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GeoMatch/MisMatch: A Critical Investigation of a Refugee Resettlement and Labour Market Integration Algorithm in the Netherlands

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Abstract

This article critically investigates the unintended and perverse effects of digital public technologies on refugees' fundamental rights and socio-economic inclusion. As a case study, we examine the GeoMatch algorithm, a recommender system implemented by the Dutch government to automate employment search and matching processes for refugees across its 35 labour market regions. As data and methods, we used close reading techniques to analyse a set of disclosed documents obtained through Freedom of Information (FOI) requests, drawing on the practices of investigative journalism. Contrary to official claims of effectiveness, economic impact, and objectivity, our findings suggest that GeoMatch's algorithmic system prioritises aggregate optimisation over individual opportunities, with a disproportionate risk of discrimination on the basis of ethnicity, gender, or marital status. The findings further indicate a diminished capacity for both refugees and reception officers to contest automated decisions, threatening refugees' human dignity and self-determination. We therefore argue that the deployment of GeoMatch should be reconsidered until these ethical concerns are adequately addressed. The article provides an empirical case supporting concerns raised in the literature on the role of algorithmic systems in social and economic stratification. Methodologically, our contribution endorses the emerging approach of combining FOI and close reading to study opaque technological systems and automated policy domains.

Keywords

AI; Big Data; digital migration governance; freedom of information; FOI requests; GeoMatch algorithm; refugee reception; refugee resettlement

1. Introduction

Digital technologies have significantly transformed the governance of migration and arrival infrastructures for asylum seekers. These innovations include the use of Big Data and AI to automate the identification and registration of newly arrived migrants, risk assessment, resettlement, housing allocation, welfare distribution, and improvements in labour markets and civic integration. Recently, recommender system algorithms have emerged in refugee reception to offer a data-driven approach to placement. Their goal is to match individual characteristics of refugees with local integration opportunities to improve outcomes such as employment and, consequently, reduce welfare expenditure. Yet their effectiveness in finding the most suitable living place for persons depends, for instance, on data quality, ethical design, and the inclusion of human judgment—what some call the "human-in-command"—to address complex and context-specific needs. These concerns raise urgent questions about the role of digital technologies in shaping socio-economic inclusion and exclusion for migrants.

Our case study examines the GeoMatch algorithm, a recommender system that has been implemented by the Central Agency for the Reception of Asylum Seekers (COA; Centraal Orgaan opvang Asielzoekers), the Dutch central government agency responsible for the reception, accommodation, and guidance of asylum seekers in the Netherlands. The GeoMatch algorithm was created by the Immigration Policy Lab (IPL, based at Stanford University and ETH Zurich) to predict employment outcomes for visa applicants in Canada (Ferwerda et al., 2020). There, the algorithm functioned as a nudging tool to overcome new migrants' biased preferences in favour of well-known locations such as big cities (Ferwerda et al., 2020). Under the auditing of the consultancy firm Deloitte, the Dutch pilot project of GeoMatch was initiated in 2021 (and since 2025 has been in its "trial phase") to support COA's decision-making regarding the placement of newly arrived refugees in one of the 35 Dutch labour market regions (LMRs). Amid increasing political pressures on COA in particular and the whole asylum system in general, the deployment of the algorithm coincides with the 2024 Dispersal Act (*Spreidingswet*), which aims to ensure more balanced placement of asylum seekers across municipalities, as well as the Civic Integration Act (*Wet Inburgering*), which seeks to ensure that newcomers can learn Dutch more quickly and gain work experience at the same time. According to COA, the GeoMatch algorithm is expected to help allocate over 35,000 refugees annually (Hotard et al., 2025).

Beyond the technical limitations, questions of power and agency emerge. Existing literature distinguishes between bottom-up uses of technology by migrants and top-down deployments by states (Alencar, 2024). Bottom-up use of technologies serves newly arrived migrants in functions such as navigation, job information, and guidance, while top-down use of technologies serves state functions such as surveillance and border control, service delivery, and welfare distribution. The latter systems are increasingly developed through public–private partnerships with uneven accountability. While advocates stress their potential for efficiency and transparency, critical scholars have underscored their risks, particularly regarding privacy and human rights for subjects who might be in vulnerable and/or dependent situations due to their hierarchical positioning vis-à-vis the state (Madianou, 2024; Molnar, 2024).

Our interest in this algorithm lies in its unusual positioning: unlike many top-down deployed digital tools in asylum governance, it is not intended to police but claims to generate meaningful profiles aimed at promoting socio-economic inclusion. Therefore, the research adopts a socio-technical paradigm drawing on research in economics, migration infrastructure, and Big Data and AI studies to bridge between the analysis

of the algorithm's technical claims and underlying assumptions, on the one hand, and a critical perspective on its social and ethical implications regarding fundamental human rights. This article asks: To what extent does automating refugee resettlement and labour market integration through algorithms, such as GeoMatch, mitigate or reproduce pre-existing socio-economic inequalities and affect refugees' opportunities for agency and dignity? And if concerns about perverse effects arise, what are their possible sources, and how might practitioners anticipate and prevent them in future digital innovation processes?

Besides the Netherlands, the GeoMatch algorithm has been introduced in refugee governance in several countries, including the US, Canada, Switzerland, Mexico, and Sweden. We have been able to document its development and use in the Netherlands. In this process, we collaborated with the investigative journalism collective Follow the Money (FTM) to submit Freedom of Information (FOI) requests. As an underused method for accessing documents held by public institutions, FOI can be repurposed to investigate opaque and black-boxed processes in algorithmic governance (Stavinoha, 2024). The process yielded 35 documents, including technical documentation, project initiation papers, audits, and data privacy assessments. Triangulating these sources, we mapped the institutional actors involved and analysed how they were framed through close reading (Ellermann, 2024). Focusing more on its technical documentation and application procedures, we then studied how the GeoMatch algorithm works, "reading along" (Stoler, 2009) the dominant arguments and frames and "against the grain" to uncover those that remained unstated, within the scope of our research question.

Our contribution is structured as follows: First, we review scholarship on digital innovation rationalities in the public sector, algorithmic labour-market matching, and the principle of human dignity in legal assessments of AI. Second, we outline our methodological contribution using FOI requests and close reading, proposing the concept of FOI-request literacies. Finally, we present our empirical findings and examine the implications of profiling algorithms like GeoMatch for refugee inclusion and automated public decision-making more broadly.

