

SAMIR BAKHTAWAR

300252877

PAP 7998 – MAJOR RESEARCH PROJECT

ARTIFICIAL INTELLIGENCE IN THE MIGRATION SECTOR: A SIMPLE BUZZWORD

OR SERIOUS IMPLICATIONS FOR MIGRANTS?

DECEMBER 7TH 2022

Table of Contents

| | |
|---|------------|
| <i>Acknowledgement</i> | <i>iii</i> |
| <i>Introduction</i> | <i>1</i> |
| <i>Outline</i> | <i>3</i> |
| <i>Context</i> | <i>4</i> |
| <i>Theoretical framework</i> | <i>7</i> |
| <i>Literature review</i> | <i>10</i> |
| 1. Organizational ambitions and considerations for AI and digital solutions | 10 |
| 2. Refugees and migrants' ICTs usage | 23 |
| 3. Surveillance of migrants by State authorities through digital means | 27 |
| <i>Data Analysis</i> | <i>33</i> |
| <i>Discussion</i> | <i>42</i> |
| <i>Conclusion and recommendations</i> | <i>47</i> |
| <i>Bibliography</i> | <i>53</i> |
| <i>Annex</i> | <i>59</i> |

Acknowledgement

I would like to first thank Professor David Brown of the University of Ottawa for his continuous support and dedicated involvement in this research paper. His assistance is greatly appreciated, and this paper would never have been possible without his gracious help.

The extent of my gratitude cannot be fully expressed into words, but I would also like to thank the following friends for their support over the recent years: Jasmine Tajeddine, Dominic Bélisle, Jerry Vu, Elise Brien, Xavier Bordeleau, Mia Salera, Noémie Simard-Weaner, and Flavien Demeure.

I would also like to express my gratitude to my family who have supported me throughout my academic career: Farzana Agtar Mohamad, Sohail Yahyauddin, and Rohan Abounasser.

Introduction

In a bid to increase their public administration's efficiency, numerous countries including Canada have turned to digital and automated solutions to solve modern day public policy challenges. Investments for emerging technologies in the public administration sphere are continuously increasing every year (Ubaldi *et al.*, 2019). Amidst these technological developments, their ethical implications are worrying, and the digital space is in an unknown legal and ethical territory. Nevertheless, policymakers are focused on creating the legal frameworks that will safeguard the current and the next generation's digital rights. It is therefore crucial to assess the importance of digital rights when digital solutions are implemented in the context of public policies.

The migration sector has notably seen an increase of the implementation of emerging technologies: governments as much as newcomers are becoming dependant on these technologies. There are even departmental ambitions at Immigration, Refugees, Citizenship Canada (IRCC) to push for the digitalization of service delivery (IRCC, 2022). The same ambitions can be felt at different organizations in different levels of governance involved in immigration around the world such as the International Organization for Migration (IOM) (Beduschi & McAuliffe, 2022). Immigration organizations whether governmental or non-governmental consider digital solutions to improve the efficiency of their service delivery.

Currently, one emerging digital solution in its early developments is the usage of Artificial Intelligence (AI) in the migration sector. Various governments are investing in this technology (Beduschi & McAuliffe, 2022) and the research seems limited specifically in its application in the migration sector. As such, it is important to assess the implementation of digital solutions' positive and negative outcomes on newcomers, especially AI solutions. Public policies related to AI

solutions in the migration sector must consider a myriad of aspects such as privacy rights, ethics, and international considerations.

The purpose of this research will be to highlight the current literature on the presence of digital solutions, especially AI, in the migration sector. It will seek to establish both the positive and negative outcomes of this technology. The ethical considerations of AI-based digital solutions and the privacy rights of newcomers will be explored. Evidently, there are positive outcomes as well such as the reduction of service delivery bottlenecks which must also be recognized in this research. This paper seeks to further the knowledge on the presence of AI solutions in the migration sector and their implications in public administration.

Moreover, this research project will capture the applied instances of AI solutions in the OECD member States' public administrations, specifically in the migration sector, through a simple data collection and analysis. The objective will be to build a database showcasing these instances. This research project will aim to produce a set of recommendations that should be considered in the implementation of policies related to AI solutions in immigration, ensuring the best balance of efficiency and privacy rights in a newcomer's settlement journey. These recommendations will be based on the literature review and the data collection.

This paper will seek to answer the following question: what are the implications of digital solutions, specifically AI solutions, on migrants and refugees' settlement and resettlement journey? The hypothesis is that, based on international experience, a rushed digitalization of settlement organizations and IRCC's service delivery, in the absence of a policy framework, may negatively affect the integration of newcomers in Canada. A comparative analysis through a simple database showcasing an international experience will support the hypothesis.

Keywords: Immigration, migrants, refugees, AI, digital solutions, privacy, ethics, OECD, IRCC.

Outline

The following paper will be exploring the various effects of digital solutions and AI solutions to migrants seeking settlement or resettlement around the world. Each of the following sections will contribute to the research question: the introduction displaying the context of the research, the literature review on studies previously made on the same topic, the theoretical framework, the methodology for the data collection, the data analysis, the discussion on the findings, and the conclusion.

Each segment will contribute to the MRP in different ways. The context will present the multiple levels of governance's digital approach regarding immigration. This includes international organizations such as the International Organization for Migration (IOM), federal organizations such as the Immigration, Refugees, and Citizenship Canada (IRCC) department, and community-based organizations, also known as Service Provider Organizations (SPOs), such as Immigrant Services Calgary (ISC)., but it also includes migrants themselves.

These three levels of governance are involved in the settlement and resettlement journey of migrants and refugees respectively. The introduction will present the research question that will guide this project. The context will present some examples of the current situation of digital solutions in immigration across multiple levels of governance. The literature review will showcase the recent studies regarding the implications of digital solutions on migrants across the world with a specific attention to AI solutions. The theoretical framework and the methodology segments will set the foundation for the scientific research portion of this MRP. The data analysis, the discussion and the conclusion will all provide findings confirming or denying the original hypothesis laid out in the introduction.

Context

The Immigration, Refugee and Citizenship Canada (IRCC) federal department in Canada oversees all matters related to immigration and citizenship. Their annual departmental plan gives general insight on the future of the department. For instance, the Minister's summary in the departmental plan briefly announces the various directions of IRCC's future. The 2022-2023 IRCC Department Plan presents the following directions in the Minister's summary: increasing service delivery efficiency, lowering the impact of the COVID pandemic on immigrants, improve the situation for Afghan refugees, introduce a better strategy to grow Francophone immigration, support the federal government's mission to reconcile with the Indigenous Peoples, and much more (GoC, 2021).

One recurrent theme in the departmental plan is the use of digital solutions to improve the service delivery across the department, especially to process immigration files. The Minister also iterates the Digital Platform Modernization initiative which details the digitalization strategy for IRCC. This initiative includes many ideas and strategies such as the redesign of the case processing system, the Global Case Management System (GCMS) to reduce service delivery bottlenecks for newcomers ([GoC, 2022](#)). IRCC has even implemented an automated triage system for temporary resident visas (TRVs) from India and China which represent the largest populations applying for the TRVs (Tao, 2022).

The influence of digital solutions to newcomers in Canada is not solely limited to IRCC. Indeed, IRCC partners with various organizations on the municipal, the provincial and the international levels. For instance, the International Organization for Migration (IOM) is an international subsidiary organization of the United Nations (UN) in charge of migration which partners with IRCC, especially for resettlement (i.e. refugees).

The IOM, as much as IRCC, explores digital solutions to improve their service delivery. For instance, the UN's 2022 World Migration Report reviews the implications of Artificial Intelligence (AI) on migration policies in multiple contexts such as: application processing, service delivery efficiency, decision-making, and many more. The report also explores the ethical considerations regarding AI and its use in immigration (Beduschi & McAuliffe, 2022). This report seeks to assess the current situation of AI solutions in the migration sector.

In Canada, the Treasury Board of Canada (TBS) has already implemented a directive on AI which oversees the proper and ethical use of AI technologies in the federal public service (GoC, 2022). For instance, this directive requires an Algorithmic Impact Assessment, which is a risk assessment tool, transparency measures, quality assurance, recourse options, and reporting (GoC, 2022). However, transparency measures seem restricted as Gill and Molnar (2018) have previously never received information from their Access to Information requests regarding the implementation of AI solutions in the migration sector. Recourse options also seem limited as applicants who were refused in IRCC's automated application system may only appeal "[...] on certain specified grounds, such as appealing on a question of law, as opposed to on a question of fact." (Gill & Molnar, 2018, p. 53). As such, applicants who were refused from the automated process may not receive information on the reason for their refusal.

AI has become an important debate in the migration sector as news outlets document the various applications of the new technologies such as AI lie detectors at EU airports (Picheta, 2018) and Automated Border Control (ABC) systems to manage the continuously increasing number of flights landing in the EU (Sanchez del Rio *et al.*, 2016). Ethics surrounding the application of AI solutions are also often questioned as the lack of regulations and legal frameworks has caused a system where authorities perform a "surveillance-first, ask-permission-later system" (Harwell,

2019). Furthermore, countries are increasingly investing in the development of automated illegal border crossing infrastructures such as the US' Customs and Border Protection (CBP) (Tyler, 2022). Nalbadian (2022) notes that the increased world-wide interest for fortified borders may be due to the 9/11 events. Overall, these technologies prompt questions on the ethics of their usage and the impact it has on the very essence of immigration, especially considering that migrants in Europe are burning their fingerprints off to avoid constant State surveillance by EU authorities (Keung, 2020).

The various digitization plans from immigration organizations on the different levels of governance are important to assess the general ambitions for digital solutions impacting newcomers in Canada. For instance, Immigrant Services Calgary (ISC) is a municipal Service Provider Organization (SPO) in Alberta, Canada which leads a centralization project (Gateway) in Calgary aiming to reduce bottlenecks in service delivery through digital solutions ([ISC, 2022](#)). ISC's Gateway specializes as a single-point service for referring newcomers to different organizations based on their needs and assets.

Digital migration is an increasingly important subject that is gaining traction in multiple spheres of study including public administration. Leurs and Smets (2018) are even calling for further research on the subject, citing the need for an academic collaboration with geographic studies as well as a higher emphasis on "critical legal and human rights perspectives to root more firmly the orientation toward social justice, and to create awareness of the dynamic interactions and tensions between human rights in practice, legal categories and social realities." (Leurs & Smets, 2018, p. 12). The second point made by Leurs and Smets seems appropriate, especially when considering the implications of AI solutions which bring automated decision-making into public administrations.

All the previous examples show the implication of digital solutions across multiple levels of governance. Migrants must, thus, often deal with digital solutions in their settlement and resettlement journey. It is therefore important to assess the implications and the barriers they pose to migrants. Based on this assessment, a series of recommendations can be established to ensure these organizations follow the best practices to lower the negative outcomes of digital solutions on migrants.

Theoretical framework

The following paper will be employing various concepts that are essential to it such as digital solutions, digital divide, digitalization, Information and Communication Technology (ICTs), automated policy-decision, artificial intelligence, migrants, refugees, settlement, and resettlement. The concepts are in two major themes, namely digital and immigration.

On the digital theme, digital solutions represent the usage of a wide range of technologies to support policies such as Artificial Intelligence (AI), databases, websites, and applications which will be assessed for the purposes of this research. AI can be defined in multiple ways; in its simplest form, it can be defined as machines performing tasks similar to humans on “performance capacity”, meaning AI solutions will be able to perform the same tasks at least at the same, if not higher, level of productivity than humans without the human fatigue factor (Salo-Pöntinen & Saariluoma, 2022). However, the most important aspect to specify for AI is that it is designed and developed by people (Salo-Pöntinen & Saariluoma, 2022). This is important to consider since AI is often seen strictly as limited automated machines, but a human component influences it.

AI is also an integral part of a new phenomenon in a policy context, namely automated decision-making operating on a “performance capacity”. Decisions in governmental agencies are sometimes automated through the power of AI in order to improve efficiency and quality of

services without human resources (Kuziemski & Misuraca, 2020). Automated decision-making implies the involvement of large databases. In turn, databases are essentially constituted of a large amount of data collected on users. The performance capacity of AI is based on these databases. The continuous collection of data will improve the efficiency of the AI over time through machine learning. As more data is collected, the AI becomes more precise in its algorithms to make decisions (Kuziemski & Misuraca, 2020).

As for ICTs, they are simply the methods of communication and media that we have grown accustomed to in the 21st century, namely the various social medias, the internet, the telephone, and many more. ICTs are important to assess in this research project as they have serious implications in the settlement and resettlement journey of migrants and refugees. ICTs generally also involve the important concept of the digital divide. The digital divide can be defined as the gap in access to or in knowledge of ICTs between two categories of population, most often seen between urban and rural communities (Bartikowski *et al.*, 2018).

On that note, the immigration theme is the second large theme of this research project, and it includes various concepts that need to be defined. As previously mentioned, there are the concepts of settlement and resettlement as well as migrants and refugees that will be used throughout this project. The definitions of these concepts are inspired by the ones used at IRCC (2021). Resettlement strictly involves the settlement of refugees in a new host country's territory. Per the UNHCR (1957), refugees are defined as: "someone who is unable or unwilling to return to their country of origin owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group, or political opinion". As such, they are forced into resettling to a different territory. It is important to distinguish resettlement from settlement as the former strictly involves refugees while the latter involves non-refugee migrants,

namely the migrants who weren't forced to leave their country of origin. Migrants can simply be defined as individuals leaving their country of origin to live in a different one.

These are the main concepts used by each of the two major themes of this research project. There may exist alternative definitions to some of the previously defined concepts. However, the specific definitions of these concepts that were laid out in this segment will guide the research of this MRP.

Literature review

The following segment will explore the existing literature on the various subjects pertaining to the topic of digital solutions in the immigration sector. A part of the literature explores the current organizational ambitions to implement digital solutions across various levels of governance. It also explores the current application of digital solutions in the immigration sector, specifically its benefits and disadvantages. The use of digital solutions by migrants must also be reviewed as they can show important patterns that may benefit the implementation of digital solutions by immigration departments and organizations across the world. Finally, the final section will review the literature on digital usage post-arrival by migrants, more specifically issues that may arise such as the digital divide.

1. Organizational ambitions and considerations for AI and digital solutions

Organizational and departmental ambitions for digital solutions can be felt around the world, as highlighted in the context segment of this research. This portion of the literature review aims to review the scale of such ambitions. It will also review the considerations that must be considered based on academic research.

1.1 Data collection on migrants

Beduschi and McAuliffe (2022) report that the migration sector has increasingly collected information on migrants on multiple steps of their settlement journey. The collection of data includes biometric, satellite, and big data. It is important to assess the extent of data collection on migrants as it is one of the pillars of AI systems. These systems highly depend on large-scale data collection as previously explained in the theoretical framework.

Biometric data collection can prove to be a very dangerous tool if it falls into the hands of malicious actors. For instance, in Afghanistan, biometric tools were used by Americans to store information on civilians that helped the American and Western Coalition (Klippenstein & Sirota, 2021). However, following the August 2021 Taliban coup d'état, the biometric information on the Afghan population fell in the hands of the Taliban. This very recent example shows the dangers of biometric information collection, especially in zones of conflict.

Other forms of data collection may be used through social networking sites (SNSs) such as Facebook or Twitter. Indeed, Pötzsche and Braun (2016) reported a higher efficiency for data collection on migrants through Facebook than conventional data collection such as telephone sampling. For instance, they were able to retrieve 1100 individual samples in four weeks with a budget of 500 Euros six years ago with 96% of the respondents accurately representing the target population. It is important to note, however, that Pötzsche and Braun's (2016) study only inquired on voluntary participation from migrants.

A more recent study done by Mazzoli *et al.* (2020) showcases a different use of SNSs where voluntary participation from migrants is not specifically required. In this case, contrary to Pötzsche and Braun's study, the authors used data on Twitter to detect migration flows across the world through data collected on Twitter. Mazzoli *et al.* (2020) intended to evaluate migratory flows as accurately as possible as they found it challenging to assess it properly through conventional methods such as national censuses. Twitter's ease of use is mainly due to the fact that every public account's data is openly available through the website's API. Publications on Twitter are often geo-tagged as well since it is on by default which was the basis of this study.

Mazzoli *et al.* (2020) were easily able to discern the precise moment when a migrational crisis occurred in Venezuela through Twitter data. More importantly, they were also able to discern

typical migration flows and they were also able to produce a heatmap with the various concentrations of Venezuelan migrants across South America. Through this data, the authors were able to understand the most popular routes that Venezuelan migrants took as well as their preferred method of transportation. The preferred settlement cities of Venezuelan migrants were also naturally available to the authors. In total, the authors were able to properly assess the migration flows of around 160 000 Venezuelan migrants.

Besides SNSs, large-scale data collection is also possible through Call Detail Records (CDR) which are phone service transcripts collected for billing purposes by telecommunication companies. Hankaew *et al.* (2019) found multiple statistical methods to analyze the data in order to establish the best methods for specific objectives. However, the important aspect of this paper lies in the fact that CDRs were one of the legal ways of accessing mobile network data information. The authors (2019) assessed that due to the EU's privacy rights, access to mobile network data was severely restricted, but they were nonetheless able to retrieve enough information to analyze the CDRs of over 1,890,000 mobile users in Portugal from the years 2006 and 2007 (Hankaew *et al.*, 2019). The collection of mobile phone network data has been a growing interest for general mobility studies for a while now. Indeed, reports from 2013 had already shown promising results in the collection of this type of data (Calabrese *et al.*, 2013).

These findings and these types of data collection have an important significance as they showcase the potential of SNSs for data collection on migrants. Twitter's case is even more special than Facebook's as this type of data is openly available to anyone. The costs of operation are significantly reduced, only requiring computational power to parse the data. Mazzoli *et al.*'s (2020) study shows the new reality of data collection on migrants: SNSs have become a viable, if not the best, method of data collection on migrants.

Indeed, an editorial by Nature (2017) uses the example of the 2015 migration crisis in the European Union (EU) when Frontex, EU's border and coast guard agency, reported that "710 000 migrants entered the EU in the first nine months of 2015" (Frontex, 2015). Nature (2017) reports that Frontex counted the same people at least twice since they counted each entry to the EU without considering that high numbers of migrants exited the EU only to re-enter by a different route: "a person who was recorded on arrival in Greece and left the EU by going to Albania was again counted on re-entering the bloc by a different route.". Nature (2017) reports that misrepresentation of data on migration flows has become a real challenge, especially since it influences policy decisions.

Data collection on migrants is nonetheless important to inform policy and operational decisions regarding immigration. The challenge with asylum migration is that conventional methods of data collection are rarely accurate as migration flows related to asylum-seekers are seldom stable (Napierała *et al.*, 2021). Thus, Napierała *et al.* (2021) suggest creating "warning models" that can better prepare policymakers to anticipate migration crises rather than predict migration flows. They also suggest collecting data beyond the ones found in administrative records and exploring data collection opportunities in "digital footprints" such as social media and mobile phones. This reiterates previous conclusions by other papers: there are ambitions or, rather, efforts to expand data collection on migrants towards unconventional methods such as social media and digital devices that are always carried by the target audience. These conclusions are the reason why there must be more emphasis on reviewing the ethical framework surrounding migrants' privacy rights as the data collection through these unconventional methods is largely unrestricted.

Novel methods of data collection on migration flows such as the one used by Mazzoli *et al.* (2020) may offer much more accurate information to better inform policymakers prior to their

decision. However, more accurate data collection on migration flows also implies much higher surveillance potential for State authorities. This subject will be further developed later in this literature review. It remains that heavy data collection could potentially hinder many privacy rights as well as cross an ethical gray area. This issue is also closely associated with AI as it greatly depends on large amounts of data collection to function.

1.2 Ambitions for AI and its ethical considerations

Beduschi and McAuliffe (2022) indicate that AI is used by various State authorities “to support the administrative processing and decision-making in matters to migration”. AI usage is often sought by State authorities to increase efficiency and facilitate processing times as the authors also note that migration-related services are increasing. This report seeks to understand the ethical considerations of AI in governmental policies, considering the recent involvement of digital solutions in public health following the COVID-19 pandemic. Indeed, Beduschi and McAuliffe (2022) point out the negatively disproportionate effects of digital solutions in public health to vulnerable groups including migrant communities, stressing the impact on human rights.

There is a consensus that broader accountability mechanisms are required prior to the implementation of AI solutions in the migration sector (Beduschi & McAuliffe, 2022; Molnar, 2019). Beduschi and McAuliffe (2022) found that “AI systems can amplify existing human biases, not just encode them.” (p. 19). As such, it should be required that AI systems develop in an unbiased manner which can be ensured through “regular monitoring and recalibration of systems, as well as human verification protocols [...]” (p.19). This is a responsibility that can be delegated to both policymakers and systems architects. Kuziemski and Misuraca (2020) argue that the public should even participate in the debate for AI implementation in public policy and their concerns should be taken into consideration.

Even current legislation for data protection such as the European General Data Protection Regulation (GDPR) does not allow full accountability and transparency regarding AI solutions (Wachter *et al.*, 2017). Indeed, they (2017) mention the right to explanation, a legal right for users to receive an explanation on an automated decision, in the GDPR as non-meaningful legally due to the wording of the regulation. As such, users who are subject to an automated decision from a public administration may not receive a comprehensive explanation, but rather “[...] subjects are granted additional safeguards to obtain human intervention, express views, or contest a decision (Article 22(3)), but not to obtain an explanation of the decision reached.” (Wachter *et al.*, 2017, p. 89). As such, the GDPR may not force public administrations to reveal the reason why certain users were denied a decision by the automated system.

Beyond accountability measures, there must also be mechanisms in place to ensure the safeguarding of data as AI systems require immense levels of datafication of migration. Unsecure data can expose many migrants’ private information to malicious actors. This becomes an even bigger threat when data is shared among key stakeholders (Beduschi & McAuliffe, 2022). On this matter, Service Provider Organizations (SPOs) in Calgary have mentioned the need for increased information-sharing among them to improve service delivery for newcomers, especially when they need to inquire for services in multiple SPOs (ISC, 2022). Such a centralized or, rather, coordinated approach may induce risks on the privacy of newcomers as their information will be more exposed.

Therefore, Beduschi and McAuliffe (2022) highlight the importance of a human-rights approach prior to implementing AI systems. They often quote the 1951 Refugee Convention of the United Nations (UN) as the legal basis that should be respected when considering the rights of refugees in an increasingly digital bureaucratic world.

On that note, there is a growing need for international regulation regarding AI. Fournier-Tombs (2021) even suggests that the UN urgently requires an internal regulation for AI as none exists for the organization. Fournier-Tombs (2021) adds that it is crucial for the organization to implement such a regulation to “demonstrate its leadership on this important societal issue.” (p. 1). AI technology has come into the mainstream and, as such, a leadership on its regulation is more than required. Fournier-Tombs (2021) recognizes the progress being made by the EU which drafted an internal regulation proposal for AI recently.

If the UN does not take the leadership for AI regulation, the EU could well take it. Bradford (2012) calls this the Brussels Effect which signifies the influence of the EU on regulations worldwide. Indeed, the EU has historically created and led many regulations that inspired many countries and organizations to follow suit and implement similar ones. Fournier-Tombs (2021) argues that, following Bradford’s (2012) Brussels Effect, we can expect the EU to become a leader for such international regulation on AI.

Such regulation might be needed as countries are increasingly using AI solutions in their public administrations beyond the scope of public health and migration. Indeed, Ubaldi *et al.* (2019) report that digital solutions are seeing major up-take across all OECD member States and, specifically, an increased interest in AI. Indeed, Ubaldi *et al.* (2019) note 43 types of AI solutions across 21 different areas of application including immigration, but mostly found in healthcare, transportation, and security and safety. All these AI solutions would be geared towards increasing productivity by automating repetitive tasks and “enhancing predictive capabilities for better decision making and policy outcomes” (p. 38).

Overall, research on AI solutions in the migration sector seems limited. Research is most likely interested in public administration in general rather than migration specifically. For instance,

the OECD (2020) has developed a Digital Government Index ranking the various countries in its organization based on digital presence in their public policies. This index has six different categories: digital by design, government as a platform, data-driven public sector, open by default, user-driven, and proactiveness. These categories basically evaluate the level at which public policies are designed to be used and delivered through digital means. It also evaluates the importance of data in those policies and whether the governments ensure transparency and accountability through open data initiatives. AI solutions are specifically used as metrics for digital by design where they assess their implementation by country (58% has some form of AI adopted in their service delivery) (OECD, 2020). They are also used for “open by default” where they include AI as an important emerging technology which should require open data initiatives. In this case, Korea, the United Kingdom, and Denmark set themselves apart by embedding “openness by default into existing legislation and developed comprehensive strategies and initiatives to make public data, processes and services open to the community” (OECD, 2020).

Additionally, it appears that ethical ambitions for AI seem restricted as it was found by Salo-Pöntinen and Saariluoma (2022). Indeed, Salo-Pöntinen and Saariluoma (2022) reviewed many AI national strategies including the European Union’s, Japan’s, South Korea’s, the United States’, and many more. In total, 12 national AI strategies were studied, and they (2022) found that the consequences on humans were not studied enough, instead the national strategies focused on developing technologies and the economic outputs a lot more than human factors such as the impact on society. Salo-Pöntinen and Saariluoma (2022) found that policies with AI solutions often had an utilitarian optic by jeopardizing privacy rights for a “higher good”. They (2022) specifically use the example of the COVID tracking app that was deployed in numerous countries; this mobile app, for instance, marginalized even further vulnerable groups who have no access to

this emerging technology. Salo-Pöntinen and Saariluoma (2022) even suggest that national AI policies should focus more on societal impacts, going even beyond legal and ethical frameworks which are also important.

1.3 Reported Canadian usage of AI

Since 2014, AI has already been used by IRCC in the evaluation of migrant and refugee applications (Gill & Molnar, 2018). More specifically, the AI identifies the applicants' merits and potential red flags such as fraud in order to produce a recommendation on their application's acceptance or refusal. This practice is labeled as "predictive analytics" which is already in-use in various federal departments in Canada.

Since 2020, IRCC has implemented AI to manage the intake of Temporary Resident Visa (TRV) applications in three instances: online TRVs from China, online TRVs from India, and TRVs from an Indian visa application center (Nalbadian, 2021). Nalbadian's paper (2021) sheds light on AI usage at IRCC as the department has not shared the extent of AI's role to manage migration. It is important to assess the safeguards implemented for such AI usage as IRCC is one of the first federal departments using such technologies.

Multiple safeguards have been implemented to complement AI systems such as "engaging a multidisciplinary team to develop the system, engaging experts to assess the system's methodology before its launch and selecting a point of intervention that involves consistent, repetitive and frequent decision-making." (Nalbadian, 2021, p. 9). These are essential requirements for AI systems which leads Nalbadian (2021) to inquire further on its implementation's rigour.

While "engaging a multidisciplinary team to develop the system" is primordial, Nalbadian (2021) suggests publicly naming the involved parties in the development of the program as a

method of higher transparency. Nalbadian (2021) also criticizes the “engaging experts to assess the system’s methodology” as IRCC only sought the advice of the National Research Council of Canada, another Canadian federal agency which may externally appear as a factor of bias. For a higher sense of transparency and accountability, third-party review of the methodology is recommended. However, the choice for India and China as countries to test out the AI system is logical as they represent the largest populations applying for TPVs.

Nalbadian (2021) also reviews the humans-in-the-loop system, which represents the notion of leaving the final decision to a human rather than an automated system. In IRCC’s case, the humans-in-the-loop system isn’t used in the first tier of the TRV application process which consists of simple eligibility to the program. Instead, IRCC officers verify the applications based on a random sample system. As such, the automated system does take decisions on the eligibility of TRV applicants and may decline applications without the supervision of visa officers. The TRV AI system is still a pilot project and there aren’t any reports made on the progress yet.

However, Nalbadian (2021) praises IRCC’s usage of white box algorithms, which consists of a transparent machine learning model that explains to visa officers the reason for application refusals. This allows humans to complete a thorough assessment of any decisions made by automated systems.

Overall, Nalbadian (2021) recognizes that there aren’t enough transparency measures applied to the AI systems at IRCC. The safeguards developed by IRCC are, however, in the right direction in its current state. Since this is a pilot project, there are good learning opportunities for the future of AI systems in the department.

1.4 AI usage in migration

AI usage in migration varies from country to country, but they generally include chatbots, facial recognition, case management systems, linguistic and dialect recognition tools, translation tools, migration forecasting, and many more (OECD, 2022).

Facial recognition and biometrics involve a myriad of ethical considerations in order to safely collect this type of data. One of the largest risks lie in the information-sharing aspect of this data without consent. This situation became reality in South Korea when the government provided 170M facial images to private companies “[...] in its efforts to foster the AI industry.” from an AI facial recognition system used for immigration purposes (Ho-Sung, 2021). Automated Border Control (ABC) has become a reality in many countries, and it is not only limited to South Korea. Indeed, it has become part of the border-crossing across Europe where ABC systems have been implemented (Ortega *et al.*, 2020).

Nevertheless, AI uses in migration generally tend to aim for efficiency. One popular AI solution in the migration sector is in the case management system of migrant applications (OECD, 2022). This system is the epitome of public administration efficiency as it automates the application processing portion of the migration process. While it does offer efficient benefits, it also has some drawbacks. In order to better understand the conflicts posed by automation in migrant application approvals, we must turn to the world of human resources (HR) where research on automated hiring processes has already been developed. Drage and Mackereth (2022) found that AI solutions for hiring purposes are never objective and, on the contrary, they create false associations when tested on their ability to classify applicants based on their appearances. It becomes problematic and biased the moment physical appearances are considered in the process.

Others report that AI-powered tools for hiring purposes have historically marginalized already vulnerable groups such as women in the tech industry for the same reason (Dastin, 2018).

In Europe, one visa processing automated system was developed and then quickly abandoned in the UK following incidents with bias (Kilpatrick & Jones, 2022). Indeed, the UK home office's "visa-streaming" algorithm categorized migrant applicants based on their nationalities and the algorithm red-flagged certain specific nationalities which slowed down the applicants' application processing time compared to other nationalities (Kilpatrick & Jones, 2022). Currently, the algorithm has been suspended.

The OECD (2022) notes that some countries such as Germany have invested in linguistic and dialect recognition tools to automatically recognize a newcomer's country of origin as well as their specific sub-dialect based on their speech in their native language. This tool allows them to automate the classification of newcomers based on their country of origin and languages spoken. Once again, this AI solution aims to increase efficiency.

On the other hand, migration forecasting can be vague, and it can be used in different types of contexts. The focus of migration forecasting is to achieve the ability to predict migratory flows before they happen (Bijak *et al.*, 2019). However, as Bijak *et al.* (2019) notes, migration forecasting can produce high margins of error, hence the interest to develop this technology (OECD, 2022). According to Bijak *et al.* (2019), the challenges of migration forecasting currently lie in: the uncertainty about future events; inconclusive or unclear migration data; and the current forecasting models. They (Bijak *et al.*, 2019) recommend the usage of forecasting models based on specific situations by carefully assessing the strengths and weaknesses of datasets which comply the best. Mazzoli *et al.* (2020) use of twitter public data is a good example of a modern migration forecasting model using social media.

Climate migration is a specific situation that may call upon migration forecasting tools. Climate migration is a new challenge already affecting millions of people around the world who are still mostly constrained to internal displacement due to natural catastrophes such as floods, earthquakes, etc. (IOM, 2020). As such, international climate migration hasn't become a regular occurrence, but many scholars predict it will become an essential part of migration around the world shortly (Budiman & Marthin, 2020). The main challenge regarding climate migration that has persisted for decades is the name itself; while some wish to introduce the concept of "climate refugees" to add climate change as a reason for forced displacement, but various organizations such as the United Nations High Commissioner for Refugees (UNHCR) and the IOM refuse to implement such a change, fearing the endangerment of the definition of a refugee (Flavell & Chazanoël, 2017).

Nevertheless, environmental disasters cause increased migration patterns and, currently, AI solutions are being developed to predict such events (OECD, 2019). As such, AI solutions could be used for migration forecasting in the context of climate change. On that note, Boas *et al.* (2021) finds that countries currently dealing with climate migrants view them mainly as a security threat. Bettini *et al.* (2017) finds that countries from the Northern Hemisphere, specifically from Europe, view climate migrants as a security threat.

1.5 Benefits of AI solutions in migration

All the previous examples have showcased the benefits of AI solutions in the migration sector on a public administration and effectiveness perspective. These technologies often reduce the time taken to process migration files which is an important challenge as backlogs continue piling up according to the IRCC departmental plan (2022). The effectiveness of AI solutions is, without a doubt, the greatest benefit of digital and AI solutions in the migration sector. This

effectiveness can optimize the respective public administrations in charge of the migration sectors in various countries, but it can also be felt on an organizational level as well. For instance, recalling the HR uses of AI solutions, they notably have allowed a much higher amount of application processing for hiring purposes (Upadhyay & Khandelwal, 2018)

Bock *et al.* (2020) notes that various digital and AI solutions offered by SPOs in Europe greatly help newcomers' post-arrival as well. These SPOs offer digital solutions and AI solutions such as chatbots to increase the number of newcomers they can serve and in an automated manner. The use of digital solutions is similar to the ones used by governments in processing migrant applications pre-arrival.

Mazzoli *et al.* (2020), meanwhile, count on developed migration forecasting methods to increase the accuracy of migration flow analysis. Indeed, their use of public data from Twitter, as mentioned previously, offered accurate data that competed with official governmental data. Mazzoli *et al.* (2020) hope that these new migration forecasting methods will support policymakers in their decision for migration policies before a migration crisis happens.

2. Refugees and migrants' ICTs usage

Another important aspect to review is the digital solutions that migrants use themselves in their settlement and resettlement journey. The use of digital solutions by migrants can vary between in-journey and post-arrival. In all three stages of their settlement, digital solutions hold a central role whether it is from their own usage or from the state authorities'.

2.1 ICT usage and digital solutions in their journey

Migrants use ICTs and digital solutions in multiple steps of their settlement and resettlement journey. Galis and Makrygianni (2022) report a very recent and novel usage of ICTs by migrants during their settlement journey which consists of following "routes enriched by user-

generated, networked, and real-time updates from fellow migrants, safety advice and GPS coordinates for family and friends, and smuggler boats.” (p. 1). The authors sought to understand the impact of digital solutions on migrants’ national and international mobility.

Galis and Makrygianni (2022) found that most migrants depend on smartphone devices to facilitate their settlement journey. The authors speak of the digital space as an extension of the geographical space in the migrants’ settlement journey. While their digital tools allow them to find information on the weather and the safest routes to cross borders, the most impactful aspect of these tools is anonymity. This aspect is clearly important for people partaking in such settlement journeys as their identity must remain anonymous from authorities. Sanchez-Querubin and Rogers (2018) makes the point that migrants constantly develop new methods to avoid State surveillance on their irregular routes whether it's through the social media’s parameters (Whatsapp’s encryption) or through systems of route reviews (routes are liked or approved by migrants). State surveillance can even have negative effects as migrants are subject to the human smugglers’ route management to keep their online anonymity. The smugglers often meet them with violence and unsafe conditions such as lifeboats that are overcrowded (Latonero and Kift, 2018). Additionally, the criminalization of irregular routes to Europe severely limits the research as migrants do not wish to disclose further information on the process to keep their anonymity and to avoid criminal charges (Gillespie *et al*, 2018). The topic of anonymity is central when studying the role of digital solutions in the immigration sector. This topic will also be assessed in the following segment on ICT surveillance by state authorities.

Not only did migrants use ICTs to scan migration routes to their destined countries, but they also used social media to share information of their journey to their close relatives. Borket *et al*. (2018) found that 89% of their respondents migrating to Europe shared their journey via social

media and 42% of them did so on a daily basis. Kutscher and Kress (2018) also studied the migrant population heading to Europe and found that social media connectivity was important for minors as it was their main communication method to share their resettlement journey to their families back home. Borket *et al.* (2018) also adds that 85.5% of their respondents used social media to learn about the best migration routes to Europe. There is, in their opinions (2018), a strong digital literacy amongst the migrants using unconventional routes to Europe.

The dependence to mobile technology for migration is well known by State authorities in the EU. Indeed, Zavratnik and Krilic (2018) report that police authorities in Croatia, for instance, make the effort to destroy any mobile technology owned by caught migrants. According to Zavratnik and Krilic (2018), there are two main reasons for these actions: erasing traces of the “digital refugee” and ensuring that migrants have no connection to the network of migration routes available online. These actions are thus deemed as dangerous and unsafe for migrants as they lose autonomy while also being pushed towards dehumanized conditions. In Zavratnik and Krilic’s (2018) words:

“It is reasonable to conclude that smartphones taken away from refugees and destroyed by the state systems of control reduce the refugees’ potential for autonomous operation, increase inequalities, and exclude refugees from the wider field of communication rights.” (p. 158).

Dehumanized conditions occur when these “digital refugees” lose access to the network of migration routes and end up on the EU’s external borders where we find “refugee enclaves” (Zavratnik and Krilic, 2018). There is an understanding that better communication and digital rights is essential for minority and migrant groups, but the EU nor its member States are interested in guaranteeing those rights as it would oppose their

views on migration policies according to Zavratnik and Krilic (2018). Migrants are thus subject to digital inequalities even prior to their arrival in their host country.

2.2 Post-arrival digital divide

After their arrival to their country, newcomers and refugees need to use digital solutions to get in touch with community SPOs, even more so since the pandemic as virtual conference call platforms have become an essential part of service delivery. It is thus important to assess newcomers' ability to adapt digitally to their host countries.

Ertl *et al.* (2020) studies a few sample groups on their digital literacy and uses based on various factors such as gender, income, education, age, migrant background, gender, and cultural capital. The study focuses on Germany. Ertl *et al.* (2020) highlight an important finding in their research: migrant backgrounds are the second most important factor related to the digital divide (behind the age factor). They also assess that not enough academic research is being done on the digital divide affecting more negatively people with migrant backgrounds.

Specific to their digital uses, ethnic minorities, or people with migrant backgrounds, tend to use cellphones much more than traditional computers while the majority tend to use traditional computers (Bartikowsky *et al.*, 2018). The authors then point to the fact that the digital divide has evolved from a simple difference in access to the internet among the population to the difference in the type of devices that have access to the internet used by the population (Bartikowski *et al.*, 2018). It has also been found that internet access through a computer generates more economic benefits than internet access through a mobile device (Bartikowski *et al.*, 2018). The digital divide would even negatively affect the ethnic minorities' economic value creation opportunities. Bartikowski *et al.* (2018) suggests a higher emphasis on this specific digital divide in the application of digital public policies.

Zavratnik and Krilic (2018) also found that women were disproportionately affected by the digital divide during their settlement journey. Indeed, according to their research, migrant women usually had less access to information from digital means and their cell phones were not used for communication purposes (Zavratnik & Krilic, 2018). Furthermore, women were less likely to use or own digital devices such as laptops and smartphones if they were in a family: the roles were mainly monopolized by men (Zavratnik & Krilic, 2018).

There is currently no found usage of AI by migrants, but third-party non-State observers can advance research through the use of publicly available information. This is the case for the previously mentioned researchers Mazzoli *et al.* (2020) who used Twitter data to study migratory patterns from Venezuela.

3. Surveillance of migrants by State authorities through digital means

This segment of the literature reviews ICT surveillance by State authorities on migrants, especially irregular migrants. The EU will mainly be used as the main example for this type of practice. The practice is popular in the EU and, as such, it can be a good learning opportunity for Canada as well.

3.1 Migrant surveillance in Europe

Surveillance of irregular migrants in Europe is nothing new. Studies from the early 2000s indicate that this practice started the moment large databases were available on migrants. Broeders (2007) even notes that political ambitions to track irregular migrants is often based on political opinions. At that time, in 2007, the EU increased border control and overall surveillance on migrants entering the territory through sophisticated systems. However, irregular migrants remain a challenge in the EU. Similar to the conclusions brought forward by Napierała *et al.* (2021),

heavier surveillance imposed on irregular methods through digital solutions often create inequalities rather than influence the irregular migrant challenge.

ICT surveillance is not limited to the context of 2007. It has continued and developed even through recent years using databases intended for migration purposes (Vavoula, 2020). The same databases are used today as they were in 2007: the Schengen Information System (SIS II), Eurodac, and the Visa Information System (VIS). According to Vavoula (2020), three more databases have been added since: the Entry/Exit System (EES), the European Travel Information and Authorisation System (ETIAS), and the European Criminal Record Information System for third-country nationals (ECRIS-TCN). Vavoula (2020) mentions that law enforcement authorities in the EU have access to these databases due to “counter-terrorism concerns - both in the aftermath of 9/11 and in recent years” (p. 209).

Vavoula (2020) points out that immigration data in the EU is as much at the disposal of law enforcement authorities as immigrational authorities. European law enforcements often use these databases to conduct searches on potential illegal migrants, but there is no information on the aftermath of these searches. Vavoula (2020) notes that there is a serious lack of transparency in the usage of these databases by law enforcement. Originally, these databases were created for immigration purposes, but Vavoula (2020) found that it has quickly transitioned towards a law enforcement usage, the rhetoric being that available data should not be restricted to a unique usage.

Vavoula (2020) believes such rhetoric concerning data is flawed as it goes against the “purpose limitation principle”, a fundamental element of privacy, which suggests that “data must be collected for a specified, explicit and legitimate purpose, and must not be further processed in a manner that is incompatible with that purpose.” (p. 223). In the case of migration databases in the EU, these databases were slowly monopolized by law enforcement authorities. Moreover, signs

of discrimination through data collection is already present as law enforcement authorities focus on third-country nationals.

Ignoring the purpose limitation principle by EU authorities is not strictly limited to data collected within their borders. Indeed, Vavoula (2020) indicates that European law enforcement authorities use Passenger Name Record (PNR) data from Canada through the EU-Canada Agreement on PNR data, thus using the data for other reasons than they were initially intended for. Vavoula (2020) adds that law enforcement access to immigration data is eased up by a weak legal framework. Indeed, some databases are unavailable for routine access except for a reasonable belief that it may be a risk to national security, i.e., a terrorist threat. In this instance, Vavoula (2020) notes that there is no factual evidence needed to prove such a risk to national security. Vavoula (2020) recommends the EU to implement a much stronger legal framework to ensure the safeguarding of migrants' privacy rights and of the purpose limitation principle.

An additional problem brought forward by Vavoula (2020) is the quality of the data in the immigration databases. The multitude of States contributing to these data is quite important and it may even cause many errors such as translating ones. The repercussions of such mistakes in databases accessed by law enforcement authorities can be immense as wrongfully identified individuals may be accused of serious crimes. The quality of data collection must thus be of a high order when its usage is extended to law enforcement operations. However, this may not be foreseeable when the data's purpose was never destined for law enforcement operations which showcases, once again, the importance of the purpose limitation principle.

The purpose limitation principle has been completely overstepped by European law enforcement authorities as they have recently created single point-of-access portals to search in all databases simultaneously (Vavoula, 2020). Law enforcement authorities have thus even built upon

the databases initially intended for immigration purposes. Furthermore, these databases, such as the ECRIS-TCN, are often oriented towards third-country nationals which affect them disproportionately from other EU citizens. Indeed, other EU citizens have no such databases collecting extensive information on them. Vavoula (2020) explains that “more prosecutions and/or convictions of third-country nationals may take place, merely because a pool of information exists, since no equivalent EU-wide catalogue of records on EU citizens exists.” (p. 236). The European law enforcement authorities’ usage of databases is definitely concerning in regard to privacy and data protection.

European law enforcement authorities have general ambitions to surveil on the population through AI systems concentrating on predictive analysis (Catanzariti, 2020). Access to extensive databases on migrants combined with law enforcement authorities’ ambitions to enhance citizen surveillance through AI systems may be a recipe for disaster. Catanzariti (2020) reports that algorithmic surveillance is entirely based on the notion that “human behavior can be anticipated and deterred by a police action” (p. 239).

Catanzariti (2020) adds that “the use of algorithmic predictions as a way to speed up or to increase the efficiency of public services, cannot be disentangled from the general phenomenon of algorithmic surveillance, which profoundly affects the sense of identity and individual freedom.” (p. 255). Essentially, Catanzariti (2020) implies that the use of AI systems in public administration for the purpose of efficiency often leads to an infringement on privacy and data rights. This supports the idea that the very nature of AI systems challenges privacy and data rights due to the requirement of large data collection on the targeted population. The only safeguard protecting these rights are “fair procedures established by law” (Catanzariti, 2020, p. 255). It is important to

note, however, that the EU and the UK have a much higher emphasis on surveillance than Canada, but it can also serve as a lesson if there are any ambitions for stronger surveillance in Canada.

State surveillance of irregular migrants close to the EU's borders is a reality, especially around the Mediterranean Sea where the European Border Surveillance System (EUROSUR) has been deployed to automatically detect "incidents" where irregular migrants can be found before their entry to the country and alerted to the Libyan Coast Guard (Kilpatrick & Jones, 2022). A similar surveillance technology code-named "Centaur" is used around the Greek islands to detect migrants in the sea (Kilpatrick & Jones, 2022). Originally, the purpose of these technologies was to help migrants as quickly as possible, however, these technologies gradually transformed into solutions "combating illegal migration and cross-border crime." based on new EU regulation (Kilpatrick & Jones, 2022).

3.2 Canadian instances of surveillance

Canada has not been exposed to the same extent of irregular migrant challenges on its territory as the EU has in recent history. However, there are instances of heavy surveillance from Canada on its borders. Indeed, since the 9/11 events, Canada and the United States have entered an agreement on border control to share information including biometric data on individuals crossing the border between both countries (Topak *et al.*, 2015). The strategy is largely focused on pre-emptive measures from a national security point of view. However, there are no explanations detailing the reason why certain categories of individuals crossing the border may pose a security threat to the country according to Topak *et al.* (2015).

Topak *et al.* (2015) brings forward two points that may explain further the ambitions for migrant surveillance in Canada despite the multicultural image it projects: Canada avoids attracting migrants that may not possess marketable skills despite the accepting multicultural

image it projects internationally; Canada is subject to the United States' hegemony and, consequently, its ambitions to cast the widest security net in a post 9/11 context which is felt through the disproportionate targeting of members of the Muslim and Arab communities when they cross Canadian borders. It is also a reality with the Bill C-51 which "seeks to increase the scope of surveillance on these groups [young Muslims, Palestinian human rights activists, Indigenous rights activists and environmentalists]" (Topak *et al.*, 2015). Nevertheless, these reasons have created a highly security-intense context at the borders of Canada which may lead the country towards allowing law enforcement authorities accessing immigration databases similarly to the EU context.

Asylum seekers illegally crossing the border from the United States to Canada is a reality. In 2017, a surge in irregular migrants crossing the border happened following a decision by the Trump administration to deport Haitians that were granted asylum after the 2010 earthquake (Harris, 2017). Over half of the asylum seekers that crossed the border were from Haiti. In total, there were 14,467 refugee claims made by individuals who crossed the border illegally (Harris, 2017). This instance showcases the real possibility of complex challenges related to irregular migrants crossing the border like it is the case in the EU. It is thus primordial to create the proper safeguards and prepare the appropriate measures to tackle such issues, especially by applying the lessons learned by the EU's experience.

Data Analysis

Context

The use of Artificial Intelligence (AI) in the world has been on the rise for a few decades now. Currently, there is an estimated \$120B invested in AI systems across nations world-wide for the year 2022 (OECD, 2022). World-wide investments for this technology reached an all-time high in 2021 at \$210B (OECD, 2022) exactly at the peak of the COVID-19 pandemic when various countries sought AI solutions to combat the virus ([OECD, 2020](#)).

While reviewing the existing literature, it was apparent that quantitative analysis covering the extent of these policies weren't abundant. As such, a simple data collection has been completed to assess the various aspects of AI migration policies in many countries. To limit the scope of this research, the OECD member States have been chosen as the studied population. The OECD member States have specifically been chosen as they have an important average of foreign population influx (215,261) as well as asylum requests (28,724). At least 8 (21%) of OECD member States had more than 300,000 foreign population influx in 2019 and 7 (18%) of them had more than 50,000 asylum requests in 2022. These numbers suggest that OECD member States generally have a substantial workload in their migration sector. Such high numbers which illustrate their migrant-receiving nature can be attributed to the fact that they are safe havens for countries in crisis in proximity and because they foster a lot of economic developments. These States are also generally known to be technologically more inclined than most of the world as they have the capacity for it. These two factors contribute to the choice of these States as the basis of this research. This is even confirmed by the simple fact that the OECD has an AI policy observatory studying the world's AI solutions (OECD, 2022). The full methodology has already been extensively described in a previous section. The data itself is available in the annex.

Purpose and objective

The data analysis assesses the current situation on AI solutions across various States based on multiple factors. It bases the analysis on the States' usage of AI in general nationally and in the migration sector. It also bases the analysis on the ethicalness of States regarding AI solutions whether it is on its data openness or the regulations surrounding AI. This data analysis complements the literature review in the previous section of this research paper. It also aims to assess the current situation on automated decisions and databases regarding the migration sector in numerous countries, specifically the Organization for Economic Co-operation and Development (OECD) member States. The objective is to develop a database based on each OECD member States' participation in AI solutions specifically for migration purposes to assess the initial hypothesis of this paper.

Methodology

Data is collected on each OECD member State's uses of AI specifically in the migration sector, their AI initiatives for transparency, and their national strategies as well as policies regarding AI through various sources such as OECD Reports, European Commission Reports, and third-party sources if required. All the questions in this subsection will be listed in the annex through the data table.

1. Current migration statistics of OECD member States

a. Inflow of foreign population and asylum requests

As a starting point, basic data from migration statistics of each OECD member State will be captured to add more context to the data analysis of the rest of the study. Each OECD member State's inflow of foreign population and asylum requests will be assessed. Both metrics will be based on one single source of information in order to maintain a consistent dataset, because their

values may differ from one report to another due to differing definitions of concepts such as inflow of foreign population.

2. Current and Future automation or AI systems in the migration sector

a. Current AI solutions in OECD member States migration sector

In this section, each OECD member State's current AI solutions will be displayed. These will only include the AI solutions that are publicly available. The AI solutions will be categorized based on their purposes. For instance, AI solutions related to application processing or triage will be categorized as automated management systems. The automated management systems are the only category with different solutions.

b. The future of AI solutions in OECD member States' migration sector

Then, each OECD member State's usage of AI systems in the migration sector is verified. The following step is to assess the State's ambitions to implement further automation or AI solutions in the migration sector. This includes both research and general initiatives. The amount of AI policies in general, such as national strategy and developmental policies, is also verified.

3. Transparency measures

a. OECD member States' openness and accountability to the public

Then, each State's data openness is verified as a perspective on these countries' transparency. The verification is done on two levels: Open Data Strategy and Open by default. The former entails national policies on the medium-long term regarding the ambitions to release government data (OECD, 2020). The latter entails that "government data and policy-making processes (including algorithms) [are] available to the public, within the limits of existing legislation and in balance with national and public interest." (OECD, 2020).

Each answer to the previous questions is categorized in an Excel file sheet. The data analysis takes place once there is sufficient data on all the OECD member States. The data collection is mainly based on the OECD's reports, the OECD member States' departmental plans for the immigration sector and, if needed, reports from third-party organizations such as ethical watchdogs. However, most sources of information come from OECD and European Commission reports (European Commission, 2022; OECD, 2022; OECD, 2020). They will be presented before each data table. Some data tables will also have links embedded in them which will link directly to the source of origin.

Potential limitations

Potential limitations to this research may happen as automation and AI systems in the public administration are relatively new. As such, information might be restricted or non-existent in various countries which could affect the accuracy of this research. However, the lack of open data from these countries will be noted and it will contribute to this research as it will give valuable information about transparency in OECD countries. Further limitations will be detailed after the data analysis.

Analysis

1. Current migration statistics of OECD member States

a. Inflow of foreign population and asylum requests¹

On average, there was an average of 215,261 inflow of foreign population in OECD member States in 2019. On the other hand, asylum requests in OECD member States reached an average of 26,724 in 2022. The highest amount of inflow of foreign population was 1,345,900 in

¹ Annex: Table 1. Sources for the data are also available underneath the table.

Germany while the lowest was 2,500 in Slovakia. The highest amount of asylum requests was in the United States at 188,860 while the lowest was 40 in Hungary. There were only 8 OECD member States with more than 300,000 inflow of foreign population in 2019 while there were only 7 of them with more than 50,000 asylum requests.

2. Current and Future automation or AI systems in the migration sector

a. Current AI solutions in OECD member States migration sector²

There are no discernable patterns and causality between the amount of inflow of foreign population or of asylum requests and the number of AI solutions in the OECD member States' migration sector. For instance, the two countries with the most AI solutions in the migration sector are Finland (6) and Latvia (5). Finland has 24,200 inflow of foreign population and 1,370 asylum requests. Latvia has a 6,600 inflow of foreign population and 580 asylum requests. Meanwhile, countries with massive amounts of foreign population such as Turkey (578,500), Chile (254,100), and Colombia (206,700) have no reported AI solutions in their migration sectors.

It is essential to assess the importance of AI solutions in the OECD countries' public administrations. This information is specifically found in the OECD AI policy observatory. As the OECD AI's policy observatory only focuses on national policies, little to no information was displayed on AI solutions in the migration sector. Nevertheless, according to their data, 31 (82%) of all OECD member States have implemented a national AI strategy. Only 7 (18%) have not implemented such strategies nationally. As such, at least 80% of OECD member States have implemented a nation-wide AI strategy policy-wise for the foreseeable future. However, all OECD member States have at least two AI policies in their public administrations regardless of the presence of a national AI strategy.

² Annex: Table 2. Sources for the data are also available underneath the table.

On average, OECD member States have 15 policies related to AI solutions, ranging from strategies for economic development to policies ensuring the protection of privacy rights. These are policies that either regulate or set the path for the future of AI through the means of public administration.

In total, 32 (84%) OECD member States have some form of AI solutions involved in their public administrations handling immigration affairs. These AI solutions are the following: fraud detection, chatbots, automated management systems (which includes visa processing, applicant triage, cost estimator, an automated biometric identification system (ABIS)), translation tools, migration forecasting, linguistic and speech identification, border control, facial recognition, and refugee integration. Nevertheless, some of these AI solutions are not unique to the migration sector such as fraud detection, chatbots, translation tools, facial recognition, applicant triage, cost estimator, linguistic and speech identification and the ABIS. However, some of these solutions are indeed unique to the migration sector such as automated management systems (visa processing), migration forecasting, linguistic and speech identification, border control, and refugee integration.

Translation tools were used in 6 (16%) countries. However, translation tools in this context were self-reported as AI solutions by the six countries. The translation tools were mainly the publicly available Google Translate software. As such, no data collection is collected on migrants, and it did not involve any complex AI solutions. While they are important to mention, these tools should perhaps be considered as operational as they help on a day-to-day basis with no ethical threats to the newcomers' privacy rights.

Some of the most frequent AI solutions were fraud detection and automated management systems which were present in 8 (21%) and 9 (24%) of the OECD member States respectively. The least frequent AI solution was migration forecasting which was only present in Finland. AI

solutions for border control were significant as 6 (16%) countries were using them in some form. Chatbots were also used in 5 (13%) countries while facial recognition was present in 3 (8%) countries.

In total, there are 23 European OECD countries that take part in the Schengen Information System (SIS) which consists of a large database that triggers alerts to the appropriate law enforcement authorities whenever irregularities are automatically picked up by the system (Vavoula, 2021). This AI solