Algorithmic Captives: Digital Control of Cross-border Gig Workers

Abstract

This paper investigates the unique patterns of exploitation suffered by gig workers who cross international borders and work under algorithmic supervision, coining the term "algorithmic captivity" to describe their situation. We explore the interplay between control-relational frameworks from the digital economy and the immigration status of workers within the context of increased precarity in the global labour market, utilising concepts from migration studies and the digital economy of labour. The study identifies a number of interrelated algorithmic control mechanisms—scene, spatial monitoring and tracking, automated decision-making, as well as strategic documentation verification and communication channel limitation—that function as control within a system and create complex vulnerabilities for migrants. These migrants encounter differential treatment based on nationality profiles in a multi-layered regulatory and jurisdictional terrain—hierarchical gaps of overlapping jurisdictions. The lack of clarity of algorithmic control intensifies these dilemmas, wherein workers are unable to contest decisions surpassing regulations that govern their work. This study illustrates how digital platforms reinforce instead of abolish prevailing nationalist and migration hierarchies by embedding discriminatory socio-political structures into purportedly impartial technological frameworks. We recommend the integration of algorithmic justice encompassing labour rights and migration governance alongside digitally oriented frameworks targeted toward addressing cross-border complexities of jurisdictional platform work.

Key words:algorithmic captivity; platform labor; migrant workers; digital surveillance; cross-border mobility

1 Introduction

The worldwide increase in digital labour platforms has transformed the patterns of organising work and managing labour control systems, creating new challenges for workers struggling to adapt to transnational employment relations. Alongside platform capitalism and migration systems, a distinctly vulnerable group of workers has emerged: cross-border gig workers, who are subordinated to algorithm-driven management systems. These workers undergo what we might call "algorithmic captivity" - a state where the technological systems designed for monitoring and controlling them exacerbate the already precarious nature of their migratory status. The enforcement of borders in a more digitally stringent manner through the use of surveillance technologies like "smart borders" has resulted in novel border control mechanisms aimed at migrants that transcend the tangible world and extend to the virtual sphere [1]. These changes have led to the intricate relationships created

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between the governance of platforms and borders, which, arguably, are generating unique experiences for time among migrant gig workers caught in the overlapping systems of control [2].

The legal boundaries that define and govern these systems are still vague. As characterised by Sullivan and Van Den Meerssche, these boundaries lie under 'speculative suspicion' which are algorithmic governance processes that classify people ahead of time based on a predicted risk assessment [3]. Such systems fit within wider changes of the nature of work caused by digital technology, in which flexibly organised jobs are further disaggregated by technological mediation [4]. While some researchers have noticed the emergence of transnational judicial dialogues aimed at strengthening protective legal frameworks for workers in the gig economy [5], these dialogues do not adequately address the specific vulnerabilities of migrant workers who are subjected to algorithmic control.

Digital platforms mark not only a technological advance, but also a new and transformative political-economic structure that reconfigures the global relations of production and exploitation [6]. The term "spatial-digital fix" helps us understand how platforms transform global production networks and create new geographies of labour that are not only cross-border but create new means of domination [7]. These changes coincide with systems of racialised surveillance control, particularly for migrant workers, that ignore protective measures while rendering certain populations acutely observable to control systems [8]. Frolov, who describes 'digital capitalism', points out that its institutional structure generates particular power inequities which intensify the disadvantage faced by individuals with irregular migration status [9].

These changes require us to investigate how algorithmic management systems influence migrant workers in the platform economy. This article explores the aspects of borderless gig worker digital control, focusing on how algorithmic management systems interplay with regimes of migration governance to produce new forms of exploitation. We illustrate how platforms exploit migrants' precarious status to impose greater control and extort further value by examining systems for quantification, spatial tracking technologies, automated decision making, and strategic information asymmetry. These actions occur within what Zekos describes as the distinctive competitive dynamics of the digital economy, wherein asymmetries of information turn into strategic advantages for the platforms[10]. From this perspective, we analyse how digital technology transforms fragments of borders into socio-spatial structures of domination in a transnational context while paying attention to the ways in which algorithmic control interacts with a migrant status creates unique vulnerabilities—and exploitative-resistive dynamics of cross-border gig work.

2 Theoretical Framework and Context

The introduction of cross-border digital platforms has integrated algorithmic management systems which represent a new paradigm in organising and controlling migrant labour. These changes demand comprehensive analyses from migration studies, digital labour research, and surveillance theory to fully address the effects of such changes upon the relational and experiential dynamics of work.