2. Theoretical Framework

2.1. Digital Transformation: Rationalities and Power Dynamics

Digital transformation refers to the integration of digital technologies into the daily functioning of (public) institutions. Over the past two decades, governments have replaced paper-based procedures and physical counters with digital portals, databases, and algorithmic systems. These changes are rarely contained within the state machinery. They are co-produced with private actors—consultancies, technology firms, and international agencies—embedding commercial and technological agendas within public administration (Eubanks, 2018). In migration governance, such collaborations have meant that asylum seekers and migrants are increasingly managed as data points within predictive and automated systems, but at high costs for the agency of both subjects and bureaucrats (Dekker et al., 2025).

The rationalities underpinning this transformation are multiple. Beyond the dominant rationality of "algorithmic reason," which treats data as neutral and objective (Aradau & Blanke, 2022), "e-government" is often invoked to frame automation as a tool for faster, cheaper, and more consistent services (Meijer, 2015). Madianou (2024) expands this picture, identifying accountability, auditing, capitalism, technological solutionism, securitisation, and resistance as central logics in the deployment of digital systems. These logics

have both promise and risks. Auditing and accountability can easily shift into surveillance. Capitalist logics privilege profit and extractivism over a fair optimisation of public value. Techno-solutionism narrows political questions into technical fixes, while securitisation frames migrants primarily as risks to be managed. And resistance, while visible, often struggles against entrenched infrastructures (Madianou, 2024).

Crucially, critical race and feminist scholars remind us that digital systems do not emerge from neutral environments but reproduce intersectional biases, where discriminatory outcomes are obscured under the guise of neutrality (Chun, 2021; Noble, 2018). A stark example is the Dutch Childcare Benefits Scandal (2005–2019), where over 43,000 parents, many with a migration background, were wrongly accused of fraud due to flawed and racist risk models, leading to their financial ruin and, in some cases, separation from their children, eventually prompting the government's resignation (Leurs & Candidatu, in press).

Digital innovation often thrives in contexts of weak public oversight. State organisations adopt innovation for internal optimisation or legitimacy, even without proven public benefit (Jansen, 2024). In migration governance, low levels of public control mean that asylum seekers frequently serve as "testing grounds" for biometric and algorithmic systems, often without safeguards or consent (Molnar, 2024). In such cases, the evaluation of responsible innovation is not only about whether digital technologies deliver efficiency, among other positively framed logics, but also who designs and regulates them, and whose rights and interests are marginalised in the process. Critically considering the implications of digital disruptions in migration governance calls for a data justice perspective, which we will employ in Section 2.3.

2.2. Automating Search and Matching in Labour Markets

Economic models of search and matching have long shaped understandings of how labour markets function. Rooted in the human capital theory that suggests that skills, education, and experience determine differences in earnings (Becker, 1964; Mincer, 1958), search-and-matching models explain the success of job matching between job seekers and employers in human capital terms (Burnazoglu, 2020, 2021; Cahuc et al., 2008). In this view, labour market matching is a technical practice in which exchanges between job seekers and employers can be optimised by aligning the supply and demand of measurable worker attributes.

Automation extends this logic by offering to improve efficiency and objectivity in the matching process. Automated decision-making (ADM) systems, such as CV-screening algorithms, are promoted as less prone to personal bias (Woods et al., 2020) and are often perceived by workers themselves as fairer evaluators than human recruiters (Fumagalli et al., 2022). They are also credited with practical benefits: processing information quickly, reducing costs, and widening access to public services. Within this framing, ADMs function as neutral tools that transform information about skills into job matches, promising productivity gains for both employers and job seekers (Burnazoglu, 2023a).

However, an increasing amount of research shows that ADMs are not neutral in practice and that these systems can reproduce and intensify structural inequalities (Lambrecht & Tucker, 2019; Obermeyer et al., 2019). The basis for job matching is assumed to be skills, but algorithms often rely on proxies for skills, such as personal characteristics in terms of race and gender. These proxies can result in discriminatory outcomes, disadvantaging certain groups in recruitment. The opacity of ADM systems compounds the problem, as applicants are rarely informed how their data are processed or how decisions are reached.

Burnazoglu (2023b) argues that such patterns of exclusion are not accidental but reflect systemic features of stratified labour markets. Societies organise and rank people in a hierarchical way, not only according to their individual characteristics but also membership in social groups and categories. She conceptualises stratification as social-identity-based institutional structures that channel people towards different outcomes with sharply different sets of opportunities. For migrants in particular, this stratification can act like a trap, reinforcing exclusion through self-perpetuating dynamics. From this perspective, ADM systems do not simply inherit bias but can actively embed and intensify stratification by re-inscribing existing social hierarchies into digital infrastructures.

For this reason, evaluating ADM systems requires moving beyond technical performance metrics. Scholars such as Bembeneck et al. (2021) emphasise the importance of interrogating "label choice bias," asking what algorithms are intended to do, what they actually do, and whether discrepancies between the two vary across social groups. Burnazoglu (2023a) argues that when algorithms are biased such that the bias penalises certain groups, "algorithmic mediation" turns into what she calls "algorithmic stratification." Such frameworks are essential for assessing whether ADM systems contribute to equity or serve to reproduce exclusionary practices.

2.3. Human Dignity as a Counter-Framework to Automation

The rationalities of digital transformation (Section 2.1) and labour market stratification (Section 2.2) frame matching in terms of efficiency, optimisation, and employability. A human dignity perspective provides a critical counterweight, emphasising autonomy, recognition, and the prohibition against treating persons as mere objects of technical procedures in ways that undermine their equal moral worth (Orwat, 2024). Similarly, data justice in migration governance refers to the fair and ethical collection, use, and governance of migrant data to ensure the protection of their rights, agency, and equitable treatment in decision-making (Josipovic, 2023).

Dignity and justice may be threatened by the creation of profiles, proxies, or data-doubles. Algorithms reduce people to employability scores or relocation categories, as in systems like the GeoMatch algorithm, where migrants are matched to municipalities based on predicted labour-market outcomes. Even if empirically "accurate," such externally imposed profiles curtail self-representation and autonomy. Dignity and justice require control and meaningful consent, yet asylum seekers often encounter data extraction in a condition of dependency. Alajak et al. (2024) document how Dutch authorities search refugees' smartphones during asylum procedures without transparent justification, exemplifying how formal consent is meaningless when alternatives are absent. The "human in the loop" approach only safeguards dignity if there is real discretion. Eubanks (2018) shows how welfare caseworkers defer to automated risk scores under time pressure and institutional constraints. Eubanks demonstrates that while caseworkers may be present, automation bias is entrenched when they lack real decision-making authority over the systems' outputs. Finally, refugee camps often serve as low-rights zones where public–private consortia test new technologies with minimal oversight (Molnar, 2024). Such asymmetries illustrate how innovation can proceed at the expense of those least able to resist.

