviate neoliberal rationality towards a «non-instrumental rationality». To Gago, vitalist pragmatics draw from informality not so much in its link to illegality as opposed to the law, but in the sense of *seeking new forms*, highlighting its generative potential, which is surely subsumed as productive force by neoliberal accumulation, but also persists as a force of indeterminacy and negotiation (Gago 2017).

Gago's analysis is situated in the observation of the context of Latin America, characterised by a whole set of specificities, especially regarding the practices of migrants and sweatshop workers in semi-illegal textile production. At the same time, some of the interpretative categories of her work, specifically her nuanced theory of neoliberal subjectivation and the framework of vitalist pragmatics seem particularly useful for the study of the platform economy, even in the context of global-north metropolitan environments. As platform infrastructures integrate themselves and cut into the "baroque" articulation of flexible contemporary economies, they come to mediate precisely collective pragmatics "from below" as a transindividual productive force. As illustrated at various points of this research, calculation and business modelling are not only enacted from above by corporate platforms, but become the everyday essence of labour. These calculative pragmatics constitute the framework for subjectivation within platform labour. This mode of subjectivation becomes the engine of an economy that crucially combines individual self-investment and transindividual activity into a platform-mediated mass self-entrepreneurship.

Let's think once again about the waiting time that delivery couriers have to sustain. As we've seen, while this "dead" time is unpaid, it constitutes a source of value for the platform, as calculations are being made about providers' activity and about their presence in space and time. But while calculations are being made *about* them, workers are making their *own* calculations, and modelling their own business strategies. If appropriately mastered, the practice of multi-apping can turn out particularly fruitful during dead times, as a Discord user explains: «being told there's going to be a long wait is a multiapper's dream if they're smart. Stacking pickups close to each other is undetectable cuz it could be long wait likely. I either take a break close to restaurant or I try to stack another job with a [pick up] closeby or a short drop, never had a problem». Another worker also specifically identifies multi-apping as fundamental to reducing the sunken costs of waiting: «Multi-app is a nice way to cut out the wait time between jobs which is the biggest earnings loser in this work. And if you are good

you can sometimes stack the orders and do a couple at once to really push the earnings up». But multi-apping is just a basic tactic couriers have to get familiar with in order to make their time productive *for them*. As workers realise boosts and multipliers serve as mere control mechanisms and don't guarantee any reliable earnings, they have to assess their own willingness to face adverse conditions and devise their earning strategies accordingly. For instance, bad weather conditions are understandably a disincentive to work, but many clearly also see it as an opportunity, earnings-wise. As advised by a frequent contributor to the Discord server «you gotta learn to like rain cuz that's when it's easy money», or as explained more clearly by another in a discussion on incentives and boosts «Coming out when it's raining is also a very good strategy […] it's almost guaranteed to have a £1 or £1.50 surge per order and you can make £18/hour if you put the work in». Rain can also specifically serve as a motivator to stay out at work longer and put in extra effort, as attested by various real-time reactions in the chat: «sweet rain has hit central so I'm hoping it'll stay busy for a couple more hours»; «I love rain, only time that I can do orders without waiting inbetween». Many understand that gearing up to work under unfavourable conditions can be an effective way of exploiting rare occasions of labour supply scarcity in the marketplace. Reacting to a particularly frustrating shift, a worker looks forward to making the most of their winter equipment and reaping the benefits: «£37 in 3h…1.5x my ass! SO many riders were out no orders were coming. Was about 10 riders waiting for orders outside the food court […] I can't wait for it to be snow and ice. I still have my studded tires from a year or two ago. I'll be massing that money in my ski clothes idgaf. Also yes studded tires are illegal afaik, but run 50psi in winter clothes they work fine». The diverse willingness of various workers to sustain certain conditions or accept a certain pay — their individual pragmatics and calculations — are integrated by the platform management system as a key productive force. If, as argued by many in workers' conversations, migrant workers are willing to accept lower pay rates that others would decline, that is precisely why their work is valuable to the platform. So much so, that when this segment of the workforce becomes less available, the pricing system of the platform is forced to incentivise labour supply, and its mechanisms are thus temporarily tilted towards workers. As someone reports to the chat, when home office controls were out checking for undocumented workers, there was a shortage of riders in their area, and thus the platform system had to issue a boost to motivate more people to get online and on the streets: «Got a notification from [the platform] that they put on a 1.2 panic boost today which is very strange for a Monday especially when it's not raining. Checked local rider WhatsApp groups to see what's going on, turned out police and home office were out today spot checking riders so naturally a lot of riders went home or didn't bother coming out».

Studying platform pragmatics as a mode of subjectivation, we can understand the platform economy not as a homogenous or totalising power apparatus operating "from above", but rather as a conjunctural space, equally articulated through pragmatics from below, and therefore grounded in the plurality and indeterminacy of everyday practices. Similarly to what the previous chapter observed at the micro-scale of signal and transmission, this indeterminacy does not weaken the platform's algorithmic and modulative governance, but is rather essential to its productive force. Significantly, it shows how the political question of platform control over labour does not need be reduced to a dispute between obedience and autonomy, but can also be framed differently. In fact, the conditions of labour under platform mediation seem to exist in an ambiguous movement of interpretation and distortion of neoliberal rationality, which we can see simultaneously concretised in platform infrastructures and contingently appropriated in users' everyday practices. This ambivalent vitalist pragmatics appears as the mode of subjectivation of platform labour.[81]

It is not only the capacity and willingness to subject one's body to the taxing rhythms of toil that is rewarded by the platform's economic mechanism, but also significantly one's inventive capacity to react to contingency with an entrepreneurial disposition. Platforms do not prescribe their desired modes of self-exploitation. Impersonal algorithmic management does not employ the bureaucratic or soft monitoring techniques of traditional service work or even post-Fordist knowledge work. Instead, it establishes a common ground for "free" movement, upon which users-workers can develop their own practices and tactics in relative autonomy. The famously "unprecedented" conditions of the Covid-19 lockdowns exemplify a situation that many remember as a true experimental ground for platform pragmatics. «During lockdown my town shut the mall» a Discord user remembers «So the only people allowed in to it were [riders]. I had the genius idea to tell every security guy to get customers to order to the car park when they were turned away. Good solid week of pickup, walk 200 meters, drop off where my bike was parked».

However, even in regular conditions, the everyday composition of platform labour appears as fragmented, diverse and contradictory. In my experience of working as a courier in London, while there is certainly a profile that most workers tend to fit into — most of them are young to middle-aged men, often from an ethnic minority, equipped with a certain type of gear — there is also a disorderly variety of people accessing the job in diverse ways, conditions and patterns. It is not uncommon to see people working "*in incognito*", by which I mean without any of the typical gear showcasing platforms' brand logos, and sometimes even

[81] which as we'll see presents a complicated relation to political class composition.

delivering without the standard thermal bag. According to online forums, some people do this in order to not be identifiable as delivery couriers and avoid controls, which is not seen very positively among those who are active on group chats, which mostly seem to approach the job relatively seriously. For instance, a photo posted by a Discord user shows a man on a motor scooter, carrying a large restaurant paper bag in between his feet, plus a smaller one on the front part of the seat, with him seating at the very back of it. Their comment says «There's a guy in my area who delivers orders like this […] Don't it just make you feel warm and fuzzy when you're waiting around for an order that this guy could get it». Another member replies «Hopefully gets terminated soon.. though probably on a rented account anyway» and a third one adds «It doesn't even make business sense. This could be the first time that customer uses [the platform], then they decide to never use it again so it affects us all. How can you be cool with providing such a shitty service? You can get an insulated bag for a fiver […] I'm pretty sure they're uninsured on a bicycle account and don't want anything that makes them look like a delivery driver». Having a thermal bag is in theory mandatory, however they are not necessarily provided by the platform. Most of the times, couriers have to procure their own. The bags of the major delivery platforms tend to be the most expensive, but other companies like Aldi also sell cheaper ones. However, there is also a lively second hard market online. Personally, I originally bought one second-hand through Facebook marketplace, and after a month of work, the platform I was working for decided to give “recent joiners” access to a limited number of free ones, so I got a new one from them. In another comment to the picture posted in the group, a user says «I have started to see more Aldi bags again. Probably because KFC has started to stop people taking orders without a bag again. At least my local is anyway» to which the original poster replies «Riders without bags always ask riders outside if they can borrow their bag before going into KFC to collect their order. Happens quite often. Especially car drivers, I rarely see them having bags, most of the time they just put the order on passenger seat».

Here neoliberal rationality, concretised in platform mechanisms, is conjoined with the pragmatic character of precarious self-entrepreneurship. In clear contradiction with the myth of liberal autonomy, self-entrepreneurship develops through outer determination and affectability. The essentially ambivalent character of the User/used condition shines through this contradiction. On the one hand, the instrumentalised entrepreneur takes on all the risk and precarity of platform labour. Not only that, but their personal self-investment increasingly has to cover for their basic tools of work. Like for the thermal bag I just mentioned, or in the case of winter gear previously discussed, workers are responsible for independently procuring, keeping and renewing most of their equipment. Items like the bag, the vehicle, the smartphone

and any other gadgets required to enable the job, all assume the status of what Nick Dyer-Witherford identified as the «inelastic» commodities that are necessary to the «cyber-proletariat» to access the precarious global labour market. The increasing value of these commodities in relation to wages determines an increased costs of reproduction for workers who, in order to be able to sell their labour power, must enhance it beforehand with such additional commodities (Dyer-Witherford 2015). In an early work on platform delivery riders, Callum Cant correctly amends Nick Srnicek's previous analysis, identifying smartphones and bicycles not as outsourced fixed capital, but actually as means of subsistence: «the innovation of lean platforms is that they take advantage of a disorganisation of the contemporary working class to redefine the means of subsistence to include commodities like smartphones, bicycles and mopeds, but without increasing the value of the wage» (Cant 2020; Srnicek 2016). However, albeit forced to take on these inelastic commodities as their means of subsistence, the pragmatic dimension of self-entrepreneurship also retains a certain indeterminacy that challenges traditional models of subjugation. This indeterminacy is visible in the flexible and intermittent rhythms of platform labour, the urban movement it puts in circulation, and the fragmented modes of subjectivity it mobilises. By this I mean that a platform worker acts and thinks, at the same time, as: a self-entrepreneur, a servant, a reserve population threatening the work of others, an under-employed trying to make ends meet, a benefit claimer, and a learner looking for online sources to learn the ropes of a trade. Significantly, they do so without ever stably embodying any of these positions, but always shifting from one to another.

Ultimately, it is this relation that platform mediation cuts into; between the neoliberal rationality that platforms encode and express, the baroque sociality of global urban environments, and the vitalist pragmatics of the masses. Although at times this mode of subjectivation appears to re-produce neoliberal utilitarian individualism, it never fully coincides with the instrumental reason of *homo economicus*. In fact, *homo economicus* is the model encoded in the idealised User position, as it aims to obfuscate the transindividual character of labour, its non-anthropocentric and cooperative dimension. But as I've already argued extensively, the "used" condition reveals this idealised position as a fantasy — albeit a powerful one. The reality of vitalist pragmatics reveals a different principle of subjectivation for platform labour, which might be closer to a certain opportunism that characterises platform mediated collectivity. Gago interestingly draws from Paolo Virno's idea of «opportunism». While Virno describes how in post-Fordist labour opportunism has been put to work as a «bad sentiment», signifying corruption and cynical acceptance of domination, it can also be understood in its structural and non-moralistic sense, as a mass emotion and a mode of being that is rooted in a social reality characterised by unexpectedness, chronic

instability and innovation. «Opportunists are those who confront a flow of ever-interchangeable possibilities, making themselves available to the greater number of these, yielding to the nearest one, and then quickly swerving from one to another. […] It is a question of a sensitivity sharpened by the changeable chances, a familiarity with the kaleidoscope of opportunities, an intimate relationship with the possible» (Virno 2004, p.86). In this sense, opportunism appears as an essential trait of the pragmatics of the "used" condition, and as a key element of the socio-technical composition of platform labour. Significantly, to understand this composition — and then discuss its implications for a political class composition of platform labour — it seems necessary to consider this pragmatic-opportunistic dimension in relation to two other features of the socio-technical arrangement of platform labour; its heterogeneity and its ambivalence.

