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Algorithmic Governance in Context:
The Challenges of Big Data in Humanitarian Action

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ABSTRACT

Recently, humanitarian action has increasingly relied on algorithmic solutions to ensure timely and effective responses to crises. However, concerns have been presented regarding the potential risks and consequences of using AI technology solutions during these operations. The present study proposes a profound investigation of the social phenomenon of Algorithmic Governance in Context (AGiC), using data from one social context to another to develop an algorithmic process in humanitarian action. This dissertation will define several concepts related to AGiC in humanitarian action to answer the research questions. Additionally, an exploratory case study of a humanitarian algorithmic solution (GeoMatch) will be studied when hypothetically applied in two countries (Brazil and Estonia) based on the opinions of immigration experts. The study concluded that adequate AGiC is a relevant phenomenon that must be attended to for the effective implementation of AI technology in the context of humanitarian action.

Keywords: algorithmic governance, algorithmic governance in context, artificial intelligence, machine learning, humanitarian action.

INTRODUCTION

Since the COVID-19 pandemic in 2020, the use of digital technologies has been accelerated in humanitarian operations (Beduschi, 2022). International organisations and governments have relied on Artificial intelligence (AI) systems during humanitarian action to assist them in coping efficiently with conflicts and crises. They provide faster and more effective responses to crises and improve aid delivery to those in need.

AI or automated decision-making systems use machine learning algorithms to analyse data, identify patterns, and make predictions for their judgement. The increasing disponibility of powerful computing resources and vast amounts of data has enabled these systems to perform tasks on a scale and complexity beyond human capacity (Doneda, 2016). These systems are increasingly significant in shaping worldwide efforts to tackle some of the most challenging problems, especially in humanitarian aid and development (Pizzi et al.,2020).

The intense use of automated decision-making systems in humanitarian action and other domains, like business, healthcare, and education (Fairlie, 2023), led to the emergence of algorithmic governance. This governance strives to develop frameworks and principles for the responsible use of algorithmic systems in different fields. (Katzenbach & Ulbricht, 2019). It constructs a social order established on machine-coded rules, where the computer makes decisions autonomously without human intervention based on specific data (Katzenbach & Ulbricht, 2019; Issar & Aneesh, 2021).

The constant use of data in algorithmic governance has generated concerns and risks about its usage in humanitarian affairs. An increased risk of AI algorithms may perpetuate biases and discrimination, especially if trained on biased or incomplete data (Lee et al.,2019). Moreover, AI may reduce human involvement, with decisions solely based on algorithms rather than human judgement and compassion (Moser et al.,2022). These issues and other ones like transparency, accountability and ethical use of data have been suggested and discussed by specialists in the field (Pizzi et al., 2020; Beduschi, 2022). However, academia has yet to thoroughly explore a

recent phenomenon of this intense implementation of automated decision-making systems: algorithmic governance in context (AGiC).

In social sciences, AGiC refers to implementing algorithms and other automated decision-making systems within specific social, political, and economic contexts. Algorithmic related-tools become technologies influenced by social contexts (Couldry & Mejias, 2019b). Algorithms are no longer neutral series of rules; they are mathematical expressions linked with local sociocultural values (O'Neil, 2016). Some researchers show that this phenomenon can create societal repercussions (Masso, 2023), augmenting the sociocultural tensions of the new context (Gritsenko et al., 2022; Masso et al.,2022) and reshaping new digital landscapes (Masso & Kasapoglu, 2020). They seek and question ways to mitigate these societal consequences (Masso, 2023). Therefore, they are looking for the principles and guidelines or values of AGiC that guarantee an effective AGiC from one context to another

In humanitarian action, AGiC means humanitarian algorithmic tools can influence the dynamics of the social contexts (humanitarian crisis) when used there. Humanitarian action means the effort to assist and protect people in a humanitarian crisis (Kuner & Marelli, 2020). AI technologies in this intervention involve the responsible use of data to avoid recurrent data problems like data bias, data protection, and practical implementation challenges in a crisis (Kuner & Marelli, 2020). For instance, an algorithmic solution for relocating refugees to a new country uses their basic personal information like names, dates and addresses to resettle them in an appropriate place according to this information. Suppose the placement officer misinterprets the data from a refugee relocation algorithmic solution. In this case, the refugees can be relocated to a different place, affecting their social integration and hindering their adaptation and a new beginning in the host country.

Humanitarian affairs specialists have shown concerns that most algorithmic technologies are conveyed from a different context and do not consider the cultural and societal factors of the new context, resulting in wrong decisions that negatively affect people's lives (Pizzi et al., 2020). They have mentioned that using AI from another context in humanitarian operations can aggravate the situation for those already in a humanitarian crisis (Beduschi, 2022). Therefore, it is undoubtful and *sine qua non* that the social context must be considered while utilising an algorithmic solution from one context to another to evade deleterious consequences on people in an emergency crisis.

The purpose of this master's thesis is to investigate the phenomenon of AGiC in general and its particularities in the humanitarian affairs field, mainly humanitarian action. Hence, this research aims to reply to the following research questions:

1. What are the main measures to reduce the adverse effects of algorithmic governance systems?
2. Why is it essential to preserve the AGiC process during humanitarian action?
3. How to mitigate the societal impact of humanitarian action when applied in another context?

Humanitarian organisations often collect and process vast amounts of data to aid and assist people in need. However, it must be clear what their measures are to avoid the adverse effects of their algorithmic systems. Second, knowing the key elements to preserve AGiC during humanitarian action is essential to implement an algorithmic tool in another context successfully. Finally, it is vital to lessen these tools' societal (negative) impacts when applied in another context, especially in humanitarian action.

The theoretical analysis covers the main concepts revolving around AGiC. The first section, "Algorithmic Governance", covers the algorithmic governance concept, the basis for understanding AGiC. The second section, "Algorithmic governance in context", determines the concept of AGiC and contextualises this theme in humanitarian action.

The empirical analysis examines the immigration experts' opinions about implementing GeoMatch in another country's context. The author used their answers to analyse which social aspects must be considered to implement this tool in Brazil and Estonia successfully. Both countries' analyses will be compared to judge which one would face more difficulties/facilities in implementing the tool. The main aim is to help reply to the third question and verify the ways of mitigating the adverse societal effects of AGiC.

1. Algorithmic Governance

1.1. Algorithmic Governance definitions

Before the emergence of algorithmic governance, several studies were conducted on the use of technology in automated decision-making processes (Levy et al., 2021). For example, research in decision support systems explored the potential of computerised systems to assist human decision-making in various domains, such as business, healthcare, and education (Fairlie, 2023). These systems provided decision-makers with relevant information and analytical tools to facilitate their decision-making process.

Similarly, studies on expert systems aimed to create computerised systems that could emulate the decision-making capabilities of human experts in a specific domain (Tripathi, 2011). Knowledge representation and reasoning techniques influenced these systems to capture and formalise expert knowledge and use it to make decisions or provide recommendations. (Ogheneovo & Nlerum, 2020). In addition, the field of artificial intelligence (AI) has a journey of developing algorithms and techniques for automated decision-making, such as neural networks, decision trees, and rule-based systems. Data designed these algorithms to learn from data and to make predictions or decisions rooted in that learning (Sarker, 2022).

However, these earlier studies did not explicitly focus on the governance of algorithmic systems, nor did they address their use's broader social and ethical implications (Tsamados et al., 2022). As automated decision-making systems became more prevalent in various domains, researchers raised concerns about their impact on fairness, accountability, and transparency (FAT) (Aysolmaz et al., 2023). These systems led to the emergence of algorithmic governance, which seeks to address these concerns and develop frameworks and principles for the responsible use of algorithmic systems in different domains. (Katzenbach & Ulbricht, 2019).

Algorithmic governance is a framework where algorithms-based systems are responsible for the decision-making authority (Just & Latzer, 2016; Danaher et al., 2017; Latzer & Festic, 2019). This system creates a social order based on machine-coded rules, where the computer makes decisions autonomously without human intervention based on specific data (Katzenbach & Ulbricht, 2019; Issar & Aneesh, 2021). The concept of algorithmic governance originated from

the formulation of the term 'algorithm' in India, and the invention of the Turing algorithm machine shaped it (Hopcroft, 1984; Issar & Aneesh, 2021).

This governance focuses on the role of algorithms and their mathematical and statistical procedures in shaping social structures and being a bridge between humans and machines (Gillespie, 2014; Katzenbach & Ulbricht, 2019). It opposes other methodological approaches to governance (Aneesh, 2009), such as 'governance without numbers', which states like Bhutan, Yogyakarta Special Regency, and Thailand have applied successfully (Drechsler, 2019). Hence, algorithmic governance is more rigid than other forms of governance, as it needs to consider the current governance arrangement of the institution or seek a new governance structure to replace it (Latzer et al., 2019; Wanckel, 2022).

Algorithmic governance branches into two main areas of study: social sciences and computer sciences. The former focuses on the societal implications of algorithmic decision-making power on human decisions (D'Agostino & Durante, 2018; Katzenbach & Ulbricht, 2019; Rieder et al., 2018), while the latter is concerned with the technical aspects of formulating and maintaining algorithms (Doneda & Almeida, 2016; Katzenbach & Ulbricht, 2019; Shin et al., 2019). However, both fields have similar concerns related to the ethical use of data for algorithmic governance, including data bias, discrimination, privacy violations, lack of transparency and accountability, and risks to privacy and data protection (Waseem & Hovy, 2016; Williams et al., 2018; Moats & Seaver, 2019; Galetsi et al., 2019; Birch et al., 2021; Sun et al., 2021).

The use of data in algorithmic governance has raised concerns about data ethics among companies and governments to "preserve the safety, privacy and protection of individuals' data" (United Nations, 2020). There have been alterations in laws and regulations to address the responsible use of data, with weighted fines for privacy violations as an example of the EU's response, and have generated conflicts of this usage (Utrecht Data School, 2022). In addition, there may be a need for a more critical evaluation of the social impact of data-driven policies, emphasising the importance of shared values and social responsibility in such grey areas that data outcomes bring. Therefore, incorporating ethical considerations and critical evaluation of the social impact of data-driven policies is crucial in ensuring a responsible and beneficial algorithmic governance framework. (Utrecht Data School, 2022).

In conclusion, the emergence of algorithmic governance has kindled the need to address the social and ethical implications of automated decision-making systems. While earlier studies focused on developing computerised decision support and expert systems, they did not explicitly address the broader implications of their use. Algorithmic governance seeks to develop frameworks and principles for the responsible use of algorithms in various domains, but it faces challenges related to data ethics and social impact evaluation. It is essential to incorporate ethical considerations and critical evaluation of the social impact of data-driven policies to ensure a responsible and beneficial algorithmic governance framework. This incorporation will help preserve the safety, privacy, and protection of individuals' data and ensure the development of fair, transparent, and accountable algorithmic systems.

1.2. Algorithmic Governance approaches

Data Governance is a governance approach that emerges to assist algorithmic governance. The definition of data governance refers to exercising control and authority over managing an organisation's data assets, including planning, monitoring, and enforcement (International & Data Management Association, 2017). It involves establishing rules, norms, and procedures to secure the effective management and protection of the organisation's data (Abraham et al., 2019; Cheong & Chang, 2007; Hinsberg, 2022). Although there is no standard definition of data governance across different domains, organisations should develop their systems based on their unique culture, location, context, and goals. (Abraham et al., 2019; Gupta & Cannon, 2020; Liu, 2022). Therefore, these systems should address all data governance concepts, including data stewardship, security, and architecture, and be flexible enough to cover all necessary compliance rules (International & Data Management Association, 2017).

Data governance protects sensitive data from misuse or abuse (Janssen et al., 2020). It contains mechanisms to incentivise correct behaviours and sanction incorrect ones, which helps to mitigate issues of transparency, accountability, fairness, discrimination, and trust (Janssen et al., 2020). Additionally, it establishes access and sharing policies, including measures to safeguard privacy, confidentiality, security, intellectual property, and other rights or requirements that may apply to guarantee data integrity (Gupta & Cannon, 2020). Therefore, data governance and algorithmic governance share the same ethical values, such as protecting data and keeping its integrity.

Data governance also proposes a theoretical framework comprising internal policies, rules, and procedures established to ensure data integrity and compliance when used (Doneda & Almeida, 2016). Even though the definition of data governance may vary depending on the data domain, academia and organisations widely recognise that a framework is crucial for effective data management. One of the fundamental aims of data governance is to safeguard personal data's privacy, safety, and protection, which is consistent with international human rights legislation and adopted by the international community (United Nations, 2020; World Bank, 2021).

Data governance frameworks involve using high-quality data, appropriate organisational structure, and qualified professional expertise to facilitate organisations and governments in making accurate decisions with the support of big data algorithmic systems (BDAS) (Benfeldt et al., 2020; Wanckel, 2022). The interoperability between data collected and cleaned by the experts and sharing systems backed by adequate data infrastructure is crucial to prevent data inaccuracies from data flow contaminating the organisations' systems (Dasu, 2013). The overall goals of data governance are to ensure data quality, meet compliance requirements, and produce public value from the data (Janssen et al., 2020).

Like algorithmic governance frameworks, data governance frameworks should also consider the ethical aspects of using or not using certain types of data (Prainsack & Buyx, 2016), not abuse or misuse it (Janssen et al., 2020) and cover possible legal loopholes in current data protection legislation that cannot guarantee the safety of individuals harmed by data misuse in algorithmic systems (McMahon et al., 2019). Hence, an organisational culture that fosters the ethical data values surrounding algorithms also belongs to the role of data governance (Janssen et al., 2020).

Social sciences also suggest their methodological approaches to data governance frameworks when their application expands beyond the organisations' systems, and societal implications might happen (Reutter, 2022). Big corporations established most organisation-centric data governance frameworks. They attempted to utilise vast amounts of data to recognise, anticipate, and potentially alter human actions for economic reasons (Micheli et al., 2020), and the social-sciences approach are more concerned with the datafication of the governance and its effects towards society (van Dijck, 2014; König, 2020). According to Liu (2022), the most theoretical concepts of "data governance" are organisational-oriented, and there is a necessity to build a "social data governance' model to clarify and articulate the complex social dynamics that form the foundation and context of data-driven governance systems.

In conclusion, data governance is a crucial aspect of effective data management that safeguards data integrity, compliance, and privacy. It involves the development of internal policies, rules, and procedures to ensure the effective management and protection of an organisation's data assets. Data governance frameworks must consider ethical values, such as protecting data and avoiding misuse or abuse, and should be flexible enough to cover necessary compliance rules. Data governance frameworks should also consider societal implications and ethical values when using or not using certain data types. As data-driven governance systems become prevalent, there is a growing need to develop a "social data governance" model (Liu, 2022) that considers the complex social dynamics that underpin data-driven governance systems.

1.3. Relationship between data and algorithmic governance

A data governance framework is vital in assisting the algorithmic governance framework. Automated decision-making systems rely heavily on data, and the quality and relevance of this data directly impact the FAT of the decisions made by these systems. (Pitoura, 2020). Thence, a solid data governance framework can help to ensure that the data used by algorithmic systems are sound and trustable.

Data governance involves the management of data throughout its lifecycle, from creation to disposal (Janssen et al., 2020). It includes defining data policies, procedures, and standards for collecting, storing, and processing data (Doneda & Almeida, 2016), establishing roles and responsibilities for data management and ensuring compliance with legal and ethical requirements (Eryurek et al., 2021). A well-designed data governance framework can address some challenges of algorithmic governance mentioned previously, such as the potential for bias and discrimination, lack of accountability and transparency (International & Data Management Association, 2017; Gupta & Cannon, 2020; Eryurek et al., 2021), and the 'black-box' nature of decision-making processes (Yeung, 2018).

One benefit of data governance complementing algorithmic governance is the ability to ensure data quality. Data quality is critical for the accuracy and reliability of algorithmic systems (International & Data Management Association, 2017). Poor data quality can result in inaccurate and biased decisions, seriously affecting individuals and communities (Janssen et al., 2020). A

data governance framework can ensure that the data used by algorithmic systems are accurate, complete, and free from errors and data bias.

Another important aspect of data governance, helping algorithmic governance, is transparency. Algorithmic systems are often criticised and questioned for their lack of transparency in their decisions (König, 2020; Bloch-Wehba, 2022), making it difficult to understand how decisions are made (Coglianese & Lehr, 2018). A data governance framework can assist in ensuring transparency by providing mechanisms for auditing and monitoring the data used by algorithmic systems and ensuring that the decision-making process is documented and open to scrutiny. (International & Data Management Association, 2017; Gupta & Cannon, 2020).

Finally, data governance can help to ensure accountability in algorithmic governance. Automated decision-making systems' decisions can significantly impact individuals and communities, and it is relevant to include them when making decisions (Castelluccia & Le Métayer, 2019). A data governance framework can help establish responsible and accountable guidelines for the decisions made by algorithmic systems, as well as mechanisms for addressing errors, biases, and other issues.

In conclusion, a data governance framework ensures algorithmic governance's effectiveness and trustworthiness. Such a framework can address data quality, transparency, and accountability challenges, which are essential for the accuracy and reliability of automated decision-making systems. By establishing data policies, procedures, and standards, defining roles and responsibilities, and ensuring compliance with legal and ethical requirements, a data governance framework can ensure that algorithmic systems' decisions are accurate, unbiased, transparent, and accountable. Integrating data and algorithmic governance can help create a more robust and trustworthy decision-making process that promotes fairness, equity, and ethical values.

2. Algorithmic governance in context

2.1. Algorithmic Governance in Context (AGiC)

Previous studies have already shown concerns about the societal consequences of using algorithms (Kitchin & Dodge, 2011; Kitchin, 2016; Loukissas, 2016), and newer studies

confirmed a more systematic approach (Masso, 2023) due to the complexity of the subject (Loukissas, 2019). New discussions have been kindled related to the subject like the ethical issues of reusing data in AI systems (Thylstrup et al., 2022), considerations of using data from one context for a health application to another (Masso et al., 2022) and the need of the AGiC framework (Masso, 2023) are some examples of the necessity of studying the subject of algorithmic governance in context in-depth.

Algorithmic Governance in Context (AGiC) refers to implementing algorithms and other automated decision-making systems within specific social, political, and economic contexts. Algorithmic related-tools become technologies influenced by social contexts (Couldry & Mejias, 2019b). Algorithms are no longer neutral series of rules; they are mathematical expressions linked with local socio-cultural values (O'Neil, 2016). Therefore, all algorithmic technologies influence the context in which they are applied (Gritsenko et al., 2022).

AGiC is still nascent in academia (Masso, 2023), and the comprehension of the diversity of data contexts is still limited (Masso et al., 2022). Many fields have needed help understanding the social implications of moving algorithmic solutions between different social contexts (Masso, 2023). However, previous studies (Kitchin, 2016) have indicated the outcomes of algorithmic solutions used in several sectors of society, such as social integration (Chiarello et al., 2021), human geography (Masso & Kasapoglu, 2020), government systems (Kitchin, 2016), digital infrastructure (Frąckowiak, 2022), and literacy (Firth-Butterfield et al.; 2022), refugee and data legislation (Zarsky, 2016; Ahmad, 2021).

Automated decision-making systems can exacerbate existing social inequalities and discriminate against marginalised groups, hindering social integration. Chiarello et al. (2021) emphasised that hiring algorithms can be biased regarding gender and ethnicity, perpetuating discriminatory hiring practices and causing complex social integration. Kitchin (2016) warned that the power of algorithms is reshaping how socioeconomic systems perform in society, influencing the assemblage of systems, such as governmental systems and regulations and frameworks.

According to Frąckowiak (2022), AI systems are establishing new planetary power relations with the need for a robust underwater digital and technological infrastructure. An extensive network of cables connecting the leading financial centres in the world (the USA and Europe) is changing the geography, recreating old colonial dependencies with the peripheral world (Frąckowiak,

2022). Algorithms and their systems have been utilised as calculative devices to control territories and minorities around the globe (Masso & Kasapoglu, 2020).

Algorithmic governance has also been studied concerning refugee and data legislation. Some researchers have analysed and applied automated decision-making systems to refugee resettlement processes (Bansak et al., 2018) and the implications of such systems on violating human rights (Ahmad, 2021). Other studies have examined the challenges of regulating algorithmic decision-making systems and protecting individual privacy in the context of data legislation (Zarsky, 2016). Additionally, the effectiveness of algorithmic governance is contingent on the digital literacy of individuals who interact with such systems (Firth-Butterfield et al., 2022).

According to Firth-Butterfield et al. (2022), the unexpected consequences of automated decision-making systems can be avoided by increasing AI literacy on using AI technologies among all society actors (government, citizens and organisations) and not relying on technologists for better decisions. Indeed, Selwyn (2022) commented that understanding algorithmic decisions is contemporary citizenship to prevent unexpected consequences from them. Pasquale (2015) also argues that education can hinder the surge of a "black box society" system, where citizens are unaware of automated decision-making decisions in AI systems. Therefore, increased digital literacy can prevent or mitigate the societal consequences of algorithmic decisions.

The definition of AGiC has different meanings in computer sciences and social sciences, but its values are the same. In computer sciences, AGiC refers to data migration, a multistep procedure of transferring data from one system to another while minimising the impact of active applications on the latter. Organisations perform this procedure for business and technical reasons, to minimise or prevent any alterations or loss of existing data while transferring it to a new system (Sarmah, 2018; Fahmi & Putra, 2019; Hussein, 2021). In social sciences, AGiC refers to moving data from one social context to another to develop machine learning and algorithmic processes (Masso, 2023). Social sciences authors seek the impact of using data from one social context to another, its repercussions across society and how to mitigate them (Masso, 2023). In both fields, AGiC values generally refer to the principles, ethics, and standards that preserve this data movement. Therefore, although each field treats AGiC with a different focus, both converge on the same concerns in keeping the data's ethical values intact.

Although both domains treat the concept of AGiC differently, they have the same concerns regarding the overall quality of the data and how databases collect them (Hoeren & Kolany-Raiser, 2017; Fahmi & Putra, 2019; Janssen et al., 2020; Hussein, 2021). The unknown origin of data is a typical pattern in numerous AGiC procedures across various sectors (Azeroual & Jha, 2021; Hussein, 2021). Legacy platforms frequently have diverse data sources created by different data modelling tools or interpreted with distinct semantics (Hussein, 2021). Sometimes, the data quality could be better for its analysis and might reflect the reality of the original data (Sarmah, 2018; Azeroual & Jha, 2021). Thence, decision-making derived from data migrated from unknown or inadequate sources to algorithms and machine learning can lead to unexpected societal effects (Loukissas, 2016; Utrecht Data School, 2022; Masso, 2023).

AI data ethics values like data bias and discrimination are common concerns related to AGiC (Janssen & Kuk, 2016; Zuiderveen, 2018; Leslie, 2019; Andersson & Register, 2023). However, the clash between data protection and knowledge exchange is the most recurrent theme among academia and organisations (Masso, 2023). On the one hand, scholars want clarifications of the societal consequences of using data in another social milieu (Gritsenko et al., 2022). On the other hand, organisations want to avoid punishments and regulatory sanctions (Galetsi et al., 2019) while profiting from using data for innovation (Foege et al., 2019).

An AGiC framework is still a novelty, and its conceptualisation is necessary to understand what social shifts occur when data moves to another social context (Masso, 2023). Masso (2023) proposes three foundational principles to create a potential AGiC framework: first, societal changes (intentional or not) made using data are traceable and detected by multiple social actors (human and non-humans); second, AGiC is a process that occurs at multiple levels and scales (e.g. individual to country and country to region); and third, AGiC produces relational changes rather than causal changes (social and cultural processes are interconnected and interdependent) (Masso, 2023).

Although the absence of a theoretical framework, academia has already indicated the importance of considering contextual factors in governance frameworks (Abraham et al., 2019). Some governance models incorporating the social context have been proposed, such as Liu's (2022) "social data governance" model, which recognises each society's unique data governance framework based on its social context. Micheli et al. (2020) have also formulated cooperative

data governance models specifically for urban contexts, which may only be applicable in some contexts. Despite a few examples, these models reveal some concerns from academia in considering the social context whilst applying governance frameworks.

In conclusion, AGiC has different meanings in computer and social sciences, but both domains share similar concerns about data quality and databases. Also, decision-making based on inadequate data can lead to societal effects, and data bias and discrimination are common concerns. Even though there is no theoretical framework for AGiC, academia has stressed the importance of considering contextual factors in governance frameworks. Thus, it is crucial to consider the social context in algorithmic systems and governance frameworks to ensure the responsible use of data.

2.2. ACiG and humanitarian action

The definition of humanitarian action refers to the efforts and activities to assist and protect people affected by military conflicts, natural disasters, and other emergencies (Kuner & Marelli, 2020). The pursuit of humanitarian action is to alleviate the suffering of impacted populations and to promote their well-being and protection.

Humanitarian action encompasses a range of interventions, including, but not limited to, providing food, shelter, water, health care, and other basic needs, as well as protecting and advocating for the rights and dignity of affected populations (European Commission, 2016). Humanitarian organisations such as UNICEF, ICRC, and OCHA are critical in supplying these services, often working in partnership with governments, local organisations, and communities.

The OCHA determines that humanitarian action is guided by four fundamental principles: humanity, impartiality, neutrality, and independence (OCHA, 2022). These principles ensure that humanitarian action is efficacious in a manner that upholds the dignity, rights, and needs of impacted communities and that aid is delivered solely based on need, without discrimination or political considerations (UNHCR, 2023).

New digital technologies have become increasingly prevalent in humanitarian action in recent years, becoming a "paradigm shift" to a more efficient and fast response to humanitarian emergencies (Arendt-Casseta, 2021, p.10). For example, humanitarian organisations have used

satellite imagery and geospatial data to assess the damage caused by natural disasters and conflicts and identify areas of need (Guida, 2021). In addition, algorithmic systems have supported resource allocation in humanitarian logistics to find the best "heuristic solution" for effective, equitably and efficient resource distribution (Yu et al., 2021, p.2).

Although AI technologies have benefits, several scholars have raised concerns about data use in humanitarian affairs and started exploring new theoretical dimensions. Authors like Taylor (2017) and Dencik & Sanchez-Monedero (2022) mention concepts like data justice, the conscious and responsible use of data to respect individuals' rights; Thatcher et al. (2016) and Couldry & Mejias (2019a) 's data colonialism, the exploitation of data from colonised communities by powerful actors (governments and companies); and Milan and Treré (2019) 's Global South theory, where governments and corporations extract valuable data from undeveloped regions (Global South) and use it to their advantage without sufficient compensation or acknowledgement of the local knowledge and context are some issues being discussed.

Employing AI technology in humanitarian action also raises concerns about the potential for data bias and discrimination (Beduschi, 2022, pp.7-11) and the need to ensure data transparency, accountability, and ethical use (Pizzi et al., 2020, p.147). These ethical issues can imperil individuals' human rights if not adequately framed ("Resolution on Privacy and International Humanitarian Action," 2015), causing data breaches (Andrew et al., 2023, pp.1-16), privacy threats (Fast & Jago, 2020) and algorithmic exclusion (Albert & Delano, 2022). By prioritising ethical considerations in using AI technology in humanitarian action, we can harness its potential to improve humanitarian responses while safeguarding the rights and dignity of affected individuals and communities.

UNESCO (2021) also confirmed these worries, but they should not impede the innovation and development of AI technologies within society. Instead, it creates opportunities for promoting ethically conducted research and innovation and can assist in establishing AI technologies rooted in human rights, fundamental freedoms, values, principles, and ethical reflection (UNESCO, 2021). Thereby, there is a growing need to develop a more nuanced and context-sensitive approach to these technological tools in humanitarian action, considering the unique challenges and complexities of crises (Peach & Berditchevskaia, 2022).

Humanitarian organisations need a robust governance framework to guarantee that their data usage is law-abiding with the internal norms and procedures in humanitarian contexts, as irresponsible data use can increase the vulnerability of individuals and communities already at risk (OCHA 2020). Also, the inclusion of existing ethical frameworks must be considered due to the multidisciplinary approach of the humanitarian field (Obrecht, 2019).

No specific regulations and frameworks are currently conveyed for operating AI and ML in humanitarian actions (Kuner & Marelli, 2020). Despite that, some international organisations, such as the United Nations and its agencies, have issued directions on the responsible use of AI in humanitarian contexts (Fournier-Tombs, 2021). In addition, some countries have started devising their own AI regulations. For example, the European Union has recently suggested the Artificial Intelligence Act, which aims to regulate the development, use and deployment of AI systems in the EU (AI Act, 2021). Similarly, the United States has proposed the Algorithmic Accountability Act, which obligates companies to evaluate the effects of their automated algorithmic systems and disclose information about their usage, granting consumers the ability to make informed decisions regarding the automation of significant decisions. (Algorithmic Accountability Act, 2022).

Some methodological approaches propose an AI governance framework that assures that the development, deployment, and use of artificial intelligence (AI) is ethical, transparent, and worthwhile for society (European Commission, 2019; UNESCO, 2021) together with the principles of data governance like compliance with the applicable legislation, cooperation among diverse domains and stakeholders and creation of guidelines and instruments for supervision and control (Jobin et al., 2019). For instance, Floridi et al. (2018) advise an ethical framework for a "Good AI Society", a multi-stakeholder framework based on the ethical and human rights tenets of using AI solutions compliant with established policies, standards and rules.

Coppi et al. (2021) and Beduschi (2022) consent that a future humanitarian framework must consider data's ethical values while using algorithmic solutions. Coppi and his colleagues persist that algorithms should be transparent to everybody, explicable and understandable to anyone, and aligned with the current and relevant legislation related to AI (Coppi et al., 2021). Beduschi (2022) likewise mentions that humanitarian actors should be accountable to their beneficiaries when an AI system might jeopardise human rights. Therefore, the prospective humanitarian

framework must consider social and ethical implications when designing AI solutions (Leslie, 2019).

Pizzi and his colleagues suggest an "AI governance" or "AI ethics" framework based on human rights principles and ethical considerations that the use of AI in humanitarian development and peace operations does not violate human rights (Pizzi et al., 2020, p.152). This governance will require international cooperation because it is a transnational challenge. In addition to building capacity at the organisational level, it is paramount to establish a UN entity that allows each country to establish governance frameworks that suit its unique cultural, political, and economic context. This approach would ensure that AI governance is implemented effectively and tailored to each country's needs (Pizzi et al., 2020).

Humanitarian action is the collection of efforts and activities that assist and protect people affected by conflicts, disasters, and other crises. It involves delivering basic needs, promoting rights and dignity, and advocating for protecting affected populations. Humanitarian organisations such as UNICEF, ICRC, and OCHA are crucial in implementing humanitarian aid. Recently, the use of AI technology in humanitarian action has become prevalent, but it has raised ethical concerns about data bias and discrimination, privacy threats, and algorithmic exclusion, among others. There is a need to foster a nuanced and context-sensitive approach to AI technology in humanitarian action to address these ethical issues, accompanied by regulations and frameworks. Ensuring ethical considerations and AI transparency can be a game-changer in the humanitarian sector, harnessing the potential of AI technology to improve humanitarian responses while safeguarding the rights and dignity of affected individuals and communities.

2.3. Algorithmic technologies (used) in humanitarian action

Masso et al. (2022) and Gritsenko et al. (2022) already indicated the augmentation of socio-cultural tensions of delocalisation and re-contextualising algorithmic solutions. This issue also occurs in the context of humanitarian action. Pizzi et al. (2020) confirmed that most of these solutions employed in humanitarian action would have been designed out-of-context and brought from other ones, like business and marketing sectors, which are not considering cultural, societal, and gender-related factors and might result in incorrect decisions that negatively affect people's lives. For instance, he illustrates that the AI tools designed in Silicon Valley and implemented in

a developing nation might not consider that country's distinctive political and cultural sensitivities. (Pizzi et al., 2020, p.155).

Beduschi (2022) also expresses concerns about transferring algorithmic solutions in a humanitarian context. She agrees that AI technologies can respond to conflict and crises in humanitarian actions. However, they are "context-dependent", which need to be adapted to the situation where they will be deployed to yield impactful outcomes (Beduschi, 2022, p.1156). For illustration, the dissertation's case study GeoMatch is an example of an algorithmic solution that must be tailored considering the countries' social context and its integration goals (Immigration Policy Lab, 2019) before its implementation for better results. In other words, each country presents different contextual particularities that will determine the success or failure of AGiC. Likewise, the social characteristics of one country (e.g. Brazil) might drastically differ from another (e.g. Estonia). Therefore, all these social-dependency factors must be accountable for effectively implementing algorithmic solutions in another context. This" context-dependency" aspect will be discussed further in section 4 (Problem setting) of this work.

Academia has already expressed its preoccupations regarding the specific risks of AGiC in humanitarian action. Some authors like Weitzberg et al. (2021) mention surveillance humanitarianism, the use of digital technologies to monitor and manage humanitarian assistance in crisis settings, which can generate ethical issues like data privacy violations, data bias and discrimination; Molnar (2020) comments on Techno-Solutionism, a belief that technology can solve any problem, regardless of its complexity or underlying societal and political issues, overlooking the complex social and political contexts that shape problems and ignoring the voices and needs of affected communities; and Madianou (2019) 's Technocolonialism, the use of technology and digital systems to exert control and domination over people and resources in the same way traditional colonialism does. These are some of the topics raising red flags on using algorithmic solutions in another context.

AGiC of humanitarian action still keeps the same concerns with data ethics when applying algorithmic solutions in another context. Beduschi (2020) mentions that data quality, data bias and data protection in humanitarian algorithmic solutions are the main issues that must be overseen to not worsen the situation of vulnerable populations. She adds that humanitarian organisations should abide by the "do no harm" principle, carefully assessing how their actions

or inactions could unintentionally harm the communities they aim to assist and hinder new hazards while using AI solutions (Beduschi, 2020).

In conclusion, using algorithmic solutions in humanitarian action has raised academic concerns regarding the potential risks and negative impacts. Adopting AI technologies without considering cultural, societal, and gender-related factors might result in incorrect decisions that negatively affect people's lives. The risks of AGiC in humanitarian action include surveillance humanitarianism, techno-solutionism, and technocolonialism, which can generate ethical issues like data privacy violations, data bias, and discrimination. Therefore, implementing algorithmic solutions in humanitarian action must follow the "do no harm" principle, carefully assessing how their actions or inactions could unintentionally harm the communities they aim to assist, ensuring data quality and protection, and avoiding data bias. Humanitarian organisations must tailor AI solutions to the context where they are inserted, considering each country's distinctive political and cultural sensitivities.