Anchoring analysis of algorithmic systems in dignity and data justice, therefore, complements critiques of rationalisation and stratification. It reframes matching not as a technical optimisation problem but as a

political question of recognising agency, control, and autonomy—an orientation that grounds our analysis of the GeoMatch algorithm and allows us to focus on socio-economic exclusionary dynamics from the perspective of the refugee subject.

3. Data and Method

Our objective was to investigate the development, justification, and framing of the GeoMatch algorithm in Dutch refugee resettlement and labour-market integration policy. To achieve this objective, this study employed a qualitative, document-based methodology combining two interrelated approaches: FOI data collection and critical close reading.

Data collection was conducted via FOI requests submitted to Dutch government institutions, especially COA, between 2023 and 2025. This was done in collaboration with investigative journalists from FTM. First, FTM reached out to us with a request for a formal analysis of the first-round evidential documents they had gathered through an independent FOI request. Upon completing our initial analysis and realising the gaps that existed in the curated evidence, we extended this collaboration with FTM in order to co-develop strategies for filing further requests. The resulting 35 documents span from technical documentation to project plans, audit reports, data privacy assessments, email communications, and formal agreements.

In return for the direction we offered to advance this collaborative investigation, the partnership with FTM gave us insights into the procedural and rhetorical literacies required for FOI-based research: how to phrase requests, where to submit them, and how to monitor compliance with statutory deadlines. Despite its promise, FOI is not a panacea. Gathering the necessary documents entailed repeated requests, long waiting periods, and navigating institutional selectivity. In the first submission round for this manuscript, we were still awaiting responses to follow-up requests. For transparency and replicability, we include the full FOI filing letters as well as their respective official decisions in the supplementary material.

While FOI requests are gaining traction in critical migration studies, they remain under-theorised methodologically. Schmidt (2024, p. 503) notes that they have "received comparably little methodological scrutiny." We aim to address this gap by arguing that engaging with FOI requires developing what we term "FOI literacies": a reflexive awareness of the political and procedural structuring of public disclosure mechanisms. FOI archives are not neutral; they are curated, strategic, and shaped by institutional rationalities (Stavinoha, 2024). As Schmidt (2024) observes, FOI disclosures create "live archives," revealing certain truths while obscuring others.

To operationalise FOI literacies, researchers must adopt methods attentive not only to the content of disclosures but also to their conditions of possibility. The task is not simply to extract information from released documents, but to interrogate how disclosure itself is structured by bureaucratic logics, redaction practices, and the selective visibility and invisibility of certain actors' activities in state archives. For this reason, we turn to interpretive approaches such as close reading, which allow us to hold together what is present and absent, what is rendered legible, and what remains obscured.

Close reading originated in literary studies and is increasingly used in governance research (Bonjour & de Hart, 2013), enabling researchers to unpack how institutional documents normalise, legitimise, and conceal

particular policy logics. As Ellermann (2024, p. 340) puts it, "interpretive reading requires us to grapple with a speaker's choice of frame…as well as with what remains unsaid." Drawing on Stoler (2009), we both read "along" and "against the archival grain," paying attention to how internal bureaucratic logics embed power relations, while also unsettling the intended narratives of the state. Schäfer (2024) confirms the value of close reading of algorithmic systems to reveal the hidden labour, failures, and adaptive practices within data processes.

To this end, our analysis of the FOI corpus employed a close reading approach attentive to the context and positionality of document authors, their dominant arguments and framings, as well as to alternative frames that were less explicitly articulated but discernible from the background noise. Our thematic coding followed an iterative, inductive approach whereby codes were developed directly from the public documents and refined by frames proposed in the literature (Madianou, 2024). This inductive approach led us to focus on three key documents: COA's project initiative document (24 pages), IPL's technical documentation of the GeoMatch algorithm (104 pages), and Deloitte's final auditing report (49 pages). Together, these documents exemplify distinct institutional logics: bureaucratic, technical, and managerial. In addition, we adopted an iterative interpretive approach, informed by participant observation at a public conference in May 2025 featuring COA and IPL (see Hotard et al., 2025), and by triangulation with media reports and parliamentary debates.

4. Analysis

In this section, we report on the findings of our analysis. First, we begin with an overview establishing the project's frames, context, and the positionality of its actors, which foregrounds our close reading of the GeoMatch algorithmic system. Next, we conduct a detailed technical analysis of the system, focusing on its logic of inquiry, input data, machine-learning technique, and output. Finally, we examine how the algorithmic system is integrated in the broader administrative procedures of COA.

4.1. Situating the GeoMatch Algorithm: Context, Positionality, and Frames

The GeoMatch algorithm project in the Netherlands was initiated in 2021 through a collaboration between COA and IPL entitled *Kansrijke Koppeling met behulp van AI* (in Dutch: "Promising connection with the help of AI"). Several COA sources mention that the project unfolded following a 2018 study by the Netherlands Bureau for Economic Policy Analysis, which had concluded that Big Data techniques seemed promising for improving regional matching and enhancing refugees' employment outcomes (Gerritsen et al., 2018). Building on that study, COA initiated internal research into whether algorithms could strengthen refugees' labour-market participation, the Centraal Bureau voor de Statistiek (CBS) reviewed their proposal, and ultimately IPL was contracted to build the tool.

The *Project Initiation Document* by COA (n.d.-a) presents the GeoMatch algorithm through several interrelated frames as follows. The frames of effectiveness, economic impact, and social cohesion position the algorithm as a mechanism to improve refugees' integration, participation, and independence, which simultaneously contribute to the position of refugees within Dutch society. The additional emphasis on more objective decision-making further reinforces the earlier frame by suggesting that data-driven allocation will lead to more informed and reliable decisions for refugees, as opposed to relying on the subjective assessment and intuition of COA employees. The organizational intelligence frame emphasises internal

transformation: the development of a culture of continuous learning, data-driven reflection, and predictive capacity to improve COA's professional competence. The transparency frame focuses on external legitimacy, presenting data as a tool to increase trust and credibility in relations with municipalities through measurable and explainable decision-making processes. The frame of sustainable integration extends the welfare orientation into the long-term, promising individualised and adaptive support that aligns placement with refugees' skills, needs, and aspirations. Finally, the innovation and growth frame situates the algorithm within a broader narrative of digital transformation, where technological adoption signals progress, adaptability, and future-readiness.

These frames not only define COA's responsibility to refugees but also are strategic to other regulatory bodies. While in the project initiation document, the economic impact frame promotes better employment and increased independence for refugees, on COA's website and public algorithm register (COA, 2024; Het Algoritmeregister, 2024) it is reframed as a fiscal benefit for municipalities and government departments, with higher labour participation among status holders presented as a means to reduce welfare expenditure and increase tax revenues. Similarly, transparency is not represented in terms of accountability towards refugees but of its benefits to COA, in that "it offers clear and measurable indicators in the matching of status holders to municipalities, which strengthens the trust and credibility of the COA" (COA, n.d.-a, p. 6). The *Project Initiation Document* specifies a measurable goal of a four percentage-point rise in employment within the first year, amounting to a relative improvement of one-third compared to the baseline (COA, n.d.-a). Thus, the GeoMatch algorithm is framed as a predictive tool capable of processing larger volumes of data and identifying patterns that are "impossible for humans to find," while also respecting institutional constraints such as municipal quotas (COA, n.d.-b). The language of optimisation, efficiency, and innovation thus allows COA to position itself as a modern, evolving organisation that uses technical means to legitimately respond to political demands.

These institutional frames cannot be understood apart from the wider structural context and political pressures shaping Dutch asylum policy. Historically, permit-holders were allocated under the Housing Act purely according to municipal population size, without regard to labour-market opportunities. However, the Netherlands has been facing a structural housing shortage for a long time. As a result, municipalities varied in their willingness and capacity to host newcomers, with local political opposition, financial constraints, and resource scarcity fuelling uneven provision of services. This prompted the 2024 Dispersal Act (*Spreidingswet*), which obliges municipalities to provide accommodation. Importantly, the law is framed not as a temporary crisis measure but as a permanent restructuring of asylum reception.

Second, political discourse increasingly stresses rapid labour-market integration. Under the 2021 Civic Integration Act, newcomers are expected to enter work, paid or unpaid, within three years, a responsibility again devolved to municipalities. And while COA is not the implementing authority for the Civic Integration Act, it is structurally implicated because it shapes the placement and information flows that municipalities use when delivering on their mandated integration responsibilities. In short, COA is involved in supporting these transitions and "pre-integration" tasks because it controls who goes where, when, and with what data (Raad van State, 2023). Its placement decisions effectively set the starting conditions that allow municipalities to meet their integration duties.

Beyond the legislative frameworks of the Dispersal Act and the Civic Integration Act, COA has faced increasing political pressure under the recent Dutch government. This includes budget cuts, the transfer of

financial responsibilities for asylum reception from the central government to COA and local partners, and public rhetoric framing COA's work as misaligned with national asylum priorities (European Council of Refugees and Exiles, 2025; Government of the Netherlands, 2025). Symbolic gestures, such as the minister's refusal to approve royal honours for COA volunteers (Daams, 2025), further underscore a broader political distancing from the asylum-reception system. With conditions at reception centres increasingly falling below EU standards (Rechtbank Den Haag, 2022), the GeoMatch project emerges not simply as a technical innovation, but as part of a broader effort to reconcile shortages and political scepticism with a push for data-driven "solutions."

The network of actors defined in COA's project initiation document (COA, n.d.-b) consists of three partners: IPL, which carries out the design, testing, and implementation of the *Kansrijke Koppeling* solution; CBS, which assesses AI-related risks in refugee placement and provides complementary data and trend information to improve COA's dataset; and Deloitte, which was contracted to audit the technical and ethical elements of the algorithm. The actual network extends beyond this limited set of actors. For instance, our FOI material reveals that the consultancy firm Berenschot conducted a data protection impact assessment and an artificial intelligence impact assessment, which are mandatory under European and Dutch law. More importantly, other actors directly impacted by the project—including refugees, organisations that represent refugees such as the Dutch Refugee Council, and any receiving municipalities—are also not explicitly mentioned.

Our analysis of external sources shows some critical conflicts between the positionality set out in COA's documents and the reality. First, the non-inclusion of refugees is concerning because they are fully dependent on COA and the municipalities for housing allocations. Following this thread, the absence of clear representation from the municipalities could have a significant impact on the project's effectiveness. The Dispersal Act reduces COA's dependency on the municipalities by making the latter's participation legally mandatory, although COA must still rely on them to deliver the requisite housing and integration services.

Second, COA describes IPL as a "partner," but IPL presents COA more as a source of funding. In its own media communications, IPL promotes GeoMatch as a tool being piloted internationally—with pilot programs in Canada as well as the Netherlands—"with the support of two funders," one of which is COA (IPL, 2021). This gap between COA's sense of ownership and IPL's global ambitions raises questions about who really controls the project. IPL also claims the authority to judge whether the algorithm is fair, despite not being democratically accountable.

Based on our examination of the legal and academic arguments as well as other documentation provided (COA & IPL, 2024a, 2024b, 2024c, 2024d), we can describe the positionality within this social network as follows: COA is the data controller/owner with statutory power, IPL is the processor with high technical influence but contractually subordinated, CBS is a neutral data authority, the municipalities and ministries are informed recipients, and refugees are subjects without agency.

4.2. GeoMatch Technical Model: Input, Function, and Output

In this section, we examine the technical aspects of the GeoMatch algorithm. In particular, we examine the algorithm's logic of inquiry, input data and variables, the machine learning technique used to find relationships in the data, and the output in terms of the recommended region for each case.

4.2.1. The Policy Problem and GeoMatch's Logic of Inquiry

COA's project initiation document states that the algorithm is designed to match refugees' skills, qualifications, and preferences with regional labour market needs in order to support their integration into Dutch society (COA, n.d.-a). This matching is subject to policy constraints, including a consideration of proportionality to account for the receiving capacity of each market region, the "municipal quotas," as well as what we shall term the "smoothing constraint," which ensures a balanced allocation across the municipalities over time (as per IPL's technical documentation).

To solve this policy problem, one might expect the algorithm's logic of inquiry to estimate a newcomer's prospects in each of the 35 LMRs in the Netherlands and suggest a region where the individual would have the highest likelihood of employment, subject to the prescribed constraints above. However, the GeoMatch algorithm follows a different logic. While it estimates the prospects of a newcomer in each LMR, it also simulates future arrivals and compares the first estimate with the prospects, in each particular placement, of hypothetical individuals based on their predicted skill profiles.

The GeoMatch research team makes a distinction between "online and offline problems." The offline problem assumes all refugee cases are known in advance and can be assigned optimally at once, while the online problem reflects the real-world setting where refugees must be assigned immediately as they arrive, without knowledge of future arrivals, creating a trade-off between optimising for current and future employment outcomes. As offline problems presume complete knowledge of all cases, they require the creation of hypothetical refugee profiles (simulated from historical data) to approximate a full set of cases before the real information is available. As the GeoMatch research team explains:

> The dynamic aspect of this problem introduces a key trade-off between immediate and future rewards: assigning a current case to a location results in an immediate reward (namely, the employment score of the current case at that location), but also uses up a slot at that location for the unknown arrival. (IPL, 2024, p. 14)

The "offline problem" is solved by defining and quantifying each case's employment impact score (EIS), which reflects how good a match a refugee family is with a location. It combines three factors: their chance of finding a job there, how the placement affects future refugees' opportunities, and whether the location is already too full or too empty (see Bansak et al., 2018a, 2018b). If refugees with similar backgrounds have done well in a certain location, EIS will predict the chances of employment for new arrivals with the same profile to be higher there. As a result, that location builds a favourable score in the system, and future refugees with similar profiles are more likely to be matched with that location.

Taken as a whole, the resulting algorithm is fundamentally different from the policy problem it sought to address. The adoption of the "offline problem" logic of inquiry and its associated EIS could be partly explained by the smoothing constraint dominating the design choice. However, instead of adopting the logic of matching people to regions, GeoMatch does the reverse—matching LMR to refugees. This inversion of the matching process may appear to promote fairness by equalising results, but in practice it risks creating institutionalised disparities. In emphasising outcomes over opportunities, the system may unintentionally reproduce or magnify existing forms of stratification.

4.2.2. Input: Databases and Variables

The GeoMatch algorithm is trained, implemented, and tested using two key data sources: COA's IBIS database (named after software provider IBIS), which provide comprehensive administrative information on all status holders since 2014 and serves as the basis for generating recommendations; and CBS's Asielcohort microdata, which merge various administrative databases to track post-arrival outcomes such as economic and educational integration (IPL, 2024). It is worth noting that the Deloitte (2024) audit report highlights that key safeguards were excluded from review, leaving uncertainty about full GDPR compliance and potential personal data leaks outside the EU.

The IBIS and CBS databases support the algorithm in predicting matches between people and locations based on refugees' background characteristics. Van Grinsven, the project leader at COA, has explained that the GeoMatch algorithm is designed to estimate regional job prospects by looking at how permit holders with similar profiles have fared historically (IPL, 2021). Crucially, however, these databases do not contain information on the specific needs and opportunities in the 35 Dutch LMRs. This means that, contrary to COA's claims (COA, n.d.-a, p. 1), the algorithm can only draw on refugees' historical outcomes rather than ongoing regional labour demand.

Moreover, several cases were excluded from this data, including those where permit-holders moved to a second or third region. The justification for this exclusion is technical; IPL argues that it becomes unclear whether later outcomes should be attributed to the first or subsequent region, and multiple relocations complicate the data structure (IPL, 2024, pp. 24–25). This is concerning given that about 20% of refugees in the Netherlands relocate, regardless of income (Gerritsen et al., 2018). As such, the downside of this exclusion is that it removes evidence of poor matches, meaning the model is biased toward "successful stayers" and blind to the real frequency of relocation. In effect, the algorithm learns to match refugees to LMRs where they are more likely to remain, rather than where they might actually succeed.

In terms of selection of predictors, the GeoMatch research team's rationale is to include "as many predictors that have a plausible link to the target outcome as possible" (IPL, 2024, p. 25). The final list of variables included in the model remains unknown, despite our several requests. However, by triangulating the sources, we were able to compile a comprehensive list of these variables. In brief, these can be divided into three categories: variables that are potentially meaningful (such as previous work experience); protected demographic variables (age, nationality, language); and procedural variables (time of arrival, date of decision).

Regarding the selection of indicators, Deloitte's (2024) audits throughout GeoMatch's development suggest that the model is "fed more than it needs," raising serious concerns about the robustness, impartiality, and reproducibility of its predictions. Thus, scientific standards, which require clear justification and transparency in the selection of variables, seem largely absent.

4.2.3. Technique

The GeoMatch algorithm uses the gradient boosting machine (GBM) estimation technique, an ensemble method that combines many weak models into a stronger one. As GeoMatch's research team argues, GBMs are valued for "their robustness to irrelevant predictors, automatic variable selection, and ability to discover

complex interactions without requiring researcher specification" (IPL, 2024, p. 10). This is achieved by building a sequence of decision trees, each of which corrects the errors of the previous one; at each step, the algorithm selects only the features that reduce prediction errors, leaving unused those that do not contribute. In practice, this implies that the model itself determines which variables matter for the prediction, potentially excluding others that may hold social or contextual significance. This makes it crucial to scrutinise which predictors the model deems relevant.

To examine the relationship between the inputs and the algorithm predictions, we looked at the variable importance plots generated from the GeoMatch backtest predictions. These plots were presented in a 35-page appendix in the algorithm's technical documentation (IPL, 2024). On each page, a plot corresponding to an LMR is printed, ranking the predictors (for example, age, education level, country of origin, or work experience) by how strongly they influenced the model's predictions in that region based on historical data.

We compiled the 35 variable importance plots in Figure 1 to reveal which factors the algorithm found most significant when making predictions for that LMR. Inspecting this figure visually, we see that across regions, procedural variables (e.g., age_at_assign, assign_month, and assign_year) consistently dominate predications. Similarly, demographic variables (e.g., country_origin, language, male, and marital_status) also rank highly. By contrast, human capital variables—such as previous work experience in health, transport, automation and IT, trade, logistics, and hospitality—show low significance.

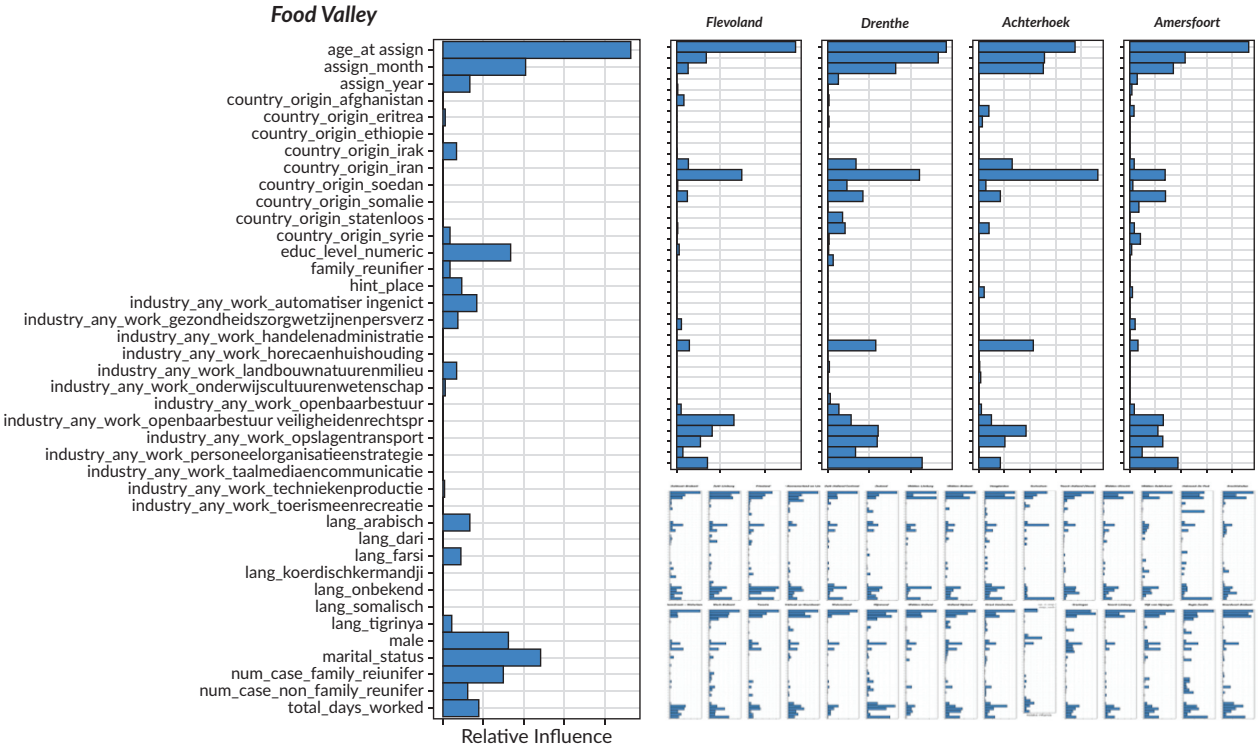

Figure 1. GeoMatch variable importance plots. Notes: The y-axis lists the predictor variables used in the GBM model; the x-axis shows their relative influence (variable importance), expressed as a percentage of the total influence across all predictors; longer bars indicate which variables the GBM relied on most heavily when making predictions. Source: Adapted from the 35 individual plots presented in Appendix 3 of the IPL's technical documentation (2024, pp. 66–101).

These variable importance patterns are unexpected. For example, in Twente, the home of a technical research university, or the Eindhoven and Veldhoven region (Zuidoost-Brabant), which is a tech and design hub, one might expect experience in automation and IT to be significant. However, in both LMRs, these variables contribute less than 20% of the impact of factors like age or marital status. Likewise, in the Food Valley LMR, which is known for agriculture and food science, work experience in agriculture contributes minimally. These patterns suggest that the GeoMatch algorithm is not performing skills-based matching in any meaningful way.

This is troubling for several reasons. First, it undermines the stated rationale of automated job-matching, which is supposed to be centred on relevant skills and work experience. Second, it suggests that protected demographic variables contribute more to predictions than human capital indicators, leading to a risk of discriminatory outcomes, as decisions may be driven by factors such as age and gender, which are explicitly protected under Article 21 of the Charter of Fundamental Rights of the European Union. Moreover, the combined use of demographic and procedural variables is particularly problematic because, as a 2024 DAIA/AIIA report by Berenschot (2024) critically notes: while GeoMatch does not directly include variables such as race, ethnicity, or religion, it relies on proxies such as country of birth or language, which can operate as indirect indicators of ethnic origin or religion.

4.2.4. Output

The GeoMatch algorithm's output variable is defined as the "medium-term outcome of employment attainment within a full year after moving into housing in the municipality" (IPL, 2024, p. 24). Technically, this outcome is operationalised as a binary variable which indicates "whether a status holder has found any employment in any of the 12 months within their first year after moving into housing in the municipality." One of the main justifications behind the choice of this outcome is to help refugees achieve "long-term and lasting success" (p. 24).

In examining this choice of outcome variable, we note several issues. First, the measured employment is largely limited to short-term employment, regardless of its duration. This means that a refugee who holds a job for just one day within the first 12 months after their relocation would be counted as a success. In contrast, the Dutch CBS's Monitor of Wellbeing (CBS, 2025), for example, defines employment as working at least 12 hours per week for six months. Furthermore, the binary variable not only ignores the duration of employment but also its quality. OECD frameworks define job quality as a multi-dimensional consideration that factors in earnings, job security, and work environment (Cazes et al., 2015). GeoMatch's definition of outcome meets none of these standards. If the choice of outcome is indeed meant to achieve long-term success, such a measurement would fall short since it accounts for neither job quality nor security.

Finally, it is important to note that the desired outcome is operationalised for each case at the level of the family, as opposed to the individual. That is, as per the IPL's technical documentation: "the predicted probability that at least one refugee in the case would find employment at the location in question" (IPL, 2024, p. 11). This is done by starting with individual predictions, whereby the model first estimates the employment prospects of each member of the family. To move from the individual to the family, different aggregation methods exist to combine these probabilities, such as taking the average, the maximum, or the methods applied in the GeoMatch algorithm, which combine all family members' probabilities to estimate the chance that someone (anyone) in the family will secure a job.

The implications of adopting this aggregation method for a family-level outcome might be severe given the risks of gender-based biases in the algorithm. On the one hand, the "at least one" method gives a bit more weight to families where multiple members have some chance of employment. On the other hand, this level of aggregation can reproduce or mask gender disparities. Figure 1 shows that the "male" variable strongly influences the model prediction, while "female" does not appear at all. This indicates that the model has learned a strong positive association between being male and employment outcomes, likely reflecting underlying gender disparities in the training data. When mapped to family-level decisions, this in turn embeds gender-based discrimination into family-level placement decisions, regardless of women's positions within a household.

4.3. GeoMatch Administrative Process: User Journey, Control, and Consent

After our technical examination of the GeoMatch algorithm, in this section we finally turn to an examination of the administrative process, which is equally important in shaping outcomes.

As noted in Section 4.1, before 2016 and under the Dutch Housing Act, the relocation policy typically assigned refugees to municipalities according to population size, without regard to labour-market opportunities (Gerritsen et al., 2018). With the introduction of the "promising coupling" policy in 2016, COA sought to improve integration outcomes by placing refugees in regions where they had better employment and education prospects. Accordingly, the matching process began with a profile assessment carried out in an intake interview. Employees recorded both "hard criteria" (such as employment opportunities, presence of first-degree family members, and medical advice) and "soft criteria" (such as extended family ties or regional connections). Based on this, the staff drafted a regional recommendation, generally aligned with the intake interview. This process gave employees significant influence over placement outcomes.

With the introduction of GeoMatch, the administrative process has been restructured, as shown in Figure 2. Now, the algorithmic recommendations are integrated into the workflow as follows. After the interview, but before drafting their own regional recommendation, employees receive three suggestions from GeoMatch. They may add up to three of their own, resulting in between three and six options. A separate decision-maker then selects the final region from this combined list.

This administrative shift has major implications for transparency, consent, and control. First, employees' roles are diminished. Although they continue to conduct interviews, they cannot access the algorithm's decision criteria. As discussed in Section 4.2.3, the GeoMatch algorithm uses decision-tree models that determine by themselves which variables are "relevant" and which are not, with the latter effectively excluded from the ADM process. For example, employment history may be discounted if deemed statistically irrelevant. Yet COA has agreed with IPL, the developer, not to disclose this information to employees, explaining that "although these plots are included in the technical appendix, they will not be provided to users, as focusing too much on individual predictions would present an incomplete picture of what COA is trying to achieve with GeoMatch" (IPL, 2024, p. 21). This explanation would fit with what we observed in Section 4.2.1. However, as a result, employees cannot see how particular factors are excluded from the automated decision results, nor can they challenge the algorithm's reasoning or explain it to refugees.

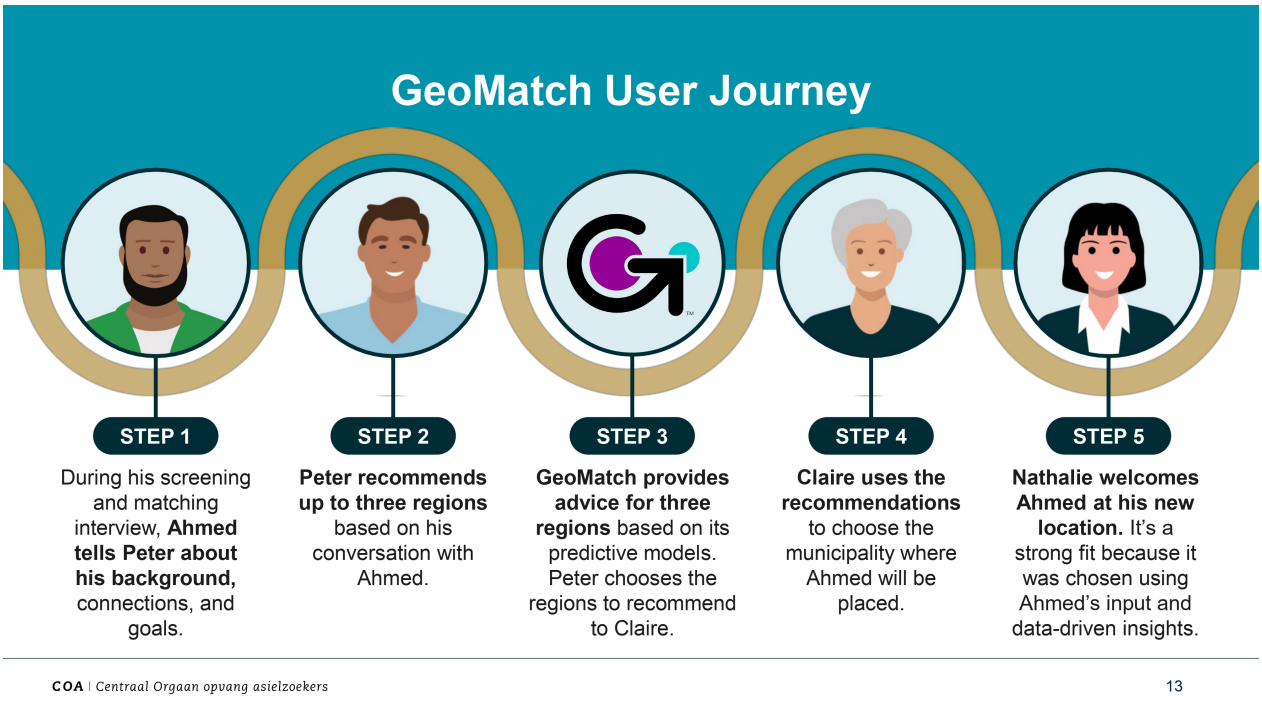

Figure 2. GeoMatch user journey. Source: Hotard et al. (2025).

Second, informed consent is weakly addressed. Current work instructions offer no clear guidance on how to explain automation to refugees. Apart from a short statement on the COA website, there is no structured protocol (cf. COA, 2024). The website notes:

> To see whether you can find work in a region, we combine your data with national data from Statistics Netherlands [CBS]….Based on this, our computer system [GeoMatch] estimates how likely it is that you will find work in different regions. (COA, n.d.-c)

This statement acknowledges ADM, but provides little detail on data use, decision logic, or the right to opt out. Refugees, therefore, cannot give meaningful consent, since they are neither fully informed nor able to contest the process.

Finally, the decision-making structure leaves little room for either employees or refugees to exert control. The final choice between human and algorithmic recommendations rests with a third-party decision-maker, with no direct input from the refugee. Even when employees or refugees advocate for a placement based on family or community ties, these views can be overridden.

5. Discussion and Conclusion

This study set out to critically analyse the GeoMatch algorithm, a recommender system piloted by the Dutch national reception agency, COA. We investigated its impact on refugees' fundamental rights and socio-economic inclusion, as well as possible sources of risk. Through close reading, we examined materials obtained through FOI requests, including the algorithm's technical documentation, project initiation

documents, and audit reports. By analysing government framing and assessing the algorithm's workings against these frames, we evaluated whether the system delivered on its stated goals.

Our analysis suggests that the GeoMatch algorithm reproduces, rather than mitigates, socio-economic inequalities. Framed as a means to achieve effectiveness, economic impact, sustainable integration, and social cohesion, the algorithm's operational logic prioritises aggregate economic gain over individual welfare. It matches refugees to locations where similar profiles have historically fared best, rather than evaluating which region offers the best opportunities for each refugee. This creates a "rich-get-richer" dynamic, reflecting a utilitarian form of optimisation that prioritises efficiency and aggregate benefit over individual welfare or equity (Bembeneck et al., 2021).

Reliance on historical data also undermines the algorithm's own utilitarian rationale. Without input regarding actual labour-market demand in different regions, the algorithm systematically underestimates the potential of previously disadvantaged individuals. This logic reifies stratified labour markets, systematically sorting disadvantaged groups into locations with lower economic prospects and reinforcing pre-existing inequalities. Consequently, total welfare is reduced rather than maximised. Such a process, which Burnazoglu (2023a) terms "algorithm stratification," can occur due to several reasons, such as reliance on historical data, and is amplified by probable miscommunications between policymakers and the algorithm's developers.

In the long run, such stratification threatens the algorithm's goals of sustainable integration and social cohesion. Because the GeoMatch algorithm matches places to people rather than people to places and draws solely on previous outcomes, refugees with weaker employment prospects are likely to be directed to municipalities where previous cohorts have also struggled, often due to discrimination. This risks fuelling the socio-economic exclusion of refugees and, by extension, social tensions.