The anecdotical reports and the examples of everyday practices gathered in my research highlight the heterogeneity of logics and temporalities that animate the flexible workforce of digital platforms. Besides the most immediate distinction between full time workers, working up to over 60 hours per week, and those with more part time arrangements, platform work presents a wide diversity of schedules, combinations with other jobs, and even seasonal occupations — as some workers tend to find a seasonal winter job to avoid cycling out in the coldest months. In their daily routines, some people wait patiently in groups by their local fast food restaurants, while others commute from outside the city to reach the centre and spend their whole day in the busiest districts. While some strategise to make the most of weekend shifts in order to supplement the income from their day job, a researcher like me might be more concerned with their academic performance than with maximising their earnings at all costs. If students work on weekday evenings to make extra cash in the face of rising living costs, migrant workers use their weekly earnings to pay for their accommodation, expenses and rented accounts, only to then send their weekend earnings to their families back home. In his ethnographic account of one of the early riders' struggles in Brighton in 2016, Callum Cant discusses the dissolution of the organisation after months of strikes, concluding that the composition of the workforce was too unstable to resist longer as a collective political subject. According to him, on the one hand, this was due to workers' social heterogeneity and «striation along the lines of migration status, language, race, level of education, forms of other income, age». On the other, it was also partially determined by the decentralised and fragmented character of the labour process itself (Cant 2020). This promiscuous composition of the platform labour force crucially combines with the ambivalent character of their vitalist opportunism. In fact, on the one hand the framework of pragmatics from below challenges totalising readings of platform power as the ultimate subjugation of self-exploiting labour, and

foregrounds instead the agency and participation within neoliberal rationality of those who are often assumed to be simply victims to it. On the other though, it would be superficial to automatically apply anti-capitalist connotations to the pragmatics of the masses, as if they constituted an inherently antagonistic multitude.[82] Because neoliberal rationality is negotiated in diverse and contradictory ways, platform pragmatics display the co-existence of workers' solidarity with brutal dynamics of reciprocal exploitation, as shown for example by the practice of illegally sub-renting accounts to undocumented workers. Within the fragmented and opportunistic composition of the platform workforce, ferocious competition seems to co-exists alongside practices of reciprocity and mutualism in workers' sociality, that resemble instances of David Graeber's «everyday communism» (2013).

Platform mediation and class composition

Throughout the different chapters, I have discussed how the socio-technical forms of platform mediation emerge as concretisations of pre-existing social forms, cultural logics and contingent economic practices, in resonance with the specific affordances of technical objects at a given time. As we have seen, these emerging forms of mediation produce not only connections, but the re-coding and reconfiguration of certain social relations. I argue that what is connected, activated and reconfigured through platform mediation is precisely the functionally integrating relations between:

- platform infrastructures as concretisations of neoliberal rationality;
- the abstract model of use-instrumentality, which encodes historically determinate power relations, and can be concretely activated in user-instrument, master-servant and labour-capital relations;

[82] It is interesting to reflect on how any imagined innocence inherent to the working class is based on a misunderstanding of how the working class, and their desire, exists in relation to capital — drawing from Tronti's Workers and Capital, from Deleuze and Guattari's understanding of capitalism and desire in Anti Oedipus, as well as from Mark Fisher's reading of Lyotard's Libidinal Economy (Deleuze & Guattari 1983; Fisher 2020; Tronti 2019). To assume that any working class is essentially innocent and that their desiring investment into subjugation is simply an effect of alienation means — first — not taking their capital-ised/subsumed desire seriously and thus rejecting it in a moralistic fashion, and — second — it means assuming that a working class desire autonomous from capital even exists, not considering that the working class is itself an effect of capital, and therefore a worker's field of desire can only be immanent to capital, albeit sometimes against it. As explained early on by Tronti «the working class need only look at itself to understand capital. It need only combat itself in order to destroy capital» (2019).

- the indeterminate and speculative character of contemporary technical systems, as well as the specific economic arrangements by which they are taken up;
- the pragmatic opportunism of post-Fordist labour, and the heterogeneous composition of its precarious global labour power

To understand the political significance of this dynamic process of mediation, it's important to ask whether the vitalist pragmatics of "used" labour express forms of class antagonism, and if they constitute a mode of political class composition. That of class composition is an analytical framework developed within the Marxist movement *Operaismo* and later *Autonomia* throughout the 1960s and 70s. The process of composition can be understood in two parts: the «technical» or socio-technical organisation of labour power within relations of production, as variable capital; and the «political» composition and self-organisation of this labour against capital, as a working class. The leap from a certain socio-technical composition to a political class composition is what shapes workers' organised struggle and antagonism (Alquati 1975). In Negri's words:

> *«by class composition, I mean that combination of political and material characteristics – both historical and physical – which makes up: (a) on the one hand, the historically given structure of labour-power, in all its manifestations, as produced by a given level of productive forces and relations; and (b) on the other hand, the working class as a determinate level of solidification of needs and desires, as a dynamic subject, an antagonistic force, tending towards its own independent identity in historical-political terms» (Negri 1988, p.209).*

The framework has been employed in recent years to study platform labour, especially in the context of a revived interest in the methods and concepts of *operaismo*, and the practices of workers' inquiry or "*conricerca*" — for instance in Italy by the collective Into the Black Box, and in the anglophone world by authors like Callum Cant, Jamie Woodcock and others associated with Notes from Below and Viewpoint Magazine. The militant ethnographies of gig workers' struggles conducted within this line of scholarship tend to focus on the particular modes of class composition resulting from the precarisation imposed on platform workers by the status of "independent contractors" (Into the Black Box 2022; Waters & Woodcock 2017). A dynamic that is generally highlighted is that by which, while this fragmented and precarious technical composition initially had a de-composing effect on class power, it also ended up opening «avenues for the recomposition of the class around unrestricted antagonism» (Cant 2020). In fact, while legal protections such as minimum wage, holiday and sick pay are taken away from platform workers, traditional union regulations restricting workers' action also no

longer apply, which, according to Cant, creates «unmediated» power relations between classes, leaving workers with no other option than direct action, leveraging «immediate class power at the point of production» (Cant 2020). In other words, ethnographies such as that carried out by Cant suggest that the technical class composition of platform mediated gig work produces a direct assertion of working class autonomy.

While my project focused more on the socio-technical composition of platform labour, rather than on the political struggles of gig workers, and my research did not feature a militant form of ethnography, it is still important to reflect on how we can understand the politics of platform labour from the perspective of a critical study of mediation and through the idea of users-workers pragmatics. In order to do this, it might be worth reflecting briefly on the theoretical implications of the class composition framework drawn from *operaismo*. Orthodox Marxist-Leninist thought distinguished between workers' awareness of their shared condition in relation to production — as class "in itself" — and their consciousness and organisation as a class against capital — class "for itself". Here, the proletariat becomes the subject of history by virtue of class consciousness being injected into an already structured class by a vanguard party, revolutionary education or proletarian ideology (Balibar 1994). In alternative to this framework, class composition is understood more as a process, both a product and producer of social relations within capitalist production, and it is developed within *operaismo* to understand the feedback relation between organised workers' struggle and its displacement — or de-composition — by way of capitalist technical development. In fact, class composition needs to be understood as the core of *operaismo*'s "reversal of perspective"; whereby class struggle acts as the motor compelling capital to reconfigure value production in order to de-compose or capture any forces that disrupt or escape its functioning (Alquati 1975; Negri 1988; Tronti 2019). This configures a generative loop of class de-composition and re-composition, between real subsumption and modes of antagonism which can take the form of a direct refusal of work but also of what Deleuze and Guattari defined as «lines of flight». This does not affirm any pure space for class consciousness as autonomous from capital or as a unified antagonist subject, but rather understands class composition as a wealth of practices, desires and inventions. Because the working class is already an effect of capital, as argued by Tronti, its struggle cannot be autonomous from it, but only exist immanently to forces of composition. A line of flight is not an escape away from an assemblage, but rather an inventive and turbulent force upon which an assemblage mutates, re-configures and potentially breaks down, developing different arrangements (Deleuze & Guattari 1987; Negri 1988; Thoburn 2003; Tronti 2019). In light of this, it is interesting to reflect on some ways in which conflict and appropriation are articulated within platform labour.

Conclusions

Given the flexible character of the workforce, the spatial distribution of work, and the diverse subjective investments mobilised by platform mediation, the forms of labour discussed in this project cut across various aspects of everyday life and bring together segments of the social body beyond those traditionally addressed by workers' movements. For instance, migrants, undocumented workers, students and various part-time and unstable workers, all access platform labour in fragmented, occasional and volatile ways, often significantly integrating it with other forms of work and sources of income. As a result, the vitalist pragmatics of a promiscuous and diffuse working class participate in the logic of platform capitalism by interpreting it, embodying it and bending it to their interests in various ways. Furthermore, platform labour is not only characterised by the participation of those who access work through the digital marketplaces, but also at least in some way by the interventions of technical practitioners, activists and researchers. Therefore, platform mediation opens labour to contaminations and appropriations that, although always immanent to capitalist relations of production, articulate critique and antagonism is novel and unorthodox ways — some of which I think it's interesting to discuss in this final section of the thesis.

Direct conflict

Some of the key appropriations of platform logic are obviously those of workers' struggle, which are articulated along traditional geometries of class conflict, in a position of open and direct antagonism. Even from my non-militant position and without direct involvement in workers' organisation, platform labour appears as an open laboratory for forms of antagonism. In fact, in response to the de-composition of some traditional forms of workers' power, new tactical adaptations find ways of subverting platform logic, at least in some contradictory ways.

Among workers' discussion, the politics of accepting or rejecting orders are often discussed. As previously mentioned, there is a widespread sense that fees have been on the

decline since the pandemic, and that over-hiring practices from platforms have only intensified this. According to the vernacular knowledge of algorithmic management, it seems that if enough workers reject an order, the system will start offering that same order for an increased fee, in order to motivate acceptance. Thus the conduct of workers who accept any fee, and validate any attempt of the system to lower pay[83], is seen by many as detrimental to everyone's earnings. This is frequently used as an argument against the practices of workers with rented accounts — which often also means migrant workers. On the other hand, the practice of rejecting a certain type of order *en masse* is usually invoked as a form of spontaneous collective action, aimed at resisting attempts by the platform to introduce formulas that end up lowering wages. Early in 2023, one of the major delivery platforms started trialing a new model for combining orders from different restaurants in the same delivery trip. Normally, couriers would be able to "stack" two orders from the same restaurant, and deliver them to different addresses in the same area, something that according to the platform is "designed so you can earn more in less time by reducing your travel back and forth". However the new feature would offer riders stacked orders that they would pick up from different restaurants in the same area, and deliver to different customers, to "complete more orders in less time"[84]. A Discord user posts a screenshot of the email announcing the controversial new feature, commenting «oh boy», to which a second worker replies «Anyone that says this is a good thing is delusional. Always comes to [the platform] making more money off each order». Another member later adds «I had one a few weeks ago, must have been them trialing it but [if I remember correctly] it was a base fee wagamama order of like £3.80 and then it offered me the second one for £5.50 or so, so I'm thinking oh this isn't too bad…turns out the £5.50 was just both orders together» and concludes that «it's another fucking scam for us, *instant reject it always*» (emphasis added). The collective rejection of orders has been widely used as a technique of resistance and negotiation against worsening conditions in recent years, to which platforms usually respond by issuing boosts and temporary bonuses, as a corrective measure to re-equilibrate labour supply, and simultaneously undermine collective action. As one courier says «it doesn't help that some people take advantage of rider strikes and do as many orders as possible especially if [the platform] slaps a panic 1.2 boost or something like that». This appears as a way in which workers try to leverage the limited power afforded to them by marketplace dynamics, albeit without any clear organisation.

---

[83] During my time as a courier fees have started lowering below £3.50 for an order

[84] Quotes from an email sent out by the platform to announce the new feature

However, the necessity of overcoming some of the technical challenges posed by platform de-composition has also strategically been tackled in highly organised ways. In fact, digital platforms' deployment of logistical media to superimpose warehouse and transportation functions over the urban landscape grants them the crucial advantage of eliminating a traditional site of workers' leverage in logistics, which is the presence of bottlenecks in the supply chain. As documented early on by workers' inquiries like those of Cant and Woodcock, this displacement of power was followed by a re-composition of workers' struggle tactically developed along this decentralised organisation (Cant 2019; Woodcock & Hughes 2018). As the point of production is extended to the whole city, riders turn the traditional picket line into a flying picket, whereby workers move along key arterial roads of the city, disrupting the circulation of commodities in a distributed fashion, while also performing the traditional picket function of reaching out to previously uninvolved workers.