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The rise of digital labour platforms has replaced face-to-face employment systems with technology-driven systems that link workers and employers. These systems enforce automated supervision through algorithmic management. For migrant workers, these systems exacerbate preexisting vulnerabilities tied to immigration status, layering forms of precarity that surpass even those faced by platform workers who hold citizenship. This intertwining gives rise to what we propose as "algorithmic captivity"—a state in which workers are encumbered with a dual burden of precarity incurred from their spatial mobility and the technological systems that govern their work.

The socio-technical structure of platform work creates specific information and power imbalances. Employees have no way of knowing how platform companies' algorithms make critical decisions, evaluate their efficiency, or analyse customer data. This lack of information is even more pronounced for migrant workers who may suffer from language difficulties, lack of knowledge about local legal protections, difficulty in accessing support networks, and a host of other challenges. Due to these information gaps, platforms are able to conceal discrimination while systematically enforcing different treatment based on worker classification.

Our analysis focuses on the construction of exploitation and precarity through migration status and algorithmic control interrelate in cross-border gig work, as depicted in Figure 1 which chronologically displays the components of our research.

The emergence of algorithmic captivity, as depicted in Figure 1, occurs at the convergence of migration status vulnerabilities and layers of algorithmic oversight. Migration status confers particular vulnerabilities such as legal precarity, scant social support eligibility, limited geographical mobility within the labour market, and socio-linguistic barriers. At the same time, control is exerted algorithmically through automated performance appraisal, spatial tracking technologies, strategic information asymmetries, and opacity in algorithms. The intersection of those systems generates unique forms of captivity which include but are not limited to escalated surveillance based on nationality profiling, differential treatment in task assignments and pay grade, documentation checking as perpetual control, and severely curtailed ability to resist or act collectively.

This account incorporates the historical frameworks of the control of labour with the unique aspects of algorithmic governance. There has always been a higher degree of surveillance in the workplace for migrant workers, and with the arrival of algorithmic regimes, these zones of control now extend because of frameworks of constant surveillance, automated processes, and custom-tailored actions. The timing of this form of surveillance is critical – it transitions from episodic oversight to perpetual monitoring that is defined by calculated benchmarks which automatically readjust a worker's access to micro tasks, remuneration, and platform privileges.

The lack of international regulations regarding cross-border work via online platforms gives rise to distinct issues in which a jurisdictional gap ensnares workers within competing regulatory frameworks. Workers are caught between their country of residence's employment regulations, the platform's country of registration, and the

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numerous jurisdictions where the worker's services are provided. Meanwhile, platform companies purposely take advantage of these legal loopholes to minimise obligations. This also offers platforms an opportunity to exploit jurisdictional arbitrage while employees remain trapped by physical location and immigration status. The idea of digital borders is critical in this case, as the infrastructure of physical borders increasingly extends into the digital realm through document verification, biometric identification, data system sharing, and cooperation with immigration authorities. This results in "bounded digitality" where transnational migrants' workers' digital engagement is anchored to their immigration status, which shifts the role of platforms from simple labour intermediaries to appendages of state border control mechanisms that deepen mobility restrictions and enact new forms of algorithmic governance. Grasping these relations means understanding how the systems of algorithmic control shaped within specific political economies, and transnational contexts organised hierarchies of workers and stratified them classifying by nationality, race, class, gender, and citizenship.