3. Problem setting

3.1. Problem setting

This dissertation explores the phenomenon of AGiC in the humanitarian affairs field. This work wants to discover the particularities of this subject in the humanitarian action theme rather than generalising it, like most of the studies found during this research. It wishes to contribute new insights about this intriguing and recent object of study in academia and assist in future studies.

Humanitarian action is a required field that addresses the necessities of vulnerable populations, often in crisis or conflict situations. In the last years, there has been relevant growth in the use of technology and data in humanitarian action, including algorithmic systems for decision-making and data analysis. While these systems offer substantial potential for enhancing the efficiency and effectiveness of humanitarian action, they also raise considerations about the potential negative impacts on humanitarian crises, mainly when they use data from one social context to another.

Using algorithmic systems in humanitarian action raises concerns about ensuring that these systems' development upholds human rights standards, particularly concerning ethical data values like protection, privacy, and non-discrimination. Despite legal and ethical frameworks being in place to conduct the development and use of algorithmic systems, they still need to regulate all potential issues of using algorithmic solutions in humanitarian action (Rodrigues, 2020).

Data migration is transferring data from one system or location to another, often to improve data management, accessibility, and security. This process is typical in humanitarian action as it transfers data from the field to central databases, enabling better decision-making and resource allocations for the effectiveness of humanitarian projects (Gazi, 2020). However, this process might have societal impacts. In social sciences, data migration is also AGiC, which is repositioning data from one social context to another for an algorithmic solution (Masso, 2023). It can lead to unexpected societal and cultural repercussions, negatively impacting a context already fragile by humanitarian crises.

In humanitarian action, AGiC is social context-dependent, in which the social factors of the context will determine the defeat or the triumph of AI tools' implementation. Rescuing Pizzi et al.(2020) and Beduschi (2022), most of the algorithmic solutions present in humanitarian action were built in a different context (e.g. Finance) and brought to the humanitarian crisis context without considering the social factors of the new context. Therefore, these tools can bring negative societal consequences and worsen the situation of vulnerable people.

Another specificity of AGiC in humanitarian action is its keen sensibility to the ethical use of data. According to Kuner and Marelli (2020), recurrent data problems like data bias and data protection can escalate the suffering of the afflicted populations (Kuner & Marelli, 2020). A minuscule data analysis error or misinterpretation can harm these populations enormously. For instance, GeoMatch's algorithmic solution for relocating refugees to a new country uses their basic personal information like names, dates and addresses to resettle them in an appropriate place according to this information. Suppose the placement officer misinterprets this data. In this case, the refugees can be relocated to a different place, affecting their social integration, hindering their adaptation and a new beginning in the host country due to the officer's "slight" mistake.

Regarding the research gaps, the author noted the need for a more meticulous investigation into the impact of algorithmic decision-making on specific domains, such as healthcare, education, criminal justice and public services during the research. While some studies have been in these areas, it is necessary to go in-depth on these domains to find and reach a consensus about the specific problems. For illustration, all fields generalise the same problems of using algorithmic governance in their areas (e.g. data bias, discrimination, opacity in automated decision-making). They need to pinpoint the main issues of using this solution for each field for more helpful research and, consequently, a more effectual contribution to academia. This work will focus on the humanitarian action domain that needs more special investigation about the effects of the algorithmic solutions on it and propose new points of view related to the theme.

Furthermore, the author noted dispersed research related to the algorithmic governance topic. Although several studies (Issar & Aneesh, 2021; Gritsenko et al., 2022) define algorithmic governance and co-related subjects (e.g. automated decision-making systems, data ethics and data governance), they are decentralised and need more focus on which direction the studies in the field should go. For instance, there is no unanimity on defining fundamental aspects like "what is data governance?" or even an existing framework that unites all themes. Therefore, this work will reunite all the main theoretical concepts of the most recurrent subjects related to algorithmic governance and offer another theoretical point of view on how to interpret them and how they are pivotal to analysing the societal effects of algorithmic solutions in humanitarian action.

Another central gap is the need for more attention to the social context in which algorithmic systems are designed, deployed, and used. Many studies have focused on technical aspects of algorithmic systems, such as accuracy and efficiency in migrating data from one system to another. Few are considering the social, political and cultural implications of this movement and discussing them thoroughly. Hence, more studies are required about this phenomenon, and this work will handle it, concentrating more on humanitarian action.

The dissertation desires to explore further the phenomenon of AGiC, mainly in the humanitarian action field. This work wants to see this process's influence and impact on algorithmic tools used in humanitarian action. Hence, the research wants to address the following questions:

1. What are the measures to mitigate the adverse effects of algorithmic governance systems?

2. Why is it essential to preserve the AGiC process during humanitarian action
3. How to mitigate the societal impact of humanitarian action when applied in another context?

Humanitarian organisations often collect and process vast amounts of data to aid and assist people in need. However, it must be clear what their measures are to avoid the adverse effects of their algorithmic systems. Second, knowing the key elements to preserve AGiC during humanitarian action is essential to implement an algorithmic tool in another context successfully. Finally, it is vital to lessen these tools' societal (negative) impacts when applied in another context, especially in humanitarian action.

This dissertation focuses on AGiC in humanitarian action. Although algorithmic systems can enhance the effectiveness and efficiency of humanitarian action, they raise concerns about potential negative impacts on the human affairs field, mainly when data is transferred from one social context to another. The author notes several research gaps in this field, such as the need for a more detailed investigation into the impact of algorithmic decision-making in specific domains and more attention to the social context in which algorithmic systems are deployed. The dissertation seeks to explore the phenomenon of AGiC in the humanitarian action field and provide new insights about this intriguing and recent object of study in academia.

3.2. Case study

3.2.1. GeoMatch

IPL's GeoMatch is an algorithm-based software created and conducted by the Immigration Policy Lab and partnership with Stanford University and ETH Zurich. The tool helps policymakers and stakeholders to relocate refugees to suitable locations for resettlement, considering factors such as employment opportunities, housing availability, and social services.

GeoMatch uses machine learning algorithms to match refugees' characteristics with potential resettlement locations. The software utilises personal data to identify the characteristics of refugees, such as their country of origin, family size, and health status, and the features of potential resettlement locations, such as their economic conditions, housing availability, and social services (Mossaad et al., 2020).

One of the critical aims of GeoMatch for refugee relocation is to assist refugees in finding locations that can help them to restart their lives. By analysing resettlement patterns across different regions and communities, policymakers can identify areas where refugees are more likely to succeed and thrive, such as locations with firm social services, supportive communities, and job opportunities (Bansak et al., 2018).

Another intent of GeoMatch for refugee relocation is that it can help address the challenges and barriers that refugees often face when seeking to resettle in a new location. Refugees may face challenges upon arriving in a new country, like language barriers, cultural differences, and discrimination, making accessing housing, employment, and social services complex (Heidinger, 2023). By matching refugees with locations that can provide them with the necessary support and resources, GeoMatch can help refugees overcome these challenges and might integrate into their new communities successfully (Bansak et al., 2018).

GeoMatch software is written in the computer language R (Ferweda et al., 2022). It consists of a customised dashboard where the relocation office can set the preferences for building the prediction model (Figure 1). According to Immigration Policy Lab (2019), the software is customised in consonance with the country's context: it will consider the country's restrictions and policies related to refugees' data - and the algorithm is open source. It can be changed and deployed in several social contexts (Immigration Policy Lab [IPL], 2019). According to IPL (2019), the data merges historical data from past refugees living in the country and incoming refugees' data, like nationality, gender, age and profession (Bansak et al., 2018; IPL, 2019).

The algorithm uses a numerical sequence of supervised machine learning and optimal matching techniques to understand the interactions between their features and geographic context, influencing the outcomes of their integration process (Bansak et al., 2018; IPL, 2019). The outcomes include the time taken to secure employment, the nature of the jobs secured, and the possibility of relocation following initial resettlement. (IPL, 2019).

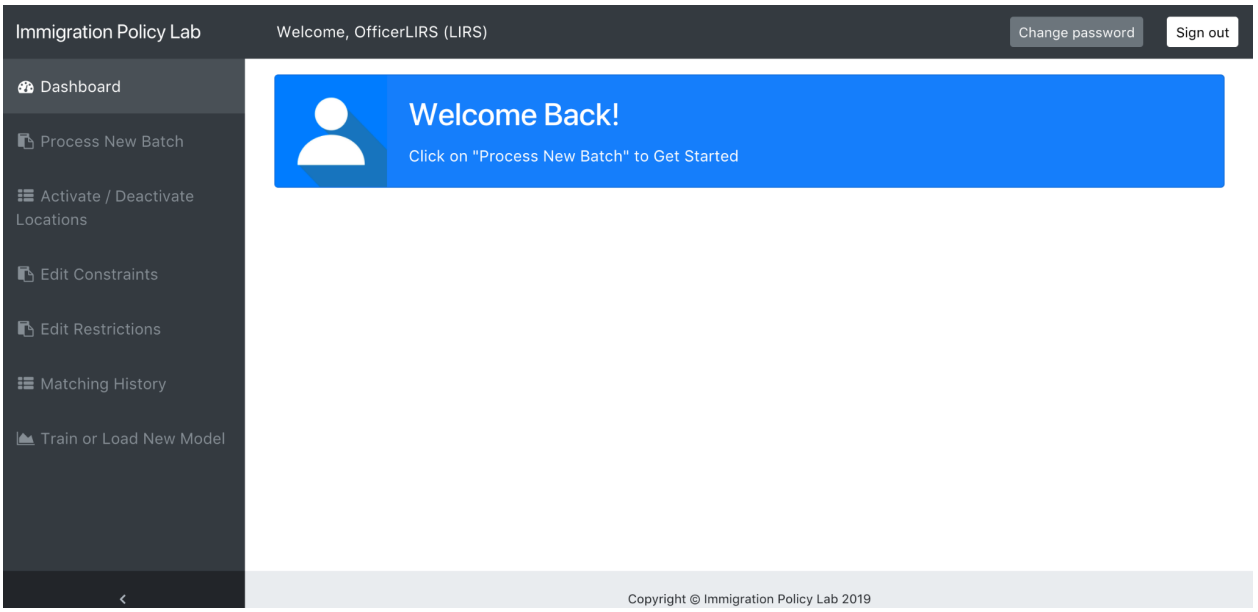

Figure 1. *GeoMatch's initial page*. (Immigration Policy Lab, 2019)

The flow of the algorithm is divided into three phases, and Bansak and his colleagues explain as follows:

- **Modelling**: The supervised machine learning process predicts new refugee arrivals' success in various resettlement locations based on quantifiable metrics, such as early employment. Resettlement historical data is used to train the model, using a single refugee as an observation unit and information on his background characteristics, arrival time, assigned location, and employment success. After, supervised learning models are created by training data to predict employment success based on refugees' background characteristics. Separate models are developed for each location, enabling the discovery of refugee and location synergies. The fitted models are applied to new arrival data to predict expected employment success in each possible resettlement location (Bansak et al., 2018). Modelling is the stage where GeoMatch's system starts to build the predictions and compare them with the new data from incoming refugees.
- **Mapping**: conversion of the predictions generated for individual refugees in the modelling stage to a case-level metric, as refugees are typically assigned to locations, often consisting of family unit cases. Various mapping functions are available, like the predicted probability that at least one refugee will find employment at the location predicted in the modelling phase (Bansak et al., 2018). Mapping is the phase where conditions are applied for the locations' predictions.