But movement and decentralisation are not the only vectors by which struggle appropriates platform logic. Third parties and partners like restaurants and supermarkets have become a key target for direct action. During my time as a courier, one of the most significant organised actions was one from Deliveroo riders, who stood in the rain on strike in the central district of Mayfair, asking for £3.80 minimum order fees and a £6.00 minimum for double drops — against the current minimum of £3.40 with no limit for doubles. Here, workers specifically combined disruptive on-site protests in front of major third party stores with the direct targeting of one of the platform's own supermarkets. Also, similarly to what happened in the past, targeting third parties enables striking couriers to directly engage with restaurant workers, the other key component of the "used" service infrastructure. In fact, by applying pressure on other "partners" of the platform, Deliveroo workers in that instance even managed to force restaurants to go offline by disabling the app on their end. In a reddit thread following the strike, a user comments «this makes no sense, there's a waiting list to become a Deliveroo driver, they'll just end up increasing their competition and have less money», which seems to be how many feel about withdrawing labour; the platform is the gatekeeper to the labour marketplace, so control of labour supply is really in their hands, not the workers'. However within the same subreddit, an organiser objects:

> *«everyone says this but that's not the easiest solution for Deliveroo. We blocked 5 major stores from giving out orders and stopped riders picking up from those locations. At the peak there was 150 drivers declining all orders. Think about how many customers they had to refund? Think about every order each of those drivers would have completed in those hours between 6-10pm. We called Deliveroo and*

explained what we're doing and why, why went to Deliveroo Hop in Oxford street and stopped those orders whilst again explaining why we're doing what we're doing. Change doesn't happen over night regardless, however if there is enough of us in the busiest areas causing them issues then hiring new riders won't be the go to solution, it will have to be increasing the pay of the orders».

When such discussions arise, some workers express a desire for structured forms of organisation, while others look at the reality of their work from a more crudely pragmatic perspective. Commenting on a wave of large strikes that has invested the UK in 2022 across various industries, from railways and royal mail to public transports and education, a frequent animator of the Discord server says «I wish we could all organize a mass strike just like tube workers are doing right now and bus drivers are supposed to strike next week. And I don't mean like an hour strike where we just reject orders for an hour cause that doesn't change shit». However others are quick to point out that «there would probably be a boost in the event of a mass strike though» and that «considering the nature of the job I'd be half tempted to just clean up all the orders», with one worker in particular posting screenshots from previous strikes in their city, where fees went up over 200% and at one point orders were being issued even with a £15 minimum earning. As shown by the discussion of opportunistic pragmatics in this chapter, workers' practices, although characterised by a tension toward generalised resistance to discipline and exploitation, are not necessarily anti-capitalist or oriented by workers' solidarity.

Moving with the trap

It is also interesting to think about some of the ways in which platform logic is embodied — and in a certain sense used — by those who are subjected to it, and specifically about how media interfaces are conductive to this embodiment and appropriation.

If the organised antagonism of riders' strikes has become a key symbol of resistance and class re-composition against platform capitalism, on the other end of the spectrum, a different form of platform mediated labour, emerged in recent years, has been widely received as a symptom of the increasingly intimate enslavement of subjectivities within digital culture — I am referring to the work of social media creators. While the struggles of couriers have been interpreted as a resurgence or an update of the Worker as an anti-capitalist subject who at least stands dignified in their exploited condition, digital creators are often characterised as craft-less and de-politicised, not only behaviourally hijacked by dopamine rushes and digital

rewards, but deluded by fantasies of fame and easy earnings promised by the virtual economy — in other words, their labour is framed as completely determined by self-valorisation. YouTubers, Twitch streamers or OnlyFans creators are some of the most known and discussed examples, but a case that has assumed particular cultural significance over the last year is that of so-called "NPC" streamers on TikTok. These are social media content creators who, during live streaming sessions, do something similar to cosplaying as NPC video game characters, controlled by their audience through a mechanism of tips and donations. The apex of this has been the viral popularity of Montreal-based creator Pinkydoll, who in the summer of 2023 had hundreds of thousands of followers on TikTok, a prolific OnlyFans account, and became a cultural sensation through her NPC livestreams (Kircher 2018). On TikTok, any user with over one thousand followers has access to the live-streaming feature, where they can engage their audience and receive in-app "gifts" which can be cashed out through the app in exchange for real money. In NPC streams, creators react in real time to gifts from their followers by performing scripted lines, expressions and physical gestures. They establish an audience-controlled choreography where each gift triggers an on-screen animation in the form of an emoji — let's say an ice cream — and the immediate reaction of the creator who performs cartoonish catchphrases and moves in response to the emoji — i.e. the serialised repetition of "mmm ice cream so good!". The expression "NPC" is derived from the "non-playable characters" of video games, the secondary characters with no autonomous storyline who are only programmed to perform a few lines or reactions when interacting with the protagonist. Just like NPCs in video games function like automated-response gadgets in the gamer-user's journey, NPC streamers act like living game pieces for the entertainment of their paying followers-users. The platform sets up the broadcast so that both sides incentivise each other to keep the engagement going. Gifts are low-cost contributions for the audience, while the broadcaster has all the interest in keeping engagement high with their performance, in order for their stream to get visibility on the platform and attract a larger audience. In such conditions, streams can go on for hours and accumulate significant earnings for creators (Tran 2023). This transactional approach to live streaming and audience interaction is also common to Twitch, Amazon's own streaming platform, initially mainly popular among the online gaming community, but which grew into a mass phenomenon during the pandemic, in part by strategically offering creators relatively generous and direct ways to monetisation, compared to other platforms like YouTube, where creators had to rely on a more indirect advertising-based earning model. Within this transactional form of attention economy, streamers render their bodies as affectable tools for user-audiences through the platform interface and its grammars of interaction — in a way that might seem novel but which exists in continuity with the marketplaces of attention and interaction configured by social media and content

platforms. This paradigm highlights formal parallels between the platform mediated labour of live streamers and that of webcam models, as recently noted for instance by Bo Ruberg, while also remaining connected to the more or less visible economies of online sex work (2022). Significantly, the cultural discourse around NPC creators has also been linked to a certain moral panic around sex workers, as well as to the frequent stigmatisation of women sexuality within gaming culture (Tran 2023).

It is interesting to think about the cultural reception of this recent form of platform mediated labour in relation to the case of Atlanta, a UK-based worker who supplements her main job as a delivery rider by augmenting it with other earning streams generated through other platforms — already discussed earlier in the third chapter. After quitting her job at the airport in 2021, Atlanta started combining combining delivery work on at least four different platforms, with a YouTube channel and a TikTok account documenting her deliveries, as well as an OnlyFans account. She produces different forms of content depending of the platform, putting together YouTube vlogs in the form of challenges, diaries, reviews and tutorials, but also TikTok posts where she interprets the trends and formats that are popular on the platform at a given time. The topics of her videos are usually related to her everyday life as a gig worker, including platform dynamics and features, earning strategies, gadgets and equipment, admin issues like taxes and insurance, and various anecdotes and stories from her shifts. What Atlanta tries to do is leverage the relative autonomy granted by platform management in order to fully valorise the time she invests in her work, by opening it to other potential earnings-streams through secondary investment on different platforms. The case of Atlanta presents an interesting example of how platform workers often tend to develop side hustles in order to extend their earning potential. As I looked for guides and tutorials on how to approach the job, most of the material I came across was produced by other gig workers, who try to build their own audience on various platforms. It is not unfrequent for some of these workers to also promote or directly sell products, services or coaching related to platform work.

By concretising neoliberal rationality in the economic mechanisms of marketplace infrastructures, platform mediation mobilises the self-reflexive opportunism of a precarious and networked labour force, offering enticing User positions and earning opportunities to enterprise-individuals, while appropriating value from their collective “used” productive capacities. The anxiety around the popularity of NPC creators seems clearly linked to the feminised character of their cultural behaviour, as highlighted for instance by their association with the moral panic around online sex work. In fact, the reason why the condition of having to perform availability and making one’s body affectable to others’ attention is framed as

undignified and de-humanising, is because it foregrounds something inherent to post-Fordist labour in general, and platform mediated labour specifically; which is the condition of self-instrumentalisation that is regularly obfuscated by the reassuring and celebrated figure of the self-possessed independent worker. Similarly, the proximity of this condition to that of the technological instrument troubles the fiction of an autonomous User, master of the machine, by foregrounding instead how media interaction entails the integration of desire with machine functioning and socio-technical concretisation. Perhaps what is disturbed by the openly feminised and instrumentalised character of platform mediated labour, is the sacred distinction between subject and object. Once again, «yesterday's monsters are today's subjects; today's machines are tomorrow's human beings» (Chude-Sokei 2015).

What the framework of vitalist pragmatics highlights to me, is that both the Young-Girl condition and the proximity to the instrument do not necessarily lead to the ultimate demise of labour's political agency, but simply distance it from the traditional humanist traits of the Worker. Precisely because of their self-reflexive opportunism, feminised and "used" workers can appropriate and interpret a logic which they still endure and suffer; first of all by drawing momentary pleasure or contingent value from their condition, but also by developing an acute sensibility to the mechanisms of their own enslavement. In an essay on socio-technical structures, alienation and escape, Benedict Singleton draws from design theory to argue that the design of a trap requires a representational model of its victim, or rather a subversion of their behaviour which enables their entrapment, and thus all traps can be read as «lethal parodies» of their prey's behaviour (Singleton 2013). From this perspective, we can understand the platform as a trap system, that subverts and modulates the behaviour of its collective prey — the self-reflexive opportunism of the "used" — in order to capture value. However, the "used" are not passively determined by their entrapment. Rather, they develop an intuitive knowledge of the platform environment — of algorithmic coordination mechanisms, behavioural rewards and attentional vectors — and on the basis of this a wealth of pragmatics and contradictory practices is produced. It is by these pragmatics that they stay clear of complete capture, by learning «how to move with the trap» (Quicho 2023). As observed in multiple cases in the course of this project, this movement is directionless, not emancipatory nor aimed at political autonomy. But perhaps it is by following this movement that social criticism can identify sites of conflict and breaks in the arrangements of platform mediation as currently existing within technoliberal capitalism.

Appendix

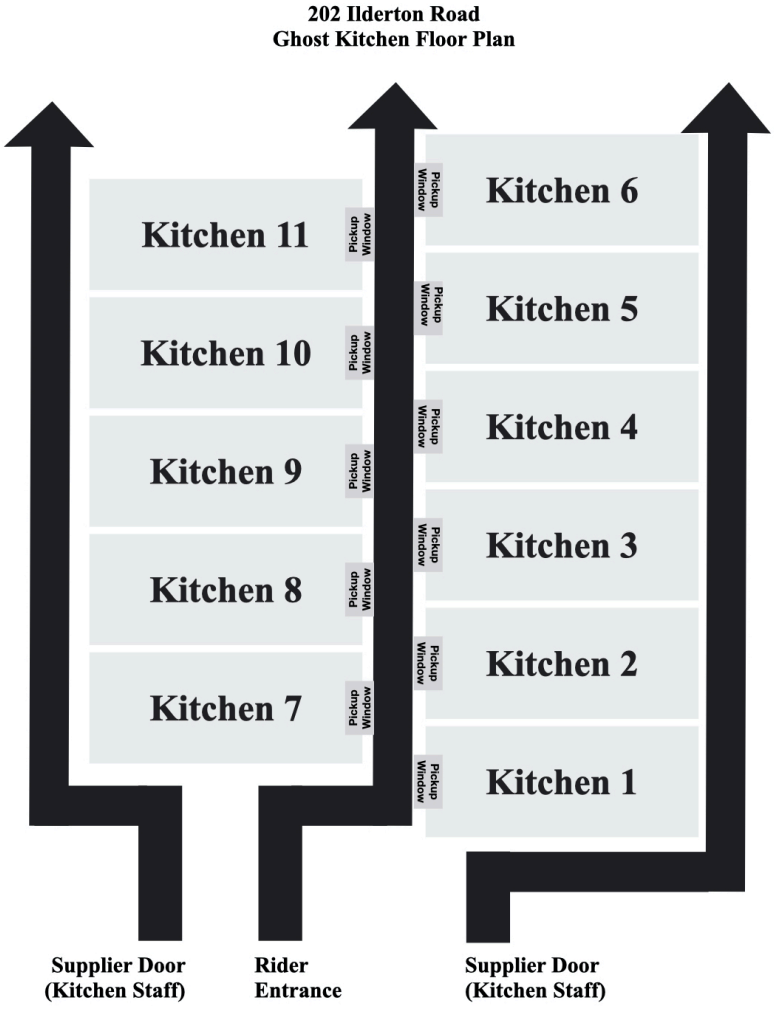

Fig. 1: a floor plan of a ghost kitchen, drawn by me on the basis of one I found and photographed on site.