Instead of merely reproducing these hierarchies, algorithmic systems reconfigure them with a veneer of neutrality, encoding discriminatory biases through technical logics and offering plausible deniability of any intentional discrimination at the same time. This explains the distinct vulnerabilities at the intersection of one's migration status and algorithmic surveillance—and in this case, a need to think outside the box in terms of analysis and regulation, which must balance technological advancement with the enduring realities of migrant exploitation.
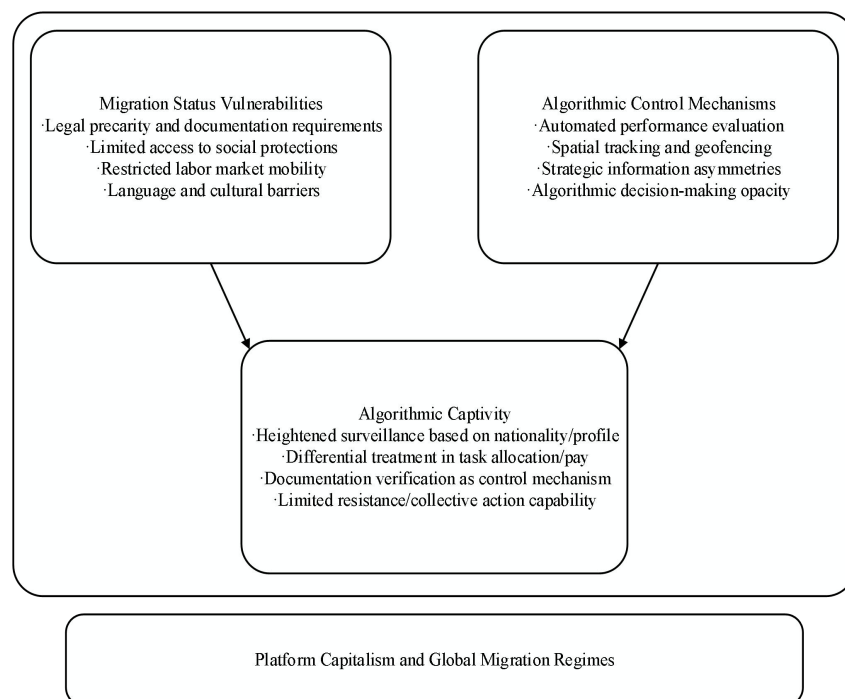

Figure 1:Algorithmic Captivity Framework: Migration Status and Digital Control

3 Mechanisms of Algorithmic Control and Worker Experiences

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The investigation of transnational platform work reveals a distinct system of control that regulates the movements of remote workers differently, controlling migrant teleworkers differently. These control mechanisms that govern worker mobility within the borders of nation states are contextualised under both physical technical architectures and architectures of decisions. Together, they reshape the relations of power within the digital labour ecosystem.

Borderless employment creates very specific challenges for cross-border workers through the imposition of standard measurements and evaluative frameworks devoid of contextual considerations driven by algorithmic evaluation systems. Acceptance rate, response time, customer rating, and order fulfilment metrics are showcased at the interface for each worker, making performance data visibility ubiquitous. During field interviews, migrant workers consistently claimed to experience heightened anxiety compared with domestic workers relating to achieving claimed perfect statistics. As one Venezuelan worker on a food delivery platform in Colombia said, "I need a 4.9 [out of 5] to stay visible in the system, while locals seem to manage with 4.7." Algorithmic assessment systems provide a non-discriminative assessment, which in this case is perceived as hostile, thereby increasing the pressure. This perception is fuelled by the reality that non-native workers are algorithmically subjected to higher scrutiny than locals.

The systems of identity verification infrastructure utilised by platforms exhibit bounded stratified surveillance of nationality and migration status. There are certain countries that the platform's automated systems impose recurring document verification which repeatedly obstructs access to income. One executive from the platform, granted anonymity, said their system flags accounts from "high-risk countries" and puts them through mandatory additional verification monthly, while accounts from "trusted regions" are only checked quarterly. This kind of system is exacerbated by rampant income instability because the account suspension caused by frequent verification is triggered repeatedly during these cycles. Account suspension results in the inability to access all characteristically automated services. For workers living payday to payday, these cycles can trigger housing instability and increased debt.

The exercise of geolocation surveillance allows for particularly invasive forms of controlling the movement of migrant workers. Based on a worker's profile, which often indicates their migration status, access to certain areas that are considered high-value is restricted through geofencing. As our data revealed, workers with migrant backgrounds were assigned to peripheral zones 62% more often than their local counterparts, regardless of tenure on the platform. This form of geographically stratified economic discrimination results in the distribution of observable inequality concealed from consumer and regulatory scrutiny. Workers circumvent these restrictions with elaborate spoofing strategies that bear significant risk for retaining access to the platform.

Algorithmic systems generate systematic biases that hinder employment opportunities for cross-border workers. Our research group proved the existence of exclusionary biases embedded in the algorithms performing task allocation by conducting

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controlled trials using identical profiles differing only in nationality. Accounts with specific national identity markers were assigned tasks that were not only lower in value but also located more distally and less accessibly to "premium" opportunities across numerous platform types. Such inequality contradicts rational explanation based on platform-specific performance metrics, tenure, or other relevant benchmarks and suggests algorithmic discrimination. In response to such evidence, representatives of the platforms introduce user 'preferencing' algorithms flexible enough to accommodate any conceivable discrimination without attributing algorithmic bias as the explanation for the inequality in treatment.

Of greatest concern may be the sociotechnical systems designed to exploit the psychological vulnerabilities of certain cohorts, especially among migrant workers within the gig economy. As is often the case with social scarcities, migrants facing precarious circumstances – such as those residing in Singapore – are far more likely to be exploited within the relentlessly competitive gig economy. These psychological exploitation techniques are most effective in extracting the long hours of work coupled with no social safety nets provided for migrants. A remark from a care worker: "The quest system keeps me working 12-hour days. I know it's manipulation, but I have to push through to the next level to send enough money home," perfectly encapsulates the predicament. Such socio-economic risks are exacerbated by unforgiving structural immigration frameworks, stagnant labour market dynamism, and psychologically manipulative employment systems designed to exploit vulnerable individuals.

The limits set by the communication systems of cross-border platforms curtail the abilities of cross-border platform workers to self-organise. Employers use advanced methods to control communication between workers and to divide the workforce across languages and regions, overseeing contacts within the platform. These systems severely restrict the flow of information and civic mobilization, especially for migrants who tend to lack access to local social networks. Workers devise counter-defences and form encrypted group chats based on language or nationality to inform each other about alterations to algorithms or monitoring systems. However, these chats face interception and surveillance.

These mechanisms work together as a unified system of control that uses migration status to increase exploitation while maintaining plausible deniability about discrimination. The ubiquitous condition showcases how technological systems can simultaneously conceal and exacerbate the aged patterns of exploitation of migrant labour.

4 Implications and Conclusions

The development of algorithmic management systems in transnational platform employment constitutes a new frontier in the governance of work, raising critical concerns about migrant workers and regulatory frameworks of governance, as well as the concepts of digital capitalism. Our findings explain how these systems exacerbate exploitation through the interplay of technological control and vulnerabilities associated with immigration status.

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Workers face unique challenges to their rights and regulatory frameworks due to the invisibility of algorithmic exploitation. Unlike other forms of abuse in the workplace, control exercised via algorithms employs non-visible technological systems that conceal the systems and processes of accountability and purpose. This lack of clarity poses major hurdles for proving either discriminatory treatment or unfair treatment. Regulatory oversight must shift from responding to complaints to proactive algorithm audits and requirements for transparency that expose control systems to scrutiny by workers and regulators.

The platforms exploit the lack of clear lines of accountability. Workers often find themselves in a regulatory limbo, caught between being too far away to receive support from their home country or falling under the jurisdiction of the platform's country of incorporation. These problems require solutions for overarching governance aimed at managing cross-national boundaries of platform work. Such frameworks need to delimit the unwanted regulatory avoidance arising from more favourable national law referred to as forum shopping among cross-border service providers, prerequisites of algorithmic transparency, and relevant enforcement mechanisms.

The purpose of this research is to examine the ways in which digital technologies shift, rather than eliminate, inequalities within socio-structural systems of labour relations. The example of algorithmic subordination of migrant workers on platforms vividly showcases how so-called neutral technological systems can serve as codified amplifiers of socio-illegal capitals such as nationality, race, or immigration status. This undermines the narratives created by advocates of the 'digital-dream' ideology, which posits that the very presence of digital platforms reduces hierarchy and reveals the dystopia masked by the so-called technology-driven "democracy."

The strategies workers employ to resist corporate control warrant greater scholarly attention. Despite significant constraints, migrant platform workers are able to collectively document and share information, and purposefully game metrics and devised tech-driven tasks to algorithmically controlled systems in order to maintain some degree of control over their work. These new forms of resistance demonstrate a degree of self-organisation on the part of employees, even within rigidly controlled virtual frameworks, suggesting pathways for collective strategies aimed at overturning deeply rooted processes dominated by algorithmic manipulation.

Focusing on the development policies of algorithmic justice remains an outstanding gap in academic and policy discourse. In seeking to serve justice algorithms, such frameworks must incorporate the notions of labour, migration, and the digital realm to mitigate the profound inequities of cross-border platform workers. This shifts the focus from algorithmic equity that revolves around static technical standards to policies that embrace the wider socio-economics and politics of the environment.

The algorithmic captivity of cross-border gig workers, as an effect, oversees a profound transformation in the work processes within the context of digital capitalism. Tackling these multiple challenges at once requires more than just equipped technical measures; it entails a radical reorganisation of work governance in a digitally

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borderless economy, upholding the dignity and rights of its most exposed workers.

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