- **Matching:** This stage includes the selection of a specific location for each case based on a chosen benchmark with conditions. The algorithm can be adjusted to multiple conditions and benchmarks, like maximising the global average probability that at least one refugee in each family would find employment. The incorporation of real-world limitations, such as the number of refugees that can be assigned to different locations in the country, is available in this phase. (Bansak et al., 2018).

Matching is the last stage of the model, and the tool recommends the ideal locations for new refugees based on the data informed in previous phases. Relocation officers can accept or not the recommendations made by the tool. (Bansak et al., 2018).

GeoMatch has been tested in two countries - the United States and Switzerland (Immigration Policy Lab, 2019) - and its application is being studied in Canada and Netherlands (Immigration Policy Lab [IPL], 2021). The results were promising in both countries, showing refugees' employment gains between 40 to 70% (Bansak et al., 2018).

Using the US refugee registry data, GeoMatch in the US showed that the software could accurately predict the likelihood of refugees finding employment in different locations, which allowed for more strategic and informed decision-making by relocation officers. Refugees resettled in locations predicted by GeoMatch had doubled the chances of finding employment sooner (25% to 50%). Almost every location predicted had higher employability, even with low employment rates (Bansak et al., 2018). Hence, this test showed the tool's efficacy, improving integration outcomes for refugees, as they could establish themselves in communities with better employment prospects and opportunities for socioeconomic integration.

Similarly, in Switzerland, the application of GeoMatch has shown promising results in optimising the employment rate after the resettlement process for refugees by considering similar cultural features. Using historical data from the Swiss State Secretariat for Migration (SEM), Geomatch predicted the increase of employment success of refugees by approximately 73% during the third-year occupation in different cantons (Bansak et al., 2018). For instance, refugees with the same language skills as the canton assigned had more earnings than those assigned to a canton with a different language (e.g. French-speaking refugees assigned to a German-speaking canton instead of the French one) (Bansak et al., 2018).

The favourable results of GeoMatch in these countries highlight the potential of using AI and ML techniques in refugee resettlement to optimise outcomes and improve the lives of refugees. However, further research and assessment are needed to understand the long-term impacts and scalability of GeoMatch in different contexts and settings. As mentioned before, using the tool in other countries' contexts or regions will require customisation to align with the social aspects of the countries - e.g. local policies, restrictions, and data availability - to minimise the possible societal negative impact of transferring an algorithmic solution to another context.

The concept of AGiC still needs to be discovered by most people, and the development of GeoMatch might not consider the societal consequences of moving an algorithmic governance solution from one context to another. Nevertheless, using GeoMatch in the US and Switzerland demonstrates the potential of data-driven decision-making and advanced analytics in optimising the resettlement process for refugees and improving their integration outcomes.

3.2.2. GeoMatch in Brazil and Estonia

The case study chosen was the refugee relocation solution GeoMatch and its hypothetical application in different countries. This algorithmic tool is an excellent example of an algorithmic solution that attempts to be used in different social contexts for relocating incoming refugees to suitable locations for resettlement based on their data. Therefore, its examination can assist in replying to the research questions and filling the gaps found.

GeoMatch is an excellent opportunity to study a real-world algorithmic tool used in humanitarian affairs. By studying its design, implementation, and outcomes, we can gain insights into algorithmic governance's challenges and opportunities in this field. The software has already been implemented and used in a real-world setting. Therefore, we have available data, knowledge and feedback collected from GeoMatch's implementers to understand better how algorithmic governance systems are perceived and used by various stakeholders, specifically in humanitarian settings.

Another contribution of this case study's investigation is to offer new research to academia. During the thesis's research, the author encountered very few studies about the effects of algorithmic solutions and co-related technologies in different contexts, like Masso et al. (2022) 's Ubenwa health application relocation and Masso & Kasapoglu (2020) 's refugees and data

experts' view regarding algorithm relocation. Therefore, a case study was paramount to assist the author in filling the research gaps and replying to his research questions while contributing to academia with an exciting case study.

Regarding the research gaps, GeoMatch will help us understand the ethical and social impacts of implementing this tool in humanitarian action. AGiC affects the dynamics of the humanitarian crisis context. Algorithmic tools' results cause societal effects in the context where it is applied, and these consequences are more severe on vulnerable populations. GeoMatch involves decisions that affect the lives of refugees, and we can investigate further its impact.

The analysis of GeoMatch also allows us to investigate the specific problems of algorithmic governance and AGiC in the humanitarian affairs field. As mentioned, most fields generalise the same problems of using algorithmic governance in their areas. Therefore, analysing GeoMatch permits us to investigate the particularities of implementing algorithmic solutions in a humanitarian action context, create new insights and avoid the generalisations found in prior research.

Examining GeoMatch allows us to focus on the societal effects of implementing AI technologies in a different social context. Most studies focus more on the designing and technical aspects of algorithmic tools, and few concentrate on the socio-political implications of this usage. Therefore, by examining GeoMatch, we can go deep into these aspects and generate new insights on this other side of algorithmic governance.

Comparing two countries' implementation of the refugee relocation algorithm, IPL's GeoMatch can provide insights into the contextual factors that affect the success or failure of the algorithm in different settings. By comparing the two countries' experiences, researchers can identify the factors that contribute to successful implementation and those that hinder it. This comparison can help policymakers and practitioners better understand how to adapt the algorithm to local contexts and improve its effectiveness.

Additionally, comparing two countries' algorithm implementation can provide a basis for knowledge sharing and learning between countries. By sharing experiences and lessons learned, countries can avoid making the same mistakes and identify best practices for successful implementation.

Finally, comparing the two countries' algorithm implementation can help generate new insights into the broader social, political, and cultural issues that affect refugee resettlement. By examining how the algorithm interacts with local norms, values, and power structures, researchers can identify ways in which the algorithm may exacerbate or mitigate existing social and political tensions and develop strategies to address these issues.

Specifically for replying to the third question, the master's case study also will bring most of the answers. A comparative analysis of a hypothetical implementation of two distinct countries (Brazil and Estonia) will be essential for several reasons:

- It helps to understand how different social, cultural, and political contexts influence the development and implementation of algorithmic solutions. By comparing the experiences of different countries, we can identify best practices and potential pitfalls in algorithmic governance;
- It permits us to gauge the effectiveness of algorithmic solutions in different contexts. What works in one social context may not work well in another due to differences in factors such as cultural norms, political structures, and technological infrastructure.
- It provides insights into algorithmic governance's ethical and social implications. It enables us to detect potential risks and harms from algorithmic solutions and develop appropriate safeguards and accountability mechanisms to mitigate them.

The analysis of the case study was based on the opinions of immigration experts about GeoMatch per se and its utilisation in different country contexts. The experts are from various backgrounds related to immigration. They responded to a questionnaire asking their opinions about the concept of the tool, its usefulness in relocating refugees, concerns and issues of using it and suggestions to improve it. Their different viewpoints could confirm the concepts of this work and show other insights not perceived during the author's research.

After collecting and analysing the answers, the author reunited and divided the insights into groups considered essential for using GeoMatch in different countries according to the experts' opinions. Then, the author selected, studied and compared two countries' social contexts (Brazil and Estonia) to verify their social challenges in implementing the tool and decide which would

present better social conditions for the installation of the tool. The following section will explain how the author compared and analysed.

3.2.3. Social context overview

The social context overview context will summarise the main social aspects treated in the case study: human geography, refugees, migration background, attitudes, and integration readiness. Understanding both countries' social contexts is imperative, as these social factors must be considered before GeoMatch's implementation.

A) Brazil

Brazil is a country of social contrasts and diversity in its geographical and social contexts. Brazil is the fifth-largest country worldwide, and its territory of 8.5 million square kilometres. It is home to over 213 million people (IBGE, 2021), making it the seventh-most populous country (US Census Bureau, 2023). Its population comprises several ethnicities, with the majority being of mixed African, European, and indigenous descent (Souza et al., 2019). Despite being classified as an upper-middle-income country (World Bank, 2023a), Brazil still faces significant social challenges, including income inequality, poverty, violence, and discrimination (OECD, 2020a).

Brazil's colonial past, marked by Portuguese colonisation and the exploitation of indigenous people and enslaved Africans, has profoundly impacted its social context. The country abolished slavery only in 1888, and the long-lasting effects of this dark period in its history can still be seen today, especially in the social inequality and discrimination faced by the black population (Princeton University, 2023). The indigenous population has also been subjected to violence and discrimination, with many communities facing the threat of forced eviction and loss of their cultural heritage (HRW, 2022).

Brazil has made relevant progress in reducing poverty and improving social inclusion in recent years (OECD, 2020a). Social programs such as Bolsa Família, which provides cash transfers to low-income families, have lifted millions out of poverty and helped reduce inequality (ILO, 2012). However, despite these advances, Brazil still faces high levels of violence, particularly in urban areas, with one of the highest homicide rates worldwide and a persistent problem of police brutality and human rights abuses (US Department of State, 2021).

Brazil is known for its cultural diversity, resulting from centuries of migration flows from different parts of the world (Hooper et al., 2018). Brazil has become an increasingly attractive destination for immigrants in recent years due to its strong economy, stable political environment, and open immigration policy (Hooper et al., 2018). The Brazilian government has been implementing several measures to facilitate the integration of immigrants, such as providing access to education and healthcare and offering permanent residency to those who meet the eligibility criteria (Ministério do Desenvolvimento Social e Agrário, 2016). Additionally, Brazilian society has shown acceptance and respect towards refugees. According to Calliari (2022), Brazil is the country that most support refugee reception globally, independently of nation and creed. Therefore, Brazil's welcoming attitude towards immigrants has made it an attractive destination for individuals seeking new opportunities and a better quality of life.

In conclusion, Brazil's social context is complex and diverse, shaped by its colonial past, its ethnic and cultural diversity, and the social challenges it continues to face. Although advancements have been achieved recently, much remains to address inequality, discrimination, and violence and ensure that all Brazilians can access the resources and opportunities they need to thrive.

B) Estonia

Estonia is a Baltic country close to the Gulf of Finland (North) and the Baltic Sea (West). It is one of the smallest European nations, with approximately 1.3 million people (Eesti Statistika, 2023b). The nation has a rich and intricate history, ruled by various empires throughout the centuries, including the Danes, Germans, Swedes, and Russians. Estonia gained independence in 1918, but the Soviet Union occupied it during World War II and could not regain its independence until 1991 (Iwaskiw, 1996; Eesti Institute, 2023).

Since regaining its independence, Estonia has undergone a significant transformation, moving from a centrally-planned economy to a market economy (IMF, 2001) with a strong emphasis on technology and innovation. Estonia is one of the most digital states in the world, with a highly developed e-government system and a thriving start-up scene (e-Estonia, 2022). However, Estonia still faces several social challenges, including regional income inequality, a declining population, and a significant rural-urban divide despite its modernisation (Fina et al., 2021).

Estonia is also a diverse country, with a significant minority population of ethnic Russians, which has created social tensions, particularly around language and cultural identity issues (Włodarska-Frykowska, 2016). Despite these challenges, Estonia has made significant progress in promoting tolerance and diversity in recent years, including implementing anti-discrimination policies and programs to support minority communities (ACFC, 2022).

In terms of education, Estonia has a robust system that emphasises high levels of educational attainment and supports lifelong learning (OECD, 2015). The Baltic state has a high literacy rate and a strong science and technology education tradition, which has helped fuel its digital transformation (Toome, 2020). However, there are still significant disparities in educational outcomes, particularly between urban and rural areas, and efforts are underway to address these inequalities (Fina et al., 2021).