Fig. 2: a view from Google Earth of a section of the South Bermondsey area, precisely around Ilderton Road and Ormside Street. The view highlights the presence of some religious centres, industrial estates, as well as of three ghost kitchens:

- Growth Kitchen: https://growthkitchen.co/
- Foodstars, a brand of «commercial kitchens», who present their Ormside Street site to potential investors in the following way: «Peckham is an up-and-coming area of South London. For those interested in kitchen rental, they can license a kitchen with Foodstars here. An influx of wealthy young professionals has led to renovation of various parts of Peckham, making it a prime destination for artisan business, arts venues and foodies. This is a prime location for a commercial kitchen» (https://foodstarsuk.com/locations/peckham/).
- Deliveroo Editions: the company's «delivery-only 'dark' kitchens», a venture which «connects growing businesses with hungry customers, in brand new areas» (https://restaurants.deliveroo.com/en-gb/editions)

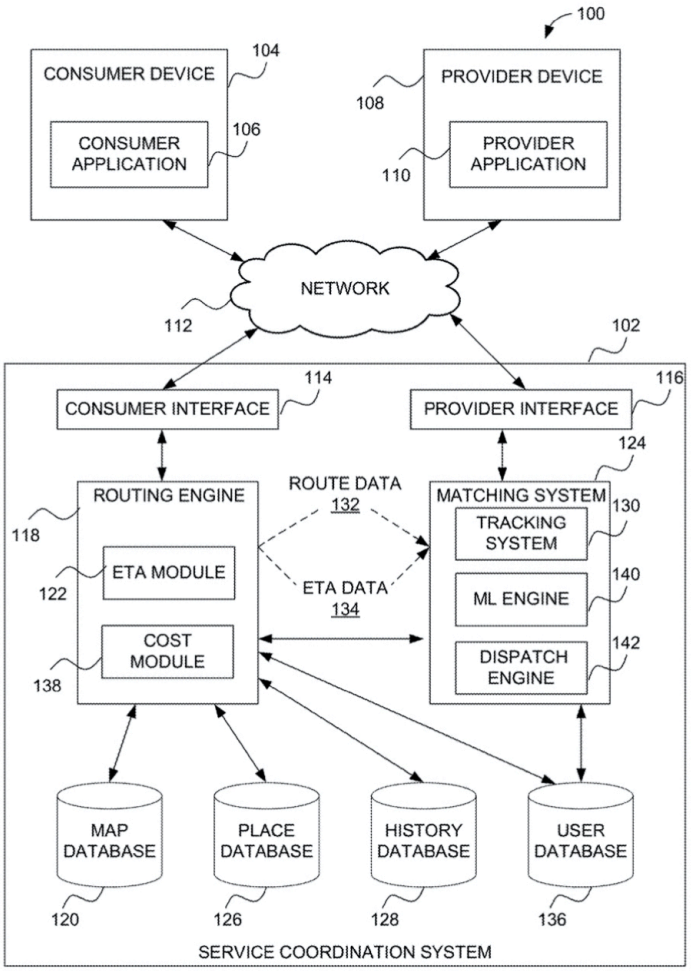

Fig. 3: a diagram of the Service Coordination System and the associated networked environment, taken from the patent (Waliany et al 2019, indicated in the patent as Fig.1).

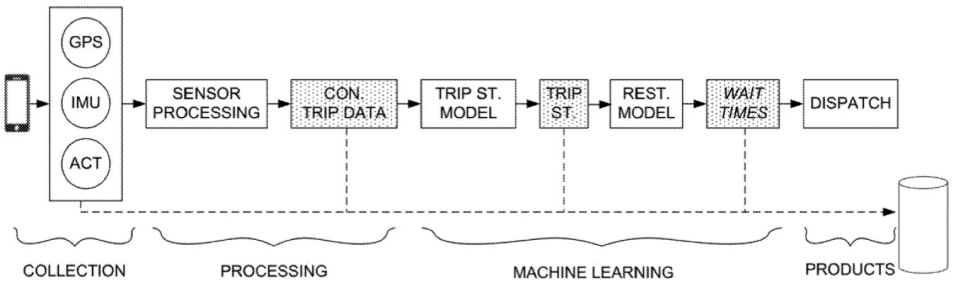

Fig 4: the Data Flow Diagram taken from the patent, showing the flow of data in an example «batch pipeline», across different components of the networked coordination system (Waliany et al 2019, Fig. 4)

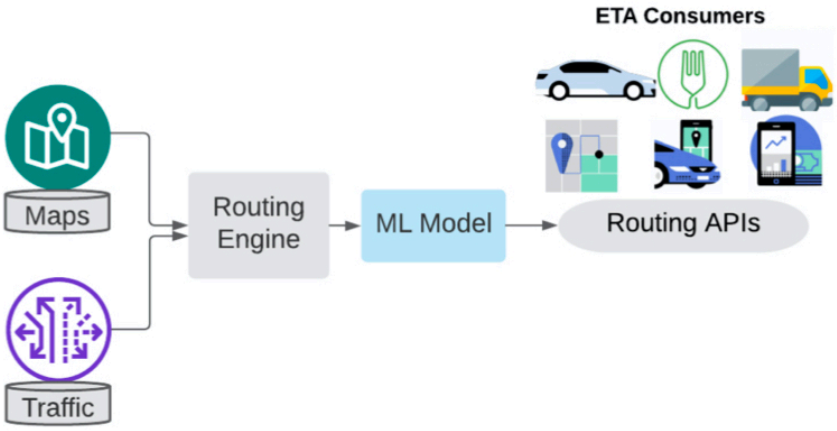

Fig. 5: a diagram of the DeeprETA model, taken from the patent, showing the key components of the hybrid approach to ETA post-processing (Hu et al 2022, indicated in the patent as Fig.1)

Bibliography

Adascalitei, D., vacas soriano, C., Staffa, E., & Hurley, J. (2022). *Telework and teleworkability during COVID: An analysis using LFS data*.

Airbnb. (n.d.). *Hosting an Experience on Airbnb*. Airbnb. https://www.airbnb.com/resources/hosting-experiences/t/hosting-an-experience-on-airbnb-71

Alkhatib, A., Bernstein, M. S., & Levi, M. (2017). Examining Crowd Work and Gig Work Through The Historical Lens of Piecework. *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, 4599–4616. https://doi.org/10.1145/3025453.3025974

Aloisi, A., & Stefano, V. D. (2022). *Your Boss Is an Algorithm: Artificial Intelligence, Platform Work and Labour*. Hart Publishing.

Alquati, R. (1962). Composizione organica del capitale e forza-lavoro alla Olivetti. *Quaderni Rossi*, *2*. https://www.bibliotecaginobianco.it/flip/QUR/002/02/index.html#62

Alquati, R. (1975). *Sulla Fiat e Altri Scritti*. Feltrinelli.

Andersen, C. U., & Pold, S. B. (2018). *The Metainterface: The Art of Platforms, Cities, and Clouds*. MIT Press.

Anderson, L. (2006). Analytic Autoethnography. *Journal of Contemporary Ethnography*, *35*(4), 373–395. https://doi.org/10.1177/0891241605280449

Andrijasevic, R. (2021). *Media and Management*. University of Minnesota Press.

Armano, E., Leonardi, D., & Murgia, A. (2022). Algorithmic Management in Food Delivery Platforms: Between Digital Neo-Taylorism and Enhanced Subjectivity. *University of Westminster Press*. https://doi.org/10.16997/book54.g

Ash, J., Anderson, B., Gordon, R., & Langley, P. (2018). Unit, vibration, tone: A post-phenomenological method for researching digital interfaces. *Cultural Geographies*, *25*(1), 165–181.

Atanasoski, N., & Vora, K. (2019). *Surrogate Humanity: Race, Robots, and the Politics of Technological Futures* (Illustrated edition). Duke University Press Books.

Atkinson, P., & Silverman, D. (1997). Kundera's Immortality: The Interview Society and the Invention of the Self. *Qualitative Inquiry*, *3*(3), 304–325. https://doi.org/10.1177/107780049700300304

Aunis, É., & Stevens, H. (2021). Patienter sur les places et foncer dans les rues. Quand les coursiers occupent l'espace public. *Images du travail, travail des images*, *11*, Article 11. https://doi.org/10.4000/itti.1839

Austin-Broos, D. J. (1998). Falling Through the 'Savage Slot': Postcolonial Critique and the Ethnographic Task1. *The Australian Journal of Anthropology*, *9*(3), 295–309. https://doi.org/10.1111/j.1835-9310.1998.tb00200.x

Autonomy. (2021). *Working Nights: Municipal strategies for nocturnal workers*. https://autonomy.work/portfolio/workingnights/

Back, L. (2012). Tape recorder. In *Inventive Methods*. Routledge.

Badger, A., & Woodcock, J. (2019). Ethnographic methods with limited access: Assessing quality of work in hard to reach jobs. *Handbook of Research Methods on the Quality of Working Lives*, 135–146.

Balibar, E. (1994). *Masses, Classes, Ideas*. Routledge.

Baptist, E. E. (2016). *Half Has Never Been Told: Slavery and the Making of American Capitalism* (First Trade Paper Edition). Basic Books.

Barad, K. (2007). *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Second Printing edition). Duke University Press Books.

Becker, G. S. (1978). *The Economic Approach to Human Behavior*. University of Chicago Press.

Becker, H. S. (2007). *Telling About Society*. University of Chicago Press.

Beer, S. (1959). *Cybernetics and Management*. Wiley.

Bellon, T., & Balu, N. (2021, November 4). Uber makes first operating profit as driver shortage eases. *Reuters*. https://www.reuters.com/technology/uber-posts-first-small-adjusted-profit-ridership-rises-delivery-gets-more-2021-11-04/

Benanav, A. (2022). *Automation and the Future of Work* (p. 160). Verso Books.

Benjamin, R. (2019). *Race After Technology: Abolitionist Tools for the New Jim Code* (1st edition). Polity.

Benkler, Y. (2002). Coase's Penguin, or, Linux and "The Nature of the Firm." *The Yale Law Journal*, *112*(3), 369–446. https://doi.org/10.2307/1562247

Bennett, T., & Frow, J. (2008). *The SAGE Handbook of Cultural Analysis*. https://doi.org/10.4135/9781848608443

Berardi, F. (2010). Cognitarian Subjectivation. *E-Flux*, *20*. https://www.e-flux.com/journal/20/67633/cognitarian-subjectivation/

Berardi, F. "Bifo." (2009). *The Soul at Work: From Alienation to Autonomy*. Semiotext.

Bergvall-Kåreborn, B., & Howcroft, D. (2014). Amazon Mechanical Turk and the commodification of labour. *New Technology, Work and Employment*, *29*(3), 213–223. https://doi.org/10.1111/ntwe.12038

Berlant, L. (2011). *Cruel Optimism*. Duke University Press.

Bernards, N., & Soederberg, S. (2021). Relative surplus populations and the crises of contemporary capitalism: Reviving, revisiting, recasting. *Geoforum*, *126*, 412–419. https://doi.org/10.1016/j.geoforum.2020.12.009

Beyes, T., Conrad, L., Martin, R., Lovink, G., & Rossiter, N. (2019). *Organize* (1° edizione). Univ of Minnesota Pr.

Birch, K., & Muniesa, F. (2020). *Assetization: Turning Things into Assets in Technoscientific Capitalism*. The MIT Press.

Blackman, L. (2012). *Immaterial Bodies: Affect, Embodiment, Mediation* (1° edizione). SAGE Publications Ltd.

Bojadžijev, M., & Mezzadra, S. (2018). La logistica delle migrazioni, intervista a cura di Niccolò Cuppini e Mattia Frapporti. *Zapruder*, *46*, 108–113.

Bologna, S. (1991). The theory and history of the mass worker in Italy. *Common Sense*, *11*, 16–29.

Bolter, J. D., & Grusin, R. (1998). *Remediation: Understanding New Media*. Mit Pr.

Bostrom, N. (2005). Transhumanist Values. *Journal of Philosophical Research*, *30*(Supplement), 3–14. https://doi.org/10.5840/jpr\emph200526

Botsman, R., & Rogers, R. (2010). *What's Mine Is Yours: The Rise of Collaborative Consumption* (Illustrated edition). Harper Business.

Braidotti, R. (2013). *The Posthuman* (First Edition edition). Polity Press.

Bratton, B. H. (2016). *The Stack: On Software and Sovereignty*. MIT Press.

Braverman, S. & Home Office. (2023, June 16). *Over 100 arrested in record breaking illegal working crackdown*. GOV.UK. https://www.gov.uk/government/news/over-100-arrested-in-record-breaking-illegal-working-crackdown

Brewer, J. D. (2000). *Ethnography*. Open University Press.

Briziarelli, M., & Armano, E. (2022). Domus Capitalismi: Abstract Spaces and Domesticated Subjectivities in Times of Covid-19. *University of Westminster Press*. https://doi.org/10.16997/book54.d

Browne, S. (2015). *Dark Matters: On the Surveillance of Blackness* (Illustrated edition). Duke University Press Books.

Bruns, A. (2008). The Future Is User-Led: The Path towards Widespread Produsage. *Fibreculture Journal*, *11*.

Bucher, T. (2012). Want to be on the top? Algorithmic power and the threat of invisibility on Facebook. *New Media & Society*, *14*(7), 1164–1180. https://doi.org/10.1177/1461444812440159

Budros, A. (1997). The New Capitalism and Organizational Rationality: The Adoption of Downsizing Programs, 1979-1994. *Social Forces*, *76*(1), 229–249. https://doi.org/10.2307/2580324

Burawoy, M. (1998). The Extended Case Method. *Sociological Theory*, *16*(1), 4–33. https://doi.org/10.1111/0735-2751.00040

Burk, D. L., & Reyman, J. (2014). Patents as Genre: A Prospectus. *Law and Literature*, *26*(2), 163–190.