The analysis also shows that the GeoMatch algorithm risks violating fundamental rights. Although COA frames the algorithm as an objective, data-driven tool that reduces the role of subjective assessments and intuition, data itself is never neutral and carries its own discriminatory values based on pre-existing inequalities. ADM systems do not simply fail to correct for structural inequality but may actually embed it in automated governance. In the case of the GeoMatch algorithm, the emphasis on aggregate stratified outcomes, coupled with the inclusion of protected demographic categories and automated exclusion of actual human capital variables, systematically produces disproportionate discriminatory outcomes on the basis of ethnicity, gender, age, and marital status. When algorithms rely on demographic proxies for employability in the context of labour markets, they risk institutionalising social stratification in seemingly technical processes (Burnazoglu, 2023a). These findings also resonate with broader studies on algorithmic discrimination showing how ADM systems reproduce social biases under the guise of neutrality (Lambrecht & Tucker, 2019; Obermeyer et al., 2019).

While these risks might be inevitable in all automation, a promise of transparency can mitigate such discriminatory decision-making. This is particularly important, not just because of the risks of discrimination on the basis of protected social groups, but also when refugees are subjected to decisions based on non-meaningful profiles through the inclusion of administrative factors. However, we see that, by design, neither refugees nor employees have control over the ADM process since outcomes at the individual level are not what COA is trying to achieve; meanwhile, considerable autonomy is given to the machine-learning

algorithm to decide which variables are relevant, without any possibility of intervention from "humans in the loop." As the variables' relative significance is not explained and Geomatch placement recommendation occurs after the interview, refugees are not provided with any justification for how the decisions are made and employees are unable to acquire meaningful consent regarding the automated process.

Given the risks of perverse effects, we asked what the possible sources of these risks might be and how they can be anticipated.

Transparency is, in fact, a dominant frame used by COA to justify the algorithm, but regarding municipalities rather than refugees. COA claims that by offering clear and measurable indicators, it strengthens its trust and credibility with local governments (COA, n.d.-a). Reading against the grain and following the "logics" of accountability and audit (Madianou, 2024), transparency becomes a frame that serves COA's broader institutional mission. That mission is not primarily to foster a positive economic impact, social cohesion, or sustainable integration, but the effective distribution of refugees across the Dutch municipalities. As such, one might say that the algorithm's purpose is revealed not in COA's explicit claims regarding the socio-economic inclusion of refugees, but by what remains unsaid in the structures created by the Dispersal Act.

Still, this does not fully explain why COA would implement an unreliable and potentially discriminatory system. "Optimisation logic"—described by Jansen (2024) as the drive to innovate for its own sake—offers only a partial explanation. In this sense, despite the top-down rationale mobilised by COA directors of keeping up in the AI race (Internationaal Kennisplatform COA, 2025), it is unlikely that COA's bureaucrats would deliberately deploy discriminatory algorithms merely to signal technological progress and appear modern. A more plausible explanation lies in institutional pressure. Facing mounting political pressures and acute housing shortages (a key theme in the 2025 national election campaigns), COA sought a quick technical solution that appeared legitimate and efficient. In this context, the partnership with IPL may have seemed pragmatic under the assumption that private partners possess greater agility and capacity for innovation than public institutions, due to the latter's bureaucracy (Madianou, 2024); GeoMatch was thus a ready-made innovation from a private actor promising data-driven efficiency at a time when COA's own institutional capacity and credibility were under strain.

Yet this pragmatic choice for solutionism also exposed COA to the commercial logic of its partners. IPL promised COA efficiency, projecting EUR 5.3 million in annual savings from reduced social assistance and increased tax revenue. Crucially, reading against the grain, we see a footnote in IPL's technical report which reveals that these gains drop to EUR 4.5 million if sensitive predictors such as religion and ethnicity are excluded (as per the IPL's technical documentation). Even without the further drops in the projections if other demographic variables are excluded, this nearly EUR 1 million difference shows that monetised ethnic profiling is not incidental but central to the GeoMatch algorithm's business strategy. These details, hidden in plain sight, whether in footnotes or plots in appendices, support our hypothesis that COA may have become complicit in ethnic profiling—not through malice, but through haste and misplaced trust in private expertise. While this hypothesis would explain how the situation arose, it does not justify the lack of due diligence and accountability from public agencies, given the large volume of research findings, from Molnar (2024) as well as others, warning how such partnerships expose groups in vulnerable situations to the non-ethical market-oriented priorities of private actors for whom technological experimentation overrides social responsibility.

In conclusion, the automation of refugee resettlement and labour-market integration policies through recommender systems, such as the GeoMatch algorithm, can reproduce pre-existing socio-economic inequalities and negatively affect refugees' fundamental rights in terms of freedom from discrimination, self-determination, and the preservation of human dignity. Among the possible sources are solutionism logic and the dominant influence of private parties over both refugees and public institutions. Accordingly, we recommend that COA's implementation of the GeoMatch algorithm should be seriously reconsidered until these critical concerns are addressed. Recommender systems could potentially be a valuable tool to empower refugees with information and agency over their lives. However, their current deployment is characterised by unreliable data and premature institutional integration, rendering them socially harmful. Until their implementation is proven to be inclusive and aligned with fundamental rights, these tools must, at most, be considered—as they were initially designed—as nudging tools used for voluntary guidance with a full explanation of their logic, rationale, and outcomes.

Beyond the empirical findings, our case study also contributes methodologically by demonstrating the value of FOI requests combined with critical close reading as a structured approach for studying opaque governmental systems. By integrating FOI-based data collection, we propose a methodological template for investigating black-boxed algorithmic systems in migration governance. We show how FOI materials can function as live archives—if approached with interpretive tools that reveal how state logics and exclusions are embedded within them. Our approach underscores the power of combining journalistic and academic research practices to navigate institutional opacity, while highlighting the importance of reflexivity, triangulation, and positionality in reading what such archives expose and conceal.

Finally, this study is not without limitations. While researchers need not provide empirical justification for caution—that responsibility lies with the state—future work could explore the algorithm's quantitative outputs after removing demographic and procedural variables. Qualitatively, future research should engage with refugee communities regarding their perspectives and experiences with relocation policies; their voices are absent in this study, which relied solely on official documents. Speaking with case workers could also provide valuable insight while reducing the burden on refugees, as staff accumulate knowledge from many cases over time.

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Conflict of Interests

The authors declare no conflict of interests.

Data Availability

The data, consisting of 35 documents, is available upon request.

LLMs Disclosure

The authors used the LLM ChatGPT 4.1 and 5.0 for grammar and style improvement of previous versions of the article, while the authors verified the quality of the edits. Prior to submission, the final version of the article was fully copy-edited by a professional human proofreader.

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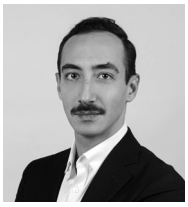

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