Overall, Estonia's social context is complex, with a mix of traditional and modern elements, a diverse population, and a range of social challenges that require ongoing attention and investment. However, the country's strong commitment to innovation and its embrace of digital technologies suggests its progress will continue for more years.

C) Differences and similarities between Brazil and Estonia's societies

Brazil and Estonia have similarities and differences regarding their social contexts related to the main topics of this research. In immigration, Brazil and Estonia have experienced waves of immigration in recent years. They have faced challenges integrating immigrants into their societies and ensuring their rights are respected. However, the reasons for immigration are different. In Brazil, people immigrate mainly for economic reasons and to escape political instability (Hooper et al., 2018). In Estonia, immigration is primarily driven by better employment opportunities, family and education (Prague Process, 2023).

In humanitarian action, both Brazil and Estonia have taken steps to address humanitarian crises and support vulnerable populations. Brazil has a long history of providing asylum to refugees and has faced challenges related to integrating them due to its social problems (UNHCR, 2021). On the other hand, Estonia has provided humanitarian aid to refugees. It has also experienced

challenges in integrating migrants from other parts of Europe because of ethnic tensions in its society (Włodarska-Frykowska, 2016).

Regarding algorithmic governance and AGiC, Brazil and Estonia are at the extremes related to AI development and digital technologies in their societies. On the one hand, Brazil has made strides in improving digital public services and governance but still faces challenges in its technological infrastructure and developing AI systems (Pacete, 2022). On the other hand, Estonia is often considered as a leader in digital governance, with a highly advanced e-government system enabling citizens to access various services online, using several technologies, including AI (Kaevats, 2021; e-Estonia, 2022; Invest Estonia, 2023). Its concerns centralise on the themes of data privacy, security challenges and the development of guidelines and regulations for the ethical use of algorithms in public services.

4. Methodology

4.1. Methodology

The methodology proposed for this dissertation combines a literature review with an exploratory case study applied in hypothetical situations, assisted by the opinions and perspectives of relevant stakeholders involved in this context. The former will define the central theoretical ideas surrounding algorithmic governance and algorithmic relocation in the context of humanitarian action to comprehend what has been studied by academia and identify research gaps in previous studies. The latter will analyse a hypothetical implementation of Immigration Policy Lab (IPL) 's GeoMatch, a humanitarian action solution for refugee relocation, in Estonia and Brazil and check if the application will provide the information needed to achieve the goals of this research.

A literature review is essential for building the theoretical analysis section of a master's dissertation. It thoroughly comprehends the existing state of knowledge on the research topic, helps uncover research gaps and inconsistencies and presents up-to-date theories and concepts of the subject (Winchester & Salji, 2016; Chigbu et al., 2023). It also presents a unique opportunity to evaluate and compare different arguments and theories rather than summarise them (Leite et al., 2019). Overall, a literature review is crucial for building a robust theoretical foundation to guide the empirical investigation and advance knowledge in the field.

A *case study* is an important research method to investigate complex and real-world phenomena deeply. It involves an in-depth study of a phenomenon or event using multiple data collection methods to understand it comprehensively (Yin, 2009). It comprehensively analyses a specific and relevant example to the research question (Priya, 2021). Therefore, this method is advantageous when investigating a relatively new or complex area with little prior research, like an algorithmic relocation solution like GeoMatch.

Finally, after the general analysis of the tool, the case study will focus on the hypothetical implementation of it in two different countries (Brazil and Estonia) based on the opinions and perspectives of immigration experts. An overview of both countries' social contexts will be presented to interpret the experts' recommendations and inspect which country would be more challenging to install the algorithmic solution.

4.2. Sample strategy

The sampling method chosen was a purposive sample to collect the data. This method was the most adequate, as the participants possessed specific characteristics or experiences related to this research (Palinkas et al., 2015). Furthermore, this method seemed the most adequate, as Masso et al. (2022) 's Ubenwa study case and Masso & Kasapoglu's (2020) refugee relocation algorithm perceptions used the same method to collect the perspectives and views from their subjects regarding the use of algorithmic solutions in another context. The former is about the Ubenwa app developed in Canada, datasets from Mexico, and both used in Nigeria to detect asphyxia from babies' cries. The latter concerns data experts' and refugees' views and perspectives on using the refugee relocation algorithm. Both studies concern the impact of algorithms and their technologies in the societies in which they are inserted. Therefore, their research structure seems the most reasonable and appropriate for the author's work (algorithmic solution GeoMatch and its impact on societal impact when applied in different social contexts).

The sample of this work used was immigration experts (n = 7) from different sectors of society - e.g. governmental and private sectors, academia, international organisations and non-governmental organisations (NGOs) - and fields co-related to the case study: humanitarian affairs and data specialists. The participants work with immigration (homogeneous characteristics) but come from different professional and academic backgrounds (heterogeneous characteristics). The thoughts of experts from different fields were essential, as algorithmic

governance is addressed in various contexts and disciplines of academia (Katzenbach & Ulbricht, 2019), and this variety of ideas gave insights that a single specific field could not cover or adequately address. Immigrant specialists can provide valuable insights into immigrants and refugees' unique challenges and identify potential issues or concerns with GeoMatch's implementation. On the other hand, non-immigrant specialists can provide a broader perspective and identify potential blind spots or biases that may exist in the implementation only uncovered by a third-person perspective.

The samples belonged to the author's social and professional networking (n = 5). Others were contacted through Facebook groups related to refugees in Estonia and non-governmental organisations (n =2). There was no specific analysis for each group. The responses were analysed equally without bias from the author only to understand their feelings regarding GeoMatch. Their complete details are in Table 1, except their names for security reasons.

Table 1.

Experts' profiles

Experts	**Gender**	**Education**	**Professional Experience**	**Years of Career**
Expert 1	M	BA	Immigration Integration guide; Department manager	2 years
Expert 2	M	MA	Government (Foreign Service)	33 years
Expert 3	F	PhD	Associate Professor; former Project Manager	20 years
Expert 4	F	MA	Project Manager	7 years
Expert 5	M	MA	Humanitarian Organisation Director	10 years
Expert 6	M	PhD	Migration and Data researcher	2 years
Expert 7	M	MA	Lawyer, consultant	5 years

Note. Table created by the author.

The questionnaire consisted of 12 questions divided into two sections. The first section consisted of 6 questions (Table 2): 3 questions about their professional background with short written answers and three multiple choice questions to gauge their knowledge in digital literacy, MA/AI and trustiness in algorithms. Also, a quick summary about GeoMatch (and co-related references) was written at the beginning of the section to give an overview of the tool to assist the respondents' answers.

Table 2.

Questions of the first section of the questionnaire

QUESTIONS	**ANSWERS / ALTERNATIVES**
1. Education	Short written answer
2. Professional Experience	Short written answer
3. Years of Practice	Short written answer
4. Digital Literacy	☐ High ☐ Average ☐ Not very knowledgeable ☐ Low
5. Experience with AI (Artificial Intelligence) / ML (Machine Learning).	☐ Used in research and/or professional task ☐ No professional experience ☐ None
6. Trust in algorithms for refugee relocation.	☐ High (totally trust) ☐ Medium (I trust in the results only in certain conditions) ☐ Low (I have doubts about the results) ☐ No trust at all

Note. Table created by the author.

The second section was six open-ended questions about their perspectives on applying GeoMatch in a different country (Table 3). This type of question allows the respondents to answer based on their understanding of the tool, work, and life experience. Furthermore, like in the first section, it was given some references to understand the flow of the tool to assist them in their replies.

Table 3

Questions of the second section of the questionnaire

QUESTIONS	ANSWERS / ALTERNATIVES
7. What is your impression of GeoMatch relocation software?	Long written answers
8. Can GeoMatch be a valuable tool for helping the refugees to integrate into your society? Why? Why not?	Long written answers
9. Do you have any concerns about how and which data is used in the tool? (E.g. personal data privacy, bias on the interpretation of which data will be used, any technical aspect, etc.)	Long written answers
10. If there are any concerns related to the data used in the tool, what are your suggestions to avoid them?	Long written answers
11. Is it any issue using an algorithmic relocation software like GeoMatch in another social context? Why? Why not?	Long written answers
12. If the government implements the tool to relocate refugees across your country, what would be the best measures to guarantee the success of its application?	Long written answers

Note. Table created by the author.

In the next subsection, it will explain the method approach chosen.

4.3. Mixed-method approach

The data collection method chosen for this work was a mix-method approach with formalised questions and open-ended questions about a "social phenomenon" (Young, 2015): the potential application of GeoMatch in different countries and its impact in different social contexts.

A mixed-method approach with formalised written and open-ended questions benefited this work. Formalised written questions could provide structured and straightforward data needed for this research. The author could directly inquire about the specific information needed from the experts without engaging in extraneous conversation, resulting in more efficient use of time. On the other hand, open-ended questions could provide rich insights into complex issues asked that may not be captured by closed questions alone. The author allowed the participants to provide more detailed and nuanced responses, providing a deeper understanding of their experiences, attitudes, and perspectives within the range of formalised written questions.

The experts' insights interpretation was made using the literature that built the theoretical concepts of the dissertation. Using this literature, the author could verify if the answers were aligned with what has already been studied by academia, consolidating the theoretical concepts of the thesis and helping to reply to the research questions.

After the interpretation, the author used their insights to indicate the main social aspects to be considered in a country when applying GeoMatch successfully. He selected Brazil and Estonia from them and compared both countries based on these aspects, covered in the following subsection.

4.4. Analysis Approach

The analysis approach compared two hypothetical cases of implementing GeoMatch. The hypothetical case study was two countries (Brazil and Estonia) and examined which country presented more societal challenges for the tool's implementation. The societal challenges of implementing the tool were separated into groups that the author considered most relevant for the success or failure of applying GeoMatch in both countries.

Hypothetical cases study were selected as they provide a way to explore the research questions and propose potential solutions in a realistic environment. Ebneyamini & Moghadam (2018) state that a case study is an empirical investigation of an up-to-date phenomenon in a real-life situation when the division between a phenomenon and its context is not evident. Therefore, a hypothetical case allows the construction of a scenario that may or may not exist in real life but permits applying theoretical frameworks and concepts to a virtual but realistic scenario.

According to Yin (2009), comparative case studies help examine similarities and differences across cases and identify patterns that may not be apparent from studying a single case in isolation. By comparing hypothetical cases, researchers can identify similarities and contrasts in factors such as the main topics of the dissertation (immigration, AGiC values, humanitarian action, and algorithmic governance) in distinct social contexts. This comparison can provide insights into how different factors may interact and influence outcomes in different scenarios.

Another reason for comparing hypothetical cases, they can help develop and refine the research methodologies and tools. For illustration, in the context of GeoMatch, comparing hypothetical cases in Brazil and Estonia can help identify the strengths and limitations of the algorithm in different social contexts and provide insights into how it can be adapted to suit distinct contexts.

The main aim of the comparison was to provide insights into the contextual factors that affect the success or failure of the algorithm in different settings (Goodrick, 2014). By comparing Brazil and Estonia's social context, the author could identify the factors that contribute to successful implementation and those that hinder it. This comparison can help to identify the main social factors that can impede the successful implementation of the tool

The author created groups based on the most recurrent social aspects pointed out by the specialists. For instance, the specialists indicated social challenges like "language barrier", "the specific social characteristics of the refugee", and "culture and legal norms". So, the author interpreted and separated them as the "social integration" aspect (group) that the countries need to have to implement GeoMatch in their countries and so on. The analysis of each aspect to be put into each group was based on the author's interpretation of what he considered adequate for the division. After analysing each group, he concluded which country would have more "social capacity" to implement the tool within their societies.

The analyses of Brazil and Estonia's social contexts used additional bibliographies related to the various social aspects of the countries. Most of the references used are governmental and international organisations' analytical reports and statistics about the socio-economic and political aspects of the countries. Hence, the author could make his analyses and create arguments about the social aspects to be considered when implementing GeoMatch, gauging each country's social challenges and potential risks.

The specialist's names will be kept in anonymity due to security reasons. Their responses' citations used aliases as "Experts" instead of their names.

The results of the empirical analysis will be discussed in the next subsection.

5. Empirical Analysis

5.1. Results and findings

5.1.1. Algorithmic Governance systems

The experts could offer excellent suggestions and opinions about the impact and risks of using AI technologies in humanitarian action. Their high level of digital literacy allowed them to confidently express their concerns about data concepts like data bias, data discrimination, data privacy and data surveillance (Firth-Butterfield et al., 2022). They emphasised the importance of data privacy and protection (Experts 1, 5 and 7) when algorithmic systems (GeoMatch) use their data for settlement predictions.

> "Algorithms may have internal biases inherent to them (see also other AI-related bias research, e.g. how AI becomes racist and misogynic after learning existing datasets)" (Expert 5)

> "Yes, I am concerned about the use of private data by the authorities to track or identify them [refugees] in order to send them back to their country of origin. Indeed, many refugees refuse to disclose their personal data to the authorities for these same reasons." (Expert 3)

Interestingly, they mentioned the need for adequate data infrastructure (data governance framework) to collect and store data to protect it, qualified technical staff to keep the algorithmic system functional and various stakeholders' participation in creating proper regulations to manage the system (Expert 6) (Gupta & Cannon, 2020). All these comments are vital characteristics of data governance, which proved beneficial in working together with algorithmic governance systems to diminish any deleterious effects it may cause.

These replies showed two fascinating concepts presented in this work's theory: the relevance of digital literacy to handle (technical staff) and evaluate algorithmic systems' results (specialists)

and the fruitful relationship between data and algorithmic governance for a better administration and use of data.

5.1.2. AI and humanitarian action

The experts' perspectives about GeoMatch were positive regarding their possible implementation due to its innovative approach (Expert 2) to assessing refugees' profiles and relocating them where they can be most productive (Expert 1) for them and the host country. However, they raised awareness that data ethics must be regarded during the AGiC process in humanitarian action to avoid the recurrent issues in algorithmic governance, like data misuse, data surveillance and data bias against the refugees (Utrecht Data School, 2022).

Indeed, these data issues can generate distortions that can affect the results of algorithmic tools in humanitarian action. Data misuse can relocate refugees to the wrong place as their data was compromised or collected incorrectly (McMahon et al., 2019); data surveillance can hinder refugees from providing accurate data due to the fear of being chased or deported (Expert 3); and data bias and discrimination can distort the results of the tool after it being "trained by existing datasets" (Expert 5) of past refugees history background (Janssen & Kuk, 2016).

> “Yes, the social segregation and the feeling of being hunted. Even though they are refugees, they are like all of us: people. And people don't always want to be tracked.” (Expert 3)

In conclusion, preserving the AGiC process in humanitarian action is necessary to avoid distortions of the results that can negatively impact refugees' lives. Any data issue mentioned can drastically alter the refugee social integration in the country and can be mitigated if measures like data ethics are adopted.

5.1.3. AGiC and GeoMatch

The experts' perspectives regarding the societal impacts of implementing GeoMatch in another context were interesting. Some did not see any problem using an algorithmic solution made in one context to a different one. Others noted that some issues, like the specific characteristics of the refugees, could conflict with the host context's local culture and legal norms (Expert 7). The tool needs to be adjusted within the context where it will be installed (Expert 6) (Beduschi, 2020)

to avoid societal consequences like social segregation and the feeling of being hunted (Expert 3). Interestingly, they also indicated that the tool implementation might be hindered by the "context's framework" and not by any limitations of GeoMatch, like the European refugee quota system:

> "It is a good idea and a good goal to use this artificial intelligence algorithm to recommend the best path for a refugee. However, some constraints are not taken into account, such as the quota system in Europe. Indeed, when a destination in Europe for refugees reaches a high rate reaching the dedicated quota rate, it then stops taking in refugees. This makes the new algorithm recommendation wrong. (...) "(Expert 3)

Furthermore, there were mixed feelings regarding the usefulness of Geomatch in helping refugees to integrate into society. Some experts are favourable that the tool can benefit both government/public agencies and refugees: the government can allocate the refugees to the places that need people and refugees who do not know where to live (Expert 1). Some partially agreed, only if social and cultural conditions are addressed, like speaking the local language to have better employment success (Expert 4) and having adequate social assistance (e.g. housing availability, access to education, healthcare and others) after their arrival at the tool's designated location (Expert 7) need to be fulfilled for the integration success.

Expert 9 made an interesting point related to the form of government:

> "In this case [data usage], the country we are talking about is Estonia where the state is highly democratic. However, the use of such technologies [algorithmic solutions] by relatively less democratic countries would raise serious concerns." (Expert 9)

It shows that algorithmic tools cannot be employed in autocratic governments. Otherwise, these tools can worsen the refugees' situation.

Experts also mentioned that the subjectiveness of the human factor (Experts 2 and 5) needs to be considered when applying the tool (Utrecht Data School, 2022) and respecting the refugees' choice in accepting or not the place to be relocated. It could be seen as oppressive if they were forced to move to the designated location predicted by the algorithm (Expert 6). Indeed, these "forced results" go against the data ethics of using AI in humanitarian action and the relevant frameworks related to the field.

> "It [GeoMatch] depends on other variables outside of the software, pertaining to human behaviour that, not been-human behaviour-an exact science, results can always vary due to changing circumstances on the ground [humanitarian crisis]." (Expert 2)

> "Possibly, if implemented correctly. But the tension between structure and agency, i.e. people's own choice and what the "machine" says" (Expert 5)

From the comments above, two considerations can be made of mitigating the societal impact of implementing an algorithmic tool in another context. The first one is the awareness of societal particularities of the context. Tools like GeoMatch cannot be implemented without considering the social context to relocate the refugee. If the refugee speaks language and culture traces A, the tool needs to relocate to a region with identical or almost similar elements of A. Otherwise, social integration and acceptance within society will reduce drastically and worsen their situation. Finally, human ethics and subjectiveness must be taken into account. From the refugee data, the tool can predict a superb place with better job opportunities and access to social services. However, he and his family want another place, even if it does not present better conditions than the prediction. Therefore, we must respect his decision above all the results from the machine, as it is his right to choose whatever he wants.

In conclusion, the findings were impressive and insightful for this research. The immigration experts expressed concerns about implementing an innovative tool with unpredictable outcomes in a different country context. Most of their ideas are linked with the concepts built in this dissertation that make algorithmic relocation a complex task to be achieved without fully understanding the refugees' social and cultural background and the social context of the host country. The interviewees comprehended that data establishes different social and cultural "settings" (Loukissas, 2019; Masso et al., 2022) where it is used and can considerably impact the refugees' lives.

5.2. Opinions and perspectives on refugee relocation solution

After analysing the experts' opinions and perspectives about GeoMatch, the author separated and generalised their ideas on the thematic groups. Each group was based on the most recurrent social aspects pointed out by the specialists:

1. Social integration
2. Human geography
3. Government system
4. Digital infrastructure
5. Digital literacy
6. Refugee and Data Legislation

These groups represent the aspects they consider essential if GeoMatch will be used to relocate refugees to another country. The arguments and conclusions were made by the author's interpretation and research on each group.

5.2.1. Social integration

Brazil and Estonia face significant challenges regarding social integration for refugees, which can impact the implementation of GeoMatch. In Brazil, more infrastructure and resources must be needed to support refugees, particularly regarding access to education, healthcare, and employment if they are relocated to low-income areas by the tool. (UNHCR, 2021). Additionally, there are several social problems in the country like high-income inequality across Brazilian society that can make their socioeconomic integration more challenging and the prevalence of violence and crime in many parts of the territory, particularly in urban areas, which can create a hostile environment for refugees (UNHCR, 2021).

Similarly, Estonia has a relatively minor population than Brazil. The social integration of refugees is a complex issue due to the country's history of ethnic tensions and discrimination against the Russian minority (Włodarska-Frykowska, 2016). Most refugees and asylum seekers in Estonia are from countries such as Syria, Russia, and Ukraine (UNHCR, 2022) and may face language and cultural barriers that make integration challenging (Włodarska-Frykowska, 2016). Furthermore, most employment and social opportunities are located in the capital city of Tallinn (Fina et al., 2021), which can limit refugees' ability to integrate fully into Estonian society if GeoMatch relocates them to other regions of the country.

To successfully implement GeoMatch, Brazil and Estonia must address these social integration challenges. This success requires a coordinated effort between government agencies,

non-governmental organisations, and local communities to develop effective strategies for supporting refugees and immigrants and promoting social integration. Such strategies could include language and cultural training programs, access to education and employment opportunities, and initiatives to foster social cohesion and reduce xenophobia.

5.2.2. Human geography

In Brazil, the vast territorial extension and the concentration of the population in urban areas pose challenges to the effective distribution of refugees throughout the country. The socioeconomic disparities between regions and the rural-urban divide make it challenging to ensure that refugees can access adequate social and economic support, including education and job opportunities, depending on which region GeoMatch will relocate them. About 87% of the Brazilian population lives in urban areas (World Bank, 2023b), and south-southeast regions of Brazil still retain the best rates of IDH and most of the country's industrial infrastructure (Silva, 2017).

On the other hand, Estonia's small size and population make it easier to distribute refugees throughout the territory. However, Estonia experiences the same trend of rural-urban divide, making more than two-thirds of the population living in urban areas (Aruja, 2023), mainly concentrated in Harju and Tartu counties (Eesti Statistika, 2023a), which can be challenging for refugees to have access to social assistance and support if they are relocated to the regions outside of Tallinn and Tartu (Fina et al., 2021). Furthermore, the significant socio-cultural divide between the Estonian-speaking population and the Russian-speaking also reflects on the socioeconomic development of the population. According to Mägi (2018), Russian-speaking settlements are more socially segregated than Estonian ones, which hinders social integration and minority participation. If GeoMatch relocates the refugees to the Russian-speaking regions, they will likely be less integrated into Estonian society.

To effectively implement GeoMatch for refugee relocation in both countries, it will be necessary to address these demographic challenges through a coordinated effort between government agencies, non-governmental organisations, and local communities. Strategies for ensuring social and economic support for refugees in rural and urban areas and promoting their social integration will need to consider each country's socioeconomic and cultural features. Additionally, measures

to address language and cultural barriers, discrimination, and access to resources and services will be crucial for installing the tool.

5.2.3. Government system

Brazil and Estonia have different forms of government, with Brazil having a federal presidential constitutional republic and Estonia having a parliamentary constitutional republic. The differences in their government systems pose unique challenges for implementing GeoMatch for refugee relocation.

In Brazil, the federal government is responsible for immigration policy and its legislation (Constituição da República Federativa do Brasil de 1988 [CRF], Art.22, item XV). However, the implementation of policies is shared with state and local governments, which can create coordination challenges for the implementation of GeoMatch. All state and municipal legislation must agree or complement the principles of the Brazilian Federal Constitution (CRF, Art.25, 1988). Therefore, if a state or local government wants to enforce a different refugee policy, it must be within the tenets of the Federal Constitution. Moreover, the complex bureaucratic process for obtaining documents and permits in each state can also create barriers for refugees to integrate into society fully (Gianezini, 2022).

In Estonia, the political system is more centralised, with most decision-making power held by the national government (Toots, 2019). The country's small size and population can make coordinating refugee services more manageable, but the Russian-speaking minority presents a unique challenge. Estonia has historically had tense relations with Russia, and the Russian-speaking minority faces discrimination and integration challenges (Włodarska-Frykowska, 2016). This cultural tension can complicate the implementation of GeoMatch as it may require special attention to ensure that the incoming refugees adequately address the needs of this population.

Brazil and Estonia's different forms of government require tailored approaches to address the challenges of implementing GeoMatch for refugee relocation. Successful implementation will depend on effective coordination between different levels of government and considering each country's unique social, cultural, and political factors.

5.2.4. Digital infrastructure

Despite significant advances in recent years, Brazil still needs help implementing GeoMatch effectively, as the Brazilian digital infrastructure has much room to grow in digital communication and data sharing. According to OECD (2020b), access to advanced communications systems, improved market conditions and frameworks, and a diminished urban-rural digital divide are some of the improvement points. Furthermore, there are concerns about the security of digital systems in Brazil, which may make refugees hesitant to share personal information through the GeoMatch platform. (Laranjeira & Moraes, 2022)

Estonia is widely known for its advanced digital infrastructure, including its electronic ID system and digital government services (Kaevats, 2021; e-Estonia, 2022). However, despite its strengths in digital technology, there are still challenges to implementing GeoMatch for refugee relocation. One of these challenges is ensuring that refugees can have adequate digital inclusion, and this inclusion may require providing digital education and training programs to refugees with limited digital literacy. Additionally, ensuring the security and privacy of sensitive refugee data within Estonia's digital infrastructure is crucial. The country's digital infrastructure must be robust enough to protect refugee data from cyber threats and unauthorised access.

Both countries must invest in improving digital infrastructure and ensuring that all citizens tackling these challenges, including refugees, have equal access to technology and internet connectivity. Furthermore, steps must be taken to ensure the security and privacy of personal data shared through the GeoMatch platform to build trust among refugees and encourage their participation in the program.

5.2.5. Digital literacy

Digital literacy in Brazil is a growing concern as technology becomes integrated into daily life. While the country has made strides in increasing internet access and usage, a significant portion of the population still needs to gain the skills and knowledge needed to take advantage of digital resources fully. The digital divide, rural-urban divide and lack of access to the internet in some regions generate unequal levels of digital literacy in the country (OECD, 2020b). Therefore, implementing a tool like GeoMatch will need highly digitally educated citizens to use and read the tool's results and allow better refugee relocation across the country.

In Estonia, on the other hand, the government has invested in digital infrastructure and education, with the country possessing one of the most advanced digital societies in the world. Since the 90s, the country has been investing in digital literacy in schooling (Savina, 2016), which can be reflected in the high number of startups in the country (Invest Estonia, 2022). Thence, Estonia has adequate infrastructure and highly skilled staff to deal with the GeoMatch tool and use it most in relocating refugees.

Overall, it is crucial for both Brazil and Estonia to consider the digital education and infrastructure needs of refugees in the implementation of GeoMatch and to foster strategies to ensure that all refugees access the necessary resources and support to utilise these technologies effectively, involving targeted training programs, partnerships with NGOs and community organisations, and innovative approaches to digital outreach and communication.

5.2.6. Refugee and Data legislation

Brazil and Estonia have laws and policies regarding refugees and data protection. However, implementing and effectively these laws can be challenging for implementing GeoMatch for refugee relocation.

In Brazil, the legal framework for refugees is governed by the Refugee Act of 1997, which defines who is considered a refugee and outlines their rights and obligations. The law also establishes the National Committee for Refugees (CONARE) to evaluate and grant refugee status (Refugee Act of 1997, art.12). Both instruments establish public policy frameworks to facilitate the integration of refugees into Brazilian society at all government levels (municipal, state and federal).

Regarding the data legislation, Brazil has had a regulatory framework for data protection called the General Data Protection Law (Portuguese: *LGPD*) since September 2018. The LGPD establishes rules for processing personal data, ensuring greater privacy and security for individuals, and it is similar to General Data Protection Regulation (GDPR) (Castro et al., 2022). The LGPD applies to public and private sectors, and a national data protection authority oversees its enforcement. However, there are still challenges to totally enforcing the LGPD. Companies and public organisations are unwilling to invest in digital security as systems security is not

culturally rooted in a country like European countries (Ventura, 2022). Hence, the refugee data can be jeopardised by disregarding various societal actors in the country.

In Estonia, the legal framework for refugees is based on the European Union's Common European Asylum System (CEAS), which defines a uniform asylum procedure within the European Community (European Commission, 1999) and includes the Act on Granting International Protection to Aliens, which defines the asylum seekers status in Estonia (Riigi Teataja, 2005). The country has provided social and economic support to newcomers (including refugees), including language and integration programs like Settle in Estonia, established in 2015 (European Commission, 2023).

Estonia has developed a robust data framework that enables efficient digital governance and supports innovation. The country has implemented various data infrastructure initiatives like X-Road, which guarantees a safe environment for data exchange between private and public sectors (e-Estonia, 2023), and The Estonian Government Cloud, a platform for managing and delivering IT services to the government sector (e-Estonia, 2018). Estonia has also enacted laws to protect personal data and ensure its secure handling. The Personal Data Protection Act (2018) regulates the use of personal data in Estonia and complements the provisions of GDPR (2016) (Riigi Teataja, 2018). Additionally, the country established the Estonian Data Protection Inspectorate in 1999 to enforce and oversee data protection regulations within the country (Data Protection Inspectorate, 2020). The development of a rugged data framework has allowed Estonia to leverage its digital infrastructure to benefit its citizens and economy.

Given the complexity of the legal frameworks and concerns regarding data protection, implementing GeoMatch for refugee relocation in Brazil and Estonia will require careful consideration and adherence to relevant laws and regulations. Likewise, it will be crucial to guarantee that the data used for matching and relocation is protected and used transparently and ethically. Finally, efforts to address discrimination and promote social integration will be critical in ensuring the success of refugee relocation programs in both countries.

5.2.7. Comparison Brazil and Estonia: final considerations

Brazil and Estonia present unique challenges and opportunities in implementing GeoMatch for refugee relocation. Each country possesses unique social aspects, and implementing the tool would be difficult in either context.

Concerning social integration, Brazil's long history of diversity and multiculturalism could be an asset, while Estonia faces challenges in integrating its Russian minority. Regarding human geography, Brazil's large size and regional income inequality could present challenges, while Estonia's small size and declining population could make it easier to redistribute refugees across the country.

Regarding the government system, Brazil's federal structure could make it more challenging to coordinate efforts across different levels of government. In contrast, Estonia's parliamentary system could allow for more centralised decision-making. In terms of digital infrastructure, Estonia's advanced e-governance and digital identity system could facilitate the implementation of GeoMatch, while Brazil's digital infrastructure is still developing.

Regarding digital literacy, Estonia is often cited as a worldwide leader in this area, with its citizens' high internet usage and digital literacy. Conversely, Brazil has a significant digital divide, with restricted access to technology and low levels of digital literacy among specific population segments.

Finally, regarding refugee and data legislation, both countries have laws and policies to regulate the processing and protection of personal data. On the one hand, Brazil's legal framework is more recent and still evolving. On the other hand, Estonia has been recognised for its advanced data protection laws and practices.

In conclusion, Brazil and Estonia present advantages and disadvantages to implementing GeoMatch for refugee relocation, but Estonia takes the lead due to its size with a centralised government and homogenous society, which facilitates the enforcement of its public policy and critical areas for GeoMatch's functioning, such as digital infrastructure and literacy, are ready for its implementation. On the contrary, Brazil only leads in social integration and diversity, an advantage for refugee socio-cultural integration. However, it needs more infrastructure and social stability to implement GeoMatch adequately.

6. DISCUSSION

Based on the findings and analyses conducted in the empirical and theoretical analysis sections, the author addressed the research questions of the thesis. Regarding the measures to reduce the adverse effects of algorithmic governance systems, adherence to ethical values in the use of data is crucial to avoid issues like data bias, discrimination, and privacy violations. Additionally, adopting a data governance framework can ensure data's safe and ethical use by establishing regulations and defining roles and responsibilities during data flow. Finally, a high level of digital literacy among all societal actors can help mitigate the harmful effects of algorithmic systems by increasing awareness and preparedness.

Preserving the AGiC process during humanitarian action is essential to prevent the further worsening of the crisis of vulnerable populations. The AGiC process is context-dependent, and its mis-adoption can cause unpredictable and incalculable societal effects. Furthermore, the ethical use of data is crucial in humanitarian action, and its violation can lead to increased suffering for impacted populations.

Algorithmic tools must be adapted to the specific application context to mitigate the societal impact of AGiC in humanitarian action when applied in another context. AI solutions are not a one-size-fits-all solution and must consider the social aspects of the context before implementation. The social dependencies of the tool must be studied, considered, and evaluated to avoid undesired social effects. Understanding the unique context can help adapt the tool for better results.

In conclusion, using algorithmic governance systems requires careful consideration of ethical values and data governance frameworks to avoid adverse effects like data bias, discrimination, and privacy violations. A high level of digital literacy among all societal actors is crucial to mitigate the harmful effects of algorithmic systems. In humanitarian action, preserving the AGiC process and ensuring ethical data use is necessary to prevent further suffering of vulnerable populations. Finally, adapting algorithmic tools to the specific context of the application is vital to avoid undesired social effects and achieve better results.

CONCLUSION

The dissertation aimed to delve into the phenomenon of AGiC in the humanitarian affairs field. This work wanted to explore the impacts, risks and particularities of using algorithmic tools from one social context to another in humanitarian action. The author built the theoretical concepts necessary.

The further investigation of the phenomenon of AGiC was the central focus of this master's thesis. This work explored the complex relationship between AGiC and humanitarian action through a comprehensive literature review and an exploratory case study.

The literature review identified several critical concepts and principles to consider when implementing AGiC in humanitarian action. In other words, the literature review indicated several measures to guarantee the AGiC values, like robust data governance framework, data ethics, awareness of data ethics when using data, and the need to consider the social context's aspects. The case study analysed the hypothetical implementation of GeoMatch in different countries' social contexts based on the recommendations of immigration experts. The case study results indicated that implementing GeoMatch would be more efficient in Estonia than in Brazil due to the country's digital infrastructure, digital literacy, and refugee and data legislation.

The expert recommendations were related to the theoretical concepts upheld in this dissertation, and their opinions assisted in confirming that if social aspects of the context are not overseen when implementing algorithmic tools, negative consequences can happen and exacerbate the vulnerability of the refugees. Therefore, further studies on AGiC are needed to comprehend its impact on society thoroughly.

Last, the refugee insights would have been valuable for the case study, and they would be the most impacted group by GeoMatch's outcomes. In addition, face-to-face interviews would have been better than questionnaires as a data collection method. Emotional cues and feelings from the experts could have been used to analyse their responses, either.

In conclusion, this master's thesis highlights the importance of ensuring AGiC values in effective humanitarian action. It underscores the total attention of AGiC values for an effective humanitarian action using AI technology from another context. Up-to-date frameworks and regulations about the use of AI in humanitarian affairs must cover the adequate implementation of AI tools in humanitarian crises, mitigating the possible societal impacts of this use in the aimed context. Moreover, several social elements must be accountable before implementing the tool in a different context. Otherwise, unexpected and adverse effects can happen, worsening the situation of the refugees.

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