Burrell, M. (2023, April 24). 60 delivery drivers arrested in London amid Home Office crackdown. *Evening Standard*.

Cant, C. (2019). *Riding for Deliveroo: Resistance in the New Economy* (1 edition). Polity.

Cant, C. (2020). The warehouse without walls: A workers' inquiry at Deliveroo. *Ephemera: Theory & Politics in Organization*, *20*(4).

Casilli, A. A. (2020). *Schiavi del clic. Perché lavoriamo tutti per il nuovo capitalismo?* (R. A. Ventura, Trans.). Feltrinelli.

Castells, M. (1996). *The Rise of The Network Society* (1st edition). Wiley-Blackwell.

Castells, M. (2007). Space of flows, space of places: Materials for a theory of urbanism in the Information Age. In W. W. Braham, J. S. Sadar, & J. A. Hale (Eds.), *Re-thinking technology: A reader in architectural theory* (pp. 440–456). Routledge.

Ceurstemont, S. (2020, January 9). Teleworking is here to stay – here's what it means for the future of work | Research and Innovation. *Horizon, The EU Research & Innovation Magazine*.

Chan, J., Selden, M., & Ngai, P. (2020). *Dying for an iPhone: Apple, Foxconn, and The Lives of China's Workers* (Illustrated edition). Haymarket Books.

Chang, H. (2008). *Autoethnography as Method*. Routledge. https://doi.org/10.4324/9781315433370

Channel 4 Documentaries (Director). (2023, March 14). *Low Pay Britain: The Truth About Your Job | Dispatches | Channel 4 Documentaries*. https://www.youtube.com/watch?v=Df990RzNwBo

Chiappini, L., & Bogers, L. (2019). *The Critical Makers Reader*. Institute of Network Culture, Amsterdam, 2019.

Chicchi, F., & Marrone, M. (2023). I paradossi del lavoro di piattaforma. Dal lavoro digitale al salario prestazionale. In M. Pirone, *Ultimo miglio. Lavoro di piattaforma e conflitti urbani*. Fondazione Giangiacomo Feltrinelli.

Chu, A. L. (2019). *Females*. Verso.

Chude-Sokei, L. (2015). *The Sound of Culture: Diaspora and Black Technopoetics*. Wesleyan University Press.

Chun, W. H. K. (2005). On Software, or the Persistence of Visual Knowledge. *Grey Room*, *18*, 26–51. https://doi.org/10.1162/1526381043320741

Chun, W. H. K. (2011). On Sourcery, or Code as Fetish. In *Imagery in the 21st Century*. The MIT Press. https://doi.org/10.7551/mitpress/9780262015721.003.0010

Chun, W. H. K. (2016). Crisis, Crisis, Crisis, or The Temporality of Networks. In *Updating to Remain the Same: Habitual New Media* (pp. 69–91). MITP.

CIPD. (2017). *To gig or not to gig? Stories from the modern economy — Future of Work Hub*. Chartered Institute of Personnel and Development.

Clough, P. T. (1998). *The End(s) of Ethnography: From Realism to Social Criticism* (2nd ed. edition). Peter Lang Inc., International Academic Publishers.

Clough, P. T. (2007). Introduction. In J. Halley & P. T. Clough (Eds.), *The Affective Turn: Theorizing the Social*. Duke University Press.

Coase, R. H. (1937). The Nature of the Firm. *Economica*, *4*(16), 386–405. https://doi.org/10.1111/j.1468-0335.1937.tb00002.x

Combes, M. (2012). *Gilbert Simondon and the Philosophy of the Transindividual* (T. LaMarre, Trans.). MIT Press.

Cornet, M., Le Ludec, C., Wahal, E., & Joulin, M. (2022). Beyond 'platformisation': Designing a mixed-methods approach to inspect (digital) working conditions through organisational systems. *Work Organisation, Labour & Globalisation*. https://doi.org/10.13169/workorgalaboglob.16.1.0052

Corriere Della Sera. (2020, April 13). Milano, l'esercito dei rider in attesa di un treno. *Video: ultime notizie - Corriere TV*. https://video.corriere.it/cronaca/milano-l-esercito-rider-attesa-un-treno/e76f24ee-7d9a-11ea-bfaa-e40a2751f63b

Cowen, D. (2014). *The Deadly Life of Logistics: Mapping Violence in Global Trade*. Univ Of Minnesota Press.

Crawford, K. (2021). *Atlas of Ai: Power, Politics, and the Planetary Costs of Artificial Intelligence*. Yale Univ Pr.

Crawford, K., & Joler, V. (2018, September 7). Anatomy of an AI System: The Amazon Echo as an anatomical map of human labor, data and planetary resources. *AI Now Institute and Share Lab*. http://www.anatomyof.ai

Cubitt, S. (2017). *Finite Media: Environmental Implications of Digital Technologies*. Duke Univ Pr.

Davis, J., Hirschl, T., & Stack, M. (1997). *Cutting Edge: Technology, Information Capitalism and Social Revolution*. Verso.

De Boever, A., Murray, A., & Roffe, J. (Eds.). (2013). 'Technical Mentality' Revisited: Brian Massumi on Gilbert Simondon. In *Gilbert Simondon: Being and Technology* (p. 0). Edinburgh University Press. https://doi.org/10.3366/edinburgh/9780748677214.003.0002

De Stefano, V. (2016). The Rise of the "Just-in-Time Workforce": On-Demand Work, Crowdwork, and Labor Protection in the "Gig Economy." *Comparative Labor Law Journal: A Publication of the*

U.S. National Branch of the International Society for Labor Law and Social Security [and] the Wharton School, and the Law School of the University of Pennsylvania, *37*, 471–504.

Deleuze, G. (1988). *Foucault*. Athlone.

Deleuze, G. (1997). *Negotiations 1972-1990* (Revised edizione). Columbia Univ Pr.

Deleuze, G., & Guattari, F. (1983). *Anti-Oedipus: Capitalism and Schizophrenia* (Reprint edizione). Univ of Minnesota Pr.

Deleuze, G., & Guattari, F. (1987). *A Thousand Plateaus: Capitalism and Schizophrenia* (B. Massumi, Trans.; First Edition). University of Minnesota Press.

Delfanti, A. (2021). *The Warehouse: Workers and Robots at Amazon*. Pluto Press.

Delfanti, A., & Frey, B. (2021). Humanly Extended Automation or the Future of Work Seen through Amazon Patents. *Science, Technology, & Human Values*, *46*(3), 655–682. https://doi.org/10.1177/0162243920943665

Dickey, M. R. (2019, June 12). Uber will start testing Eats drone delivery. *TechCrunch*. https://techcrunch.com/2019/06/12/uber-will-start-testing-eats-drone-delivery/

Dixon-Román, E., & Puar, J. (2021, December). Mass Debilitation and Algorithmic Governance. *E-Flux*, *123*. https://www.e-flux.com/journal/123/436945/mass-debilitation-and-algorithmic-governance/

Dube, A., Jacobs, J., Naidu, S., & Suri, S. (2020). Monopsony in Online Labor Markets. *American Economic Review: Insights*, *2*(1), 33–46. https://doi.org/10.1257/aeri.20180150

Dyer-Witheford, N. (2013). Red Plenty Platforms. *Culture Machine*.

Dyer-Witheford, N. (2015). *Cyber-Proletariat: Global Labour in the Digital Vortex*. Pluto Press.

Easterling, K. (2016). *Extrastatecraft: The Power of Infrastructure Space* (Illustrated edition). Verso Books.

Edwards, R. (1991). *Contested Terrain: The Transformation of the Workplace in the Twentieth Century*. Ashgate Publishing Limited.

EUR-Lex. (2021). *Commission staff Working document Executive summary of the Impact assessment report. Accompanying the document "Proposal for a Directive of the European Parliament and of the Council On improving working conditions in platform work"* [Working Document]. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52021SC0397

Euromonitor International. (2019). *Ghost Kitchens, Virtual Restaurants, and a Delivery-Optimized Future*.

Fairwork. (n.d.). *Methodology*. Retrieved August 13, 2022, from https://fair.work/en/fw/methodology/

Federici, S. (2012). *Revolution at Point Zero: Housework, Reproduction, and Feminist Struggle*. PM Press.

Feher, M. (2018). *Rated Agency: Investee Politics in a Speculative Age* (G. Elliott, Trans.). Zone Books.

Ferreira da Silva, D. (2007). *Toward a Global Idea of Race* (First edition). University of Minnesota Press.

Fisher, M. (2020). *Postcapitalist Desire: The Final Lectures* (M. Colquhoun, Ed.). Repeater.

Fortunati, L. (2007). Immaterial Labor and Its Machinization. *Theory & Politics in Organization*, *7*. https://doi.org/10.1002/9781405165518.wbeos1128

Fortune. (1946). *Fortune Magazine, Volume XXXIV Number 5: Vol. XXXIV*. Time, Inc. https://www.biblio.com/book/fortune-magazine-volume-xxxiv-number-5/d/1489402402

Foscarini, F. (2019). The Patent Genre: Between Stability and Change. *Archivaria*, *87*(87), 36–67.

Fotiadis, A., & Stavinoha, L. (2020, June 22). Asylum Outsourced: McKinsey's Secret Role in Europe's Refugee Crisis. *Balkan Insight*.

Fotopoulou, A. (2019). Understanding citizen data practices from a feminist perspective: Embodiment and the ethics of care. In *Citizen Media and Practice*. Routledge.

Foucault, M. (1991). *Discipline and Punish: The Birth of the Prison* (A. Sheridan, Trans.; New Ed edition). Penguin.

Foucault, M. (2008). *The Birth of Biopolitics: Lectures at the Collège de France, 1978-1979* (G. Burchell, Trans.). Springer.

Franklin, S. (2015). *Control: Digitality as Cultural Logic*. MIT Press.

Franklin, S. (2021). *The Digitally Disposed: Racial Capitalism and the Informatics of Value*. University of Minnesota Press.

Frase, P. (2016). *Four Futures: Life After Capitalism*. Verso.

Fraser, M. (2009). Experiencing Sociology. *European Journal of Social Theory*, *12*(1), 63–81. https://doi.org/10.1177/1368431008099644

Frey, C. B., & Osborne, M. A. (2013). *The Future of Employment: How susceptible are jobs to computerisation?* (Oxford Martin Programme on Technology and Employment). University of Oxford. https://www.oxfordmartin.ox.ac.uk/publications/the-future-of-employment/

Frydman, A. A. (2022). *Work and Pleasure; Investigating The Rise of Digital Nomads In Mexico*. Stanford Institute for Economic Policy Research (SIEPR).

Fuchs, C. (2014). *Digital Labour and Karl Marx* (1st edition). Routledge.

Fuller, M. (Ed.). (2008). *Software Studies: A Lexicon*. The MIT Press.

Fuller, M. (2017). *How to Be a Geek: Essays on the Culture of Software* (1. edizione). Polity Pr.

Fuller, M., & Goffey, A. (2012). *Evil Media*. MIT Press.

Fuller, M., & Harwood, G. (2016). Abstract Urbanism. In R. Kitchin & S.-Y. Perng (Eds.), *Kitchin, R. (Ed.), Perng, S.Y. (Ed.). (2016). Code and the City. London: Routledge.* Routledge.

Gabrys, J. (2011). *Digital Rubbish: A Natural History of Electronics*. U OF M DIGT CULT BOOKS.

Gago, V. (2017). *Neoliberalism from Below: Popular Pragmatics and Baroque Economies* (L. Mason-deese, Trans.). Duke Univ Pr.

Gajjar, M. J. (2017). *Mobile Sensors and Context-Aware Computing* (1° edizione). Morgan Kaufmann.

Galloway, A. R. (2006). *Protocol: How Control Exists after Decentralization* (R. F. Malina & S. Cubitt, Eds.; Illustrated edition). MIT Press.

Galloway, A. R. (2012). *The Interface Effect* (1st edition). Polity.

Galloway, A. R., Thacker, E., & Wark, M. (2013). *Excommunication: Three Inquiries in Media and Mediation*. University of Chicago Press.

Gandini, A. (2016). *The Reputation Economy: Understanding Knowledge Work in Digital Society* (1st ed. 2016 edition). Palgrave Macmillan.

Gandini, A. (2019). Labour process theory and the gig economy. *Human Relations*, *72*(6), 1039–1056. https://doi.org/10.1177/0018726718790002

García, A. C., Maier, S., & Phillips, A. (2020). *Location-Based Services in Cellular Networks: From GSM to 5G NR* (2nd ed. edizione). Artech House.

Gawer, A. (2014). Bridging differing perspectives on technological platforms: Toward an integrative framework. *Research Policy*, *43*(7), 1239–1249. https://doi.org/10.1016/j.respol.2014.03.006

Giardina Papa, E. (Director). (2020, February 4). *Elisa Giardina Papa: Notes on Post-Work*.

Gig Economy Researchers United. (2020, August 10). Open Letter and Principles for Ethical Research on the Gig Economy. *Medium*.

Gilbert, J. (2013). *Common Ground: Democracy and Collectivity in an Age of Individualism*. Pluto Press.

Gillespie, T. (2010). The politics of 'platforms.' *New Media & Society*, *12*(3), 347–364. https://doi.org/10.1177/1461444809342738

Gillespie, T. (2016). #Trendingistrending: When Algorithms Become Culture. *Algorithmic Cultures: Essays on Meaning, Performance and New Technologies*. https://www.microsoft.com/en-us/research/publication/trendingistrending-when-algorithms-become-culture-3/

Giousmpasoglou, C., Ladkin, A., & Marinakou, E. (2023). Worker exploitation in the gig economy: The case of dark kitchens. *Journal of Hospitality and Tourism Insights*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/JHTI-10-2022-0477

Giuliani, A., & Vercellone, C. (2019). An introduction to cognitive capitalism: A Marxist approach. In *Cognitive Capitalism, Welfare and Labour*. Routledge.

Gleick, J. (2012). *The Information: A History, A Theory, A Flood*. Vintage.

Graeber, D. (2013). *Debt: The First 5,000 Years* (Reprint edizione). Melville House Pub.

Graham, M. (2020). Regulate, replicate, and resist – the conjunctural geographies of platform urbanism. *Urban Geography*, *41*(3), 453–457. https://doi.org/10.1080/02723638.2020.1717028

Graham, M., Hjorth, I., & Lehdonvirta, V. (2017). Digital labour and development: Impacts of global digital labour platforms and the gig economy on worker livelihoods. *Transfer: European Review of Labour and Research*, *23*(2), 135–162. https://doi.org/10.1177/1024258916687250

Gray, M. L., & Suri, S. (2019). *Ghost Work: How to Stop Silicon Valley from Building a New Global Underclass* (Illustrated edition). Harper Business.

Grusin, R. (2015). Radical Mediation. *Critical Inquiry*, *42*(1), 124–148. https://doi.org/10.1086/682998

Guattari, F. (2012). *Chaosmosis: An Ethico-Aesthetic Paradigm* (P. Bains & J. Pefanis, Trans.). Power Publications, Sydney.

Haider, A., & Mohandesi, S. (2013, September 27). Workers' Inquiry: A Genealogy. *Viewpoint Magazine*. https://www.viewpointmag.com/2013/09/27/workers-inquiry-a-genealogy/

Hannonen, O. (2020). In search of a digital nomad: Defining the phenomenon. *Information Technology & Tourism*, *22*. https://doi.org/10.1007/s40558-020-00177-z

Hansen, M. B. N. (2006). *Bodies in Code* (1st edition). Routledge.

Hansen, M. B. N. (2015). Our predictive condition; or, prediction in the wild. In R. Grusin, *The Nonhuman Turn* (pp. 101–138).

Haraway, D. (1988). Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies*, *14*(3), 575–599. https://doi.org/10.2307/3178066

Haraway, D. (1991). A Cyborg Manifesto. In *Simians, Cyborgs, and Women: The Reinvention of Nature* (1° edizione). Routledge.

Haraway, D. (2015). Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin. *Environmental Humanities*, *6*(1), 159–165. https://doi.org/10.1215/22011919-3615934

Hardt, M., & Negri, A. (2001). *Empire* (Revised ed. edition). Harvard University Press.

Hargreaves, R. (2022, April 12). Deliveroo keeps on growing – but when will it turn a profit? *MoneyWeek*. https://moneyweek.com/investments/stockmarkets/uk-stockmarkets/604697/deliveroo-keeps-on-growing-but-when-will-it-turn-a

Harney, S., Cuppini, N., & Frapporti, M. (2018, October 5). *Logistics Genealogies. A Dialogue with Stefano Harney – Into the Black Box*. http://www.intotheblackbox.com/articoli/logistics-genealogies-a-dialogue-with-stefano-harney/

Harney, S., & Moten, F. (2013). *The Undercommons: Fugitive Planning & Black Study* (1st edition). Autonomedia.

Harvey, D. (2001). *Spaces of Capital: Towards a Critical Geography*. Edinburgh University Press.

Hayek, F. A. (1945). The Use of Knowledge in Society. *The American Economic Review*, *XXXV*(4), 519–530. https://doi.org/10.1142/9789812701275_0025

Hayles, N. K. (1999). *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (74th ed. edition). University of Chicago Press.

Hayles, N. K. (2017). *Unthought: The Power of the Cognitive Nonconscious*. University of Chicago Press.

Hayns, J. (2018, September 19). "Everything comes from struggle": An interview with The Paris Autonomous Deliverers' Collective. *Notes From Below*. https://notesfrombelow.org/article/everything-comes-struggle

Hermann, J. (2017, September 5). Meet Michelangelo: Uber's Machine Learning Platform. *Uber Blog*. https://www.uber.com/en-NL/blog/michelangelo-machine-learning-platform/

Hidden Architecture. (2021, September 13). Monticello. *Hidden Architecture*. http://hiddenarchitecture.net/monticello/

Hlongwa, L. N. (2022). A critical engagement with platforms through patent analysis. In M. Pirone, M. Frapporti, N. Cuppini, F. Milesi, & C. Benvegnù, *Platforms have the Power... And People can take it* (Vol. 4). Dipartimento delle Arti, Università di Bologna.

Hlongwa, L., & Talamayan, F. (2023). Patenting sociality: Uncovering the operational logics of Facebook through critical patent analysis. *Media, Culture & Society*, *45*(6), 1135–1155. https://doi.org/10.1177/01634437231154759

Hu, X., Binaykiya, T., Frank, E., & Cirit, O. (2022). *DeeprETA: An ETA Post-processing System at Scale* (arXiv:2206.02127). arXiv. http://arxiv.org/abs/2206.02127

Hu, X., Cirit, O., Binaykiya, T., & Hora, R. (2022, February 10). DeepETA: How Uber Predicts Arrival Times Using Deep Learning. *Uber Blog*. https://www.uber.com/en-MT/blog/deepeta-how-uber-predicts-arrival-times/

Hughes, A., & Mee, K. (2019). Wayfinding with my iPhone: An autoethnographic account of technological companionship and its affects. *Emotion, Space and Society*, *33*, 100613. https://doi.org/10.1016/j.emospa.2019.100613

Hughes, C., & Lury, C. (2013). Re-turning feminist methodologies: From a social to an ecological epistemology. *Gender and Education*, *25*(6), 786–799. https://doi.org/10.1080/09540253.2013.829910

Hughes, E. C. (1971). *The Sociological Eye: Selected Papers*. Aldine-Atherton.

Hui, Y. (2012). What Is A Digital Object? *Metaphilosophy*, *43*(4), 380–395.

Hui, Y. (2015). Modulation after Control. *New Formations*, *84*, 74–91. https://doi.org/10.3898/NewF:84/85.04.2015

Hui, Y. (2019). *Recursivity and Contingency*. Rowman & Littlefield International.

Illich, I. (1981). *Shadow Work*. Marion Boyars.

InfoQ (Director). (2019, April 24). *Michelangelo—Machine Learning @Uber*. https://www.youtube.com/watch?v=iCpp5mqTeXE

International Labour Organization. (2015). *World Employment and Social Outlook 2015: The Changing Nature of Jobs* [Report]. http://www.ilo.org/global/research/global-reports/weso/2015-changing-nature-of-jobs/WCMS_368626/lang--en/index.htm

International Labour Organization. (2021). *The role of digital labour platforms in transforming the world of work* [Report]. http://www.ilo.org/global/research/global-reports/weso/2021/WCMS_771749/lang--en/index.htm

Into the Black Box. (2022). *Le frontiere del capitale. Come la nuova organizzazione logistica e il potere degli algoritmi hanno cambiato il mondo*. Red Star Press.

Into the Black Box. (2021, April 22). *The perfect storm. Political overview of the new Suez crisis in the geo-historical scenario*. http://www.intotheblackbox.com/articoli/the-perfect-storm/

Iphofen, R., Huws, U., & Spencer, N. H. (2022). Researching precarious, virtual and clandestine labour: Methodological and ethical challenges. *Work Organisation, Labour & Globalisation*. https://doi.org/10.13169/workorgalaboglob.16.1.0007

Irani, L. (2015). The cultural work of microwork. *New Media & Society*, *17*(5), 720–739. https://doi.org/10.1177/1461444813511926

James, C. L. R. (1989). *The Black Jacobins: Toussaint L'Ouverture and the San Domingo Revolution* (2nd edition). Vintage.

Jarrett, K. (2015). *Feminism, Labour and Digital Media: The Digital Housewife* (1st edition). Routledge.

Jarrett, K. (2022). *Digital Labor* (1. edizione). Polity Pr.

Joint Research Centre. (2023). *Platformisation of work: Accelerated by the pandemic, a phenomenon likely to grow*. https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/platformisation-work-accelerated-pandemic-phenomenon-likely-grow-2023-04-17_en

Jones, A., & Murphy, J. T. (2011). Theorizing practice in economic geography: Foundations, challenges, and possibilities. *Progress in Human Geography*, *35*(3), 366–392. https://doi.org/10.1177/0309132510375585

Jones, P. (2012). Sensory indiscipline and affect: A study of commuter cycling. *Social & Cultural Geography*, *13*(6), 645–658. https://doi.org/10.1080/14649365.2012.713505

Kampouri, E. (2022). Gendering platform research: Theoretical and methodological considerations. *Work Organisation, Labour & Globalisation*. https://doi.org/10.13169/workorgalaboglob.16.1.0014

Kässi, O., & Lehdonvirta, V. (2018). Online labour index: Measuring the online gig economy for policy and research. *Technological Forecasting and Social Change*, *137*, 241–248. https://doi.org/10.1016/j.techfore.2018.07.056

Kellogg, K. C., Valentine, M. A., & Christin, A. (2020). Algorithms at Work: The New Contested Terrain of Control. *Academy of Management Annals*, *14*(1), 366–410. https://doi.org/10.5465/annals.2018.0174

Kember, S., & Zylinska, J. (2012). *Life after New Media: Mediation as a Vital Process*. MIT Press.

Kircher, M. M. (2023, July 17). How PinkyDoll Mesmerized the Internet With 'Ice Cream So Good.' *The New York Times*. https://www.nytimes.com/2023/07/17/style/pinkydoll-social-media-livestream.html

Kitchin, R., & Dodge, M. (2011). *Code/Space: Software and Everyday Life*. The MIT Press. https://doi.org/10.7551/mitpress/9780262042482.001.0001

Kittler, F. (2017). Real Time Analysis, Time Axis Manipulation (G. Winthrop-Young, Trans.). *Cultural Politics*, *13*(1), 1–18.

Knorr Cetina, K. (2009). The Synthetic Situation: Interactionism for a Global World. *Symbolic Interaction*, *32*(1), 61–87. https://doi.org/10.1525/si.2009.32.1.61

Knorr Cetina, K., & Bruegger, U. (2002). Traders' Engagement with Markets. *Theory, Culture & Society*, *19*(5–6), 161–185. https://doi.org/10.1177/026327602761899200

Kolinko. (2002). *Hotlines: Call Centre Inquiry Communism* (P. Position, Ed.). Kolinko.

Koranyi, B., & Baum, B. (2023, February 15). A third of euro zone employees want more remote working -ECB study. *Reuters*. https://www.reuters.com/world/europe/third-euro-zone-employees-want-more-remote-working-ecb-study-2023-02-15/

Krajewski, M. (2018). *The Server: A Media History from the Present to the Baroque* (I. Iurascu, Trans.). Yale Univ Pr.

Kushner, S. (2013). The freelance translation machine: Algorithmic culture and the invisible industry. *New Media & Society*, *15*(8), 1241–1258. https://doi.org/10.1177/1461444812469597

Latour, B. (1983). Give me a laboratory and I will raise the world. In K. Knorr-Cetina & M. Mulkay, *Science Observed: Perspectives on the Social Study of Science*. SAGE Publications.

Law, J. (2004). *After Method: Mess in Social Science Research*. Psychology Press.

Lazonick, W. (2013). The Fragility of the U.S. Economy: The Financialized Corporation and the Disappearing Middle Class. In D. Breznitz & J. Zysman (Eds.), *The Third Globalization: Can Wealthy Nations Stay Rich in the Twenty-First Century?* (p. 0). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199917822.003.0012

Lazzarato, M. (2006a). *Immaterial Labor* (First edition edition). University Of Minnesota Press.

Lazzarato, M. (2006b). The Machine. In G. Raunig, *Tausend Maschinen*. https://transversal.at/transversal/1106/lazzarato/en

Lazzarato, M. (2014). *Signs and Machines: Capitalism and the Production of Subjectivity* (J. D. Jordan, Trans.). Semiotext.

Lee, M. K., Kusbit, D., Metsky, E., & Dabbish, L. (2015). Working with Machines: The Impact of Algorithmic and Data-Driven Management on Human Workers. *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, 1603–1612. https://doi.org/10.1145/2702123.2702548

Lefebvre, H. (1991). *The Production of Space* (D. Nicholson-Smith, Trans.; 1st edition). Wiley-Blackwell.

Lentricchia, F., & DuBois, A. (2002). *Close Reading: The Reader* (Illustrated edition). Duke University Press Books.

Lichtenstein, N. (Ed.). (2006). *Wal-Mart: The face of twenty-first-century capitalism*. New Press.

Lomas, N. (2022, April 19). Deliveroo fined in France after court rules it abused riders' rights. *TechCrunch*. https://techcrunch.com/2022/04/19/deliveroo-france-lawsuit/?guccounter=1

Lorusso, S. (2019). *Entreprecariat: Everyone Is an Entrepreneur. Nobody Is Safe.* Onomatopee.

Lury, C. (2020). *Problem Spaces: How and Why Methodology Matters* (1. edizione). Polity Pr.

Lury, C., & Wakeford, N. (2012). Introduction: A perpetual inventory. In *Inventive Methods*. Routledge.

MacDougall, I. (2019, December 3). How McKinsey Helped the Trump Administration Carry Out Its Immigration Policies. *The New York Times*. https://www.nytimes.com/2019/12/03/us/mckinsey-ICE-immigration.html

MacKenzie, A. (2002). *Transductions: Bodies and Machines at Speed*. Bloomsbury Academic.

Mackenzie, A. (2010). *Wirelessness: Radical Empiricism in Network Cultures*. MIT Press.

Mackenzie, A. (2017). *Machine Learners: Archaeology of a Data Practice*. The MIT Press.

Manovich, L. (2002). *The Language of New Media* (Reprint edizione). The MIT Press.

Manovich, L. (2005). Understanding Meta-Media. *CTheory*, 10/26/2005-10/26/2005.

Mantz, J. W. (2008). Improvisational economies: Coltan production in the eastern Congo. *Social Anthropology/Anthropologie Sociale*, *16*(1), 34–50. https://doi.org/10.1111/j.1469-8676.2008.00035.x

Marazzi, C. (2010). *The Violence of Financial Capitalism* (K. Lebedeva, Trans.). Semiotext.

Marcus, G. E. (2012). Multi-sited ethnography: Five or six things i know about it now. *Multi-Sited Ethnography: Problems and Possibilities in the Translocation of Research Methods*, 16–32. https://doi.org/10.4324/978020381015

Marx, G. T. (2006). Soft Surveillance: The Growth of Mandatory Volunteerism in Collecting Personal Information—"Hey Buddy Can You Spare a DNA?" In *Surveillance and Security*. Routledge.

Marx, K. (1976). *Capital: Volume 1: A Critique of Political Economy*. Penguin Publishing Group.

Marx, K. (2014). Fragment on Machines. In A. Avanessian & R. Mackay (Eds.), *#Accelerate: The Accelerationist Reader* (2 edition). Urbanomic.

Massumi, B. (2002). On the Superiority of the Analog. In *Parables for the Virtual*. https://read.dukeupress.edu/books/book/700/chapter/133392/On-the-Superiority-of-the-Analog

Maturana, H. R., & Varela, F. J. (1980). *Autopoiesis and Cognition: The Realization of the Living* (1st edition). D. Reidel Publishing Company.

Mau, S. (2023). *Mute Compulsion: A Marxist Theory of the Economic Power of Capital*. Verso.

Mayer-Schönberger, V., & Cukier, K. (2013). *Big Data: A Revolution that Will Transform how We Live, Work, and Think*. Houghton Mifflin Harcourt.

Mazali, T., & Gay, N. (2022). *Performed Subjectivities in Ranking and Recommendation Systems* (pp. 213–224). https://doi.org/10.16997/book54.p

McFarland, M. (2022, May 13). Uber to test delivering food with robots. *CNN Business*. https://www.cnn.com/2022/05/13/cars/uber-robot-delivery-la/index.html

McLuhan, M. (1994). *Understanding Media: The Extensions of Man* (L. H. Lapham, Ed.; Reprint edition). The MIT Press.

Mendonça, P., Kougiannou, N. K., & Clark, I. (2023). Informalization in gig food delivery in the UK: The case of hyper-flexible and precarious work. *Industrial Relations: A Journal of Economy and Society*, *62*(1), 60–77. https://doi.org/10.1111/irel.12320

Mezzadra, S., & Neilson, B. (2017). On the multiple frontiers of extraction: Excavating contemporary capitalism. *Cultural Studies*, *31*(2–3), 185–204. https://doi.org/10.1080/09502386.2017.1303425

Miao, G., Zander, J., Sung, K. W., & Slimane, S. B. (2016). *Fundamentals of Mobile Data Networks*. Cambridge University Press.

Michael, M. (2006). *Technoscience and Everyday Life* (1st edition). Open University Press.

Michael, M. (2012). Anecdote. In *Inventive Methods*. Routledge.

M.M. (2021, June 29). Riders e treni, partito il dialogo tra Trenord e le aziende di delivery. *MilanoToday*. https://www.milanotoday.it/attualita/trenord-aziende-delivery-riders.html

Mnih, V., Kavukcuoglu, K., Silver, D., Rusu, A. A., Veness, J., Bellemare, M. G., Graves, A., Riedmiller, M., Fidjeland, A. K., Ostrovski, G., Petersen, S., Beattie, C., Sadik, A., Antonoglou, I., King, H., Kumaran, D., Wierstra, D., Legg, S., & Hassabis, D. (2015). Human-level control through deep reinforcement learning. *Nature*, *518*(7540), 529–533. https://doi.org/10.1038/nature14236

Moore, J. W. (2018). The Capitalocene Part II: Accumulation by appropriation and the centrality of unpaid work/energy. *The Journal of Peasant Studies*, *45*(2), 237–279. https://doi.org/10.1080/03066150.2016.1272587

Mörtenböck, P., & Mooshammer, H. (2021). *Platform Austria*. https://platform-austria.org/it

Mosco, V. (2014). *To the Cloud: Big Data in a Turbulent World* (1st edition). Routledge.

mturk.com. (n.d.). *Amazon Mechanical Turk*. Retrieved July 26, 2022, from https://www.mturk.com/

Mulcahy, D. (2016). *The Gig Economy: The Complete Guide to Getting Better Work, Taking More Time Off, and Financing the Life You Want* (First Edition). AMACOM.

Mumford, L. (1963). *Technics and Civilizations*. Harcourt.

Munster, A. (2014). Transmateriality: Toward an Energetics of Signal in Contemporary Mediatic Assemblages. *Cultural Studies Review*, *20*(1), Article 1. https://doi.org/10.5130/csr.v20i1.3836

Murphie, A. (2019). The World As Medium: A Whiteheadian Media Philosophy. In E. Manning, A. Munster, & B. M. S. Thomsen, *Immediation I*.

Negri, T. (1988). Archaeology and project: The mass worker and the social worker. In *Revolution Retrieved: Writings on Marx, Keynes, Capitalist Crisis and New Social Subjects: Selected Writings on Marx, Keynes, Capitalist Crisis and New Social Subjects*. Left Bank Books.

Neilson, B. (2012). Five theses on understanding logistics as power. *Distinktion: Journal of Social Theory*, *13*(3), 322–339. https://doi.org/10.1080/1600910X.2012.728533

New Bermondsey. (2023). *The Scheme*. New Bermondsey. http://www.newbermondsey.com/the-scheme

Noble, D. F. (2011). *Forces of Production: A Social History of Industrial Automation* (1st edition). Routledge.

Notes from Below. (2018, January 29). The Workers' Inquiry and Social Composition. *Notes From Below*. https://notesfrombelow.org/article/workers-inquiry-and-social-composition

Panzieri, R. (1976). Surplus value and planning: Notes on the reading of Capital (J. Bees, Trans.). *The Labour Process and Class Strategies*, *1*, 4–25.

Parikka, J. (2015). *A Geology of Media* (1st edition). Univ Of Minnesota Press.

Parisi, L. (2016). Automation and Critique. In *Reinventing Horizons* (p. 240). Display Association for Research and Collective Practice.

Parisi, L. (2017). Reprogramming Decisionism. *E-Flux*, *85*. https://www.e-flux.com/journal/85/155472/reprogramming-decisionism/

Parisi, L. (2019). Critical Computation: Digital Automata and General Artificial Thinking. *Theory, Culture & Society*, *36*(2), 89–121. https://doi.org/10.1177/0263276418818889

Parisi, L., & Dixon-Román, E. (2020). Data capitalism, sociogenic prediction, and recursive indeterminacies. In P. Mörtenböck & H. Mooshammer (Eds.), *Data Publics*. Routledge.

Pasquale, F. (2015). *The Black Box Society: The Secret Algorithms That Control Money and Information*. Harvard Univ Pr.

Pasquinelli, M. (2015). Italian Operaismo and the Information Machine. *Theory, Culture & Society*, *32*(3), 49–68. https://doi.org/10.1177/0263276413514117

Pasquinelli, M. (2022). Labour, Energy, and Information as Historical Configurations: *Journal of Interdisciplinary History of Ideas*, *11*(22), Article 22. https://doi.org/10.13135/2280-8574/7340

Pasquinelli, M., & Joler, V. (2021). The Nooscope manifested: AI as instrument of knowledge extractivism. *AI & SOCIETY*, *36*(4), 1263–1280. https://doi.org/10.1007/s00146-020-01097-6

Perrigo, B. (2023, July 27). AI By the People, For the People. *Time*. https://time.com/6297403/the-workers-behind-ai-rarely-see-its-rewards-this-indian-startup-wants-to-fix-that/

Piasna, A., Zwysen, W., & Drahokoupil, J. (2022). *The platform economy in Europe*. https://www.etui.org/publications/platform-economy-europe

Pirone, M., Frapporti, M., Cuppini, N., Milesi, F., & Benvegnù. (2022). *Platforms have the Power… and People can take it – Into the Black Box*. Università di Bologna.

Plant, S. (1997). *Zeroes and Ones: Digital Women and the New Technoculture* (1st edition). Doubleday.

Powell, W., & Snellman, K. (2004). The Knowledge Economy. *Annual Review of Sociology*, *30*, 199–220. https://doi.org/10.1146/annurev.soc.29.010202.100037

Precarity Lab. (2020). *Technoprecarious*. Goldsmiths Press.

Qadri, R. (2021). Platform workers as infrastructures of global technologies. *Interactions*, *28*, 32–35. https://doi.org/10.1145/3466162

Qadri, R., & Raval, N. (2021, May 17). Mutual Aid Stations. *Logic Magazine*. https://logicmag.io/distribution/mutual-aid-stations/

Qiu, J., Gregg, M., & Crawford, K. (2014). Circuits of Labour: A Labour Theory of the iPhone Era. *tripleC: Communication, Capitalism & Critique. Open Access Journal for a Global Sustainable Information Society*, *12*. https://doi.org/10.31269/triplec.v12i2.540

Quaranta, D. (2021). «Human in the Loop». Visualizzare la massa invisibile. *L'effimero Tangibile. Dal Reale al Virtuale: Arti, Spettacolo e Prospettive, Di Comunicazione Digitale*.

Quicho, A. (n.d.). Everyone Is a Girl Online. *Wired*. Retrieved December 21, 2023, from https://www.wired.com/story/girls-online-culture/

Rapley, T. (2004). Interviews. In C. Seale, G. Gobo, J. F.Gubrium, & D. Silverman, *Qualitative Research Practice*. SAGE Publications Ltd. https://doi.org/10.4135/9781848608191

Rhee, J. (2018). *The Robotic Imaginary: The Human and the Price of Dehumanized Labor* (1st edition). Univ Of Minnesota Press.

Rifkin, J. (2013). *The Third Industrial Revolution: How Lateral Power Is Transforming Energy, the Economy, and the World*. St. Martin's Griffin.

Rifkin, J. (2015). *The Zero Marginal Cost Society: The Internet of Things, the Collaborative Commons, and the Eclipse of Capitalism* (Reprint edizione). Griffin.

Robinson, C. J. (2000). *Black Marxism: The Making of the Black Radical Tradition* (2nd edition). The University of North Carolina Press.

Rosenblat, A. (2019). *Uberland: How Algorithms Are Rewriting the Rules of Work*.

Rosenblat, A., & Stark, L. (2016). Algorithmic Labor and Information Asymmetries: A Case Study of Uber's Drivers. *International Journal of Communication*, *10*(0), Article 0.

Rossi, U. (2019). The common-seekers: Capturing and reclaiming value in the platform metropolis. *Environment and Planning C: Politics and Space*, *37*(8), 1418–1433. https://doi.org/10.1177/2399654419830975

Rossiter, N. (2016). *Software, Infrastructure, Labor: A Media Theory of Logistical Nightmares* (1st edition). Routledge.

Rouvroy, A., & Berns, T. (2013). Algorithmic governmentality and prospects of emancipation (L. Carey-Libbrecht, Trans.). *Reseaux*, *177*(1), 163–196.

Ruberg, B. (2022). Live play, live sex: The parallel labors of video game live streaming and webcam modeling. *Sexualities*, *25*(8), 1021–1039. https://doi.org/10.1177/13634607221103204

Sack, W. (2019). Logic. In *The Software Arts* (pp. 107–145). The MIT Press.

Sainato, M. (2019, January 1). "We are not robots": Amazon warehouse employees push to unionize. *The Guardian*. https://www.theguardian.com/technology/2019/jan/01/amazon-fulfillment-center-warehouse-employees-union-new-york-minnesota

Schmidt, U. (2012). Ambience and Ubiquity. In *Throughout: Art and Culture Emerging with Ubiquitous Computing*.

Schoenberger, E. (1997). *Cultural Crisis Firm*. John Wiley & Sons.

Schwab, K. (2016, January 14). The Fourth Industrial Revolution: What it means and how to respond. *World Economic Forum*. https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/

Seim, J. (2021). Participant Observation, Observant Participation, and Hybrid Ethnography. *Sociological Methods & Research*, 0049124120986209. https://doi.org/10.1177/0049124120986209

Silverman, D. (2007). *A Very Short, Fairly Interesting and Reasonably Cheap Book About Qualitative Research* (1° edizione). Sage Pubns Ltd.

Simondon, G. (1992). The Genesis of the Individual. In M. Cohen & S. Kwinter (Trans.), *Incorporations* (pp. 296–319). Zone Books.

Simondon, G. (2012). Technical Mentality. In A. D. Boever, *Gilbert Simondon: Being and Technology* (New edizione). Edinburgh Univ Pr.

Simondon, G. (2017). *On the Mode of Existence of Technical Objects* (C. Malaspina & J. Rogove, Trans.; 1st edition). Univ Of Minnesota Press.

Singleton, B. (2013, June). Maximum Jailbreak. *E-Flux*, *46*. https://www.e-flux.com/journal/46/60088/maximum-jailbreak/

Sinha, A. (1992). Client-server computing. *Communications of the ACM*, *35*(7), 77–98. https://doi.org/10.1145/129902.129908

Smith, P. (1989). Writing, General Knowledge, and Postmodern Anthropology. *Discourse*, *11*(2), 158–171.

Sohn-Rethel, A. (2021). *Intellectual and Manual Labour: A Critique of Epistemology* (M. Sohn-Rethel, Trans.). Haymarket Books.

Spencer, N., & Huws, U. (2021). Platformisation and the pandemic: Changes in workers' experiences of platform work in England and Wales, 2016-2021. In *Seven ways platform workers are fighting back* (pp. 9–24). Trades Union Congress. https://researchprofiles.herts.ac.uk/en/publications/platformisation-and-the-pandemic-changes-in-workers-experiences-o

Spicker, P. (2011). Ethical Covert Research. *Sociology*, *45*(1), 118–133. https://doi.org/10.1177/0038038510387195

Spilda, F. U., Howson, K., Johnston, H. E., Bertolini, A., Feuerstein, P., Bezuidenhout, L., Alyanak, O., & Graham, M. (2022). Is anonymity dead? : Doing critical research on digital labour platforms through platform interfaces. *Work Organisation, Labour & Globalisation*. https://doi.org/10.13169/workorgalaboglob.16.1.0072

Spivak, G. C. (2015). Can the Subaltern Speak? In P. Williams & L. Chrisman, *Colonial Discourse and Post-Colonial Theory: A Reader*. Routledge.

Srnicek, N. (2016). *Platform Capitalism*. Polity Press.

SSCU University of Hertfordshire. (2019). *Platform work in the UK 2016-2019*. Foundation for European Progressive Studies. https://feps-europe.eu/publication/682-platform-work-in-the-uk-2016-2019/

Stiegler, B. (2013). The Most Precious Good in the Era of Social Technologies. In G. Lovink (Ed.), *Unlike Us Reader: Social Media Monopolies and Their Alternatives* (pp. 16–30). Institute of Network Cultures.

Stiegler, B. (2016). *Automatic Society: The Future of Work* (D. Ross, Trans.; Volume 1 edizione). Polity Pr.

Stiegler, P. B. (2010). *For a new critique of political economy* (1st edition). Polity.

Suchman, L. (2012). Configuration. In *Inventive Methods*. Routledge.

Taylor, F. (2017). *Shop Management* (1° edizione). Productivity Press.

Terranova, T. (2004). *Network Culture: Politics For the Information Age*. Pluto Press.

Terranova, T. (2022). *After the Internet: Digital Networks between Capital and the Common*. Semiotext.

Thoburn, N. (2003). *Deleuze, Marx and Politics* (1st edition). Routledge.

Timko, P., & van Melik, R. (2021). Being a Deliveroo Rider: Practices of Platform Labor in Nijmegen and Berlin. *Journal of Contemporary Ethnography*, *50*(4), 497–523. https://doi.org/10.1177/0891241621994670

Tiqqun. (2012). *Preliminary Materials for a Theory of the Young-Girl* (A. Reines, Trans.). Semiotext.

Tiqqun. (2020). *The Cybernetic Hypothesis* (R. Hurley, Trans.). Semiotext.

Toscano, A. (2014, September 29). Lineaments of the Logistical State. *Viewpoint Magazine*, *4*. https://viewpointmag.com/2014/09/28/lineaments-of-the-logistical-state/

Tran, C. H. (2023, July 25). What the "NPC streaming" TikTok trend spells for the future of gaming and erotic work. *The Conversation*. http://theconversation.com/what-the-npc-streaming-tiktok-trend-spells-for-the-future-of-gaming-and-erotic-work-210257

Tronti, M. (1962). Factory and Society. *Operaismo in English*. https://operaismoinenglish.wordpress.com/2013/06/13/factory-and-society/

Tronti, M. (2019). *Workers and Capital* (D. Broder, Trans.). Verso.

Tsing, A. (2009). Supply Chains and the Human Condition. *Rethinking Marxism*, *21*(2), 148–176. https://doi.org/10.1080/08935690902743088

Tsuji, Y. S. (2012). Profiling technology development process using patent data analysis: A case study. *Technology Analysis & Strategic Management*, *24*(3), 299–310. https://doi.org/10.1080/09537325.2012.655417

Tubaro, P., Casilli, A. A., & Coville, M. (2020). The trainer, the verifier, the imitator: Three ways in which human platform workers support artificial intelligence. *Big Data & Society*, *7*(1), 2053951720919776. https://doi.org/10.1177/2053951720919776

Turkle, S. (1995). *Life on the Screen: Identity in the Age of the Internet*. Simon & Schuster.

Upadhya, R. K. (2018, March 30). Disrupting Disruption: On Intervening Against Technological Restructuring. *Notes From Below*. https://notesfrombelow.org/article/disrupting-disruption

van Dijck, J., Poell, T., & Waal, M. de. (2018). *The Platform Society: Public Values in a Connective World*. Oxford University Press.

van Doorn, N., Ferrari, F., & Graham, M. (2023). Migration and Migrant Labour in the Gig Economy: An Intervention. *Work, Employment and Society*, *37*(4), 1099–1111. https://doi.org/10.1177/09500170221096581

Varela, F. J., Thompson, E. T., & Rosch, E. (1992). *The Embodied Mind: Cognitive Science and Human Experience* (Revised ed. edition). Mit Pr.

Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., Kaiser, Ł., & Polosukhin, I. (2017). Attention is All you Need. *Advances in Neural Information Processing Systems*, *30*. https://papers.nips.cc/paper_files/paper/2017/hash/3f5ee243547dee91fbd053c1c4a845aa-Abstract.html

Veen, A., Barratt, T., & Goods, C. (2020). Platform-Capital's 'App-etite' for Control: A Labour Process Analysis of Food-Delivery Work in Australia. *Work, Employment and Society*, *34*(3), 388–406. https://doi.org/10.1177/0950017019836911

Veen, A., Kaine, S., Goods, C., & Barratt, T. (2020). The 'Gigification' of Work in the 21st Century. In *Contemporary Work and the Future of Employment in Developed Countries*. Routledge.

Virno, P. (2001). General Intellect. In A. Bove (Trans.), *Lessico Postfordista*. Feltrinelli.

Virno, P. (2004). *A Grammar of the Multitude: For an Analysis of Contemporary Forms of Life* (I. Bertoletti, J. Cascaito, & A. Casson, Trans.). Semiotext.

Virno, P. (2006). Do You Remember Counterrevolution? In P. Virno & M. Hardt (Eds.), *Radical Thought in Italy: A Potential Politics* (First edition, pp. 241–260). Univ Of Minnesota Press.

von Neumann, J. (2016). Probabilistic Logics and the Synthesis of Reliable Organisms From Unreliable Components. In *Probabilistic Logics and the Synthesis of Reliable Organisms From Unreliable Components* (pp. 43–98). Princeton University Press.

Vora, K. (2015). *Life Support: Biocapital and the New History of Outsourced Labor*. Univ of Minnesota Pr.

Waldrop, M. M. (2002). *The Dream Machine: J.C.R. Licklider and the Revolution That Made Computing Personal* (First Edition). Penguin Books.

Waliany, R., Kang, L., Murati, E., Amin, M. S., Volk, N. P., & Nguyen, T. L. (2019). *Trip inferences and machine learning to optimize delivery times* (United States Patent US20190385121A1). https://patents.google.com/patent/US20190385121A1/en?q=(trip+inferences)&assignee=uber+technologies&oq=uber+technologies+trip+inferences

Waters, F., & Woodcock, J. (2017, September 20). Far From Seamless: A Workers' Inquiry at Deliveroo. *Viewpoint Magazine*. https://www.viewpointmag.com/2017/09/20/far-seamless-workers-inquiry-deliveroo/

Weatherbed, J. (2023, November 14). Uber is testing a service that lets you hire drivers for chores. *The Verge*. https://www.theverge.com/2023/11/14/23960367/uber-tasks-pilot-chores-driver-courier-laborer

Weheliye, A. G. (2014). *Habeas Viscus: Racializing Assemblages, Biopolitics, and Black Feminist Theories of the Human* (Illustrated edition). Duke University Press Books.

Wiener, N. (1961). *Cybernetics: Or Control and Communication in the Animal and the Machine* (2° edizione). MIT Press.

Williams, A. (2015). Control Societies and Platform Logic. *New Formations: A Journal of Culture/Theory/Politics*, *84*(84), 209–227.

Williams, R. (1985). *Keywords: A Vocabulary of Culture and Society*. Oxford University Press, USA.

Wolfson, T., Huws, U., Farrar, J. M., & Aslam, Y. (2022). 'Alongside but not in front': Reflections on engagement, disengagement and ethics in action research with workers. *Work Organisation, Labour & Globalisation*.

Woodcock, J. (2014). The workers' inquiry from Trotskyism to Operaismo: A political methodology for investigating the workplace. *Ephemera: Theory & Politics in Organizations*, *14*(3), Article 3.

Woodcock, J., & Graham, M. (2020). *The Gig Economy: A Critical Introduction* (1st edition). Polity.

Woodcock, J., & Hughes, L. (2018, December 10). The View from the Picket Line: Reports from the food platform strike on October 4th. *Notes From Below*, *A Month of Revolt in the Service Sector*(4). https://notesfrombelow.org/article/view-picket-line-reports-food-platform-strike-octo

Wynter, S. (2003). Unsettling the Coloniality of Being/Power/Truth/Freedom: Towards the Human, After Man, Its Overrepresentation--An Argument. *CR: The New Centennial Review*, *3*(3), 257–337.

Yahoo Finance. (2023, September 21). *When Will Deliveroo plc (LON:ROO) Become Profitable?* Yahoo Finance. https://finance.yahoo.com/news/deliveroo-plc-lon-roo-become-112116394.html

Yuill, S. (2008). Interrupt. In M. Fuller, *Software Studies*. The MIT Press.

Yusoff, K. (2020). The Inhumanities. *Annals of the American Association of Geographers*, *111*(3), 663–676. https://doi.org/10.1080/24694452.2020.1814688

Zehle, S., & Rossiter, N. (2016). *Mediations of labor: Algorithmic architectures, logistical media, and the rise of black box politics* (pp. 40–50). https://doi.org/10.4324/9780203404119-4

Zhuo, S., Sherlock, L., Dobbie, G., Koh, Y. S., Russello, G., & Lottridge, D. (2020). Real-time Smartphone Activity Classification Using Inertial Sensors—Recognition of Scrolling, Typing, and Watching Videos While Sitting or Walking. *Sensors*, *20*(3), 655. https://doi.org/10.3390/s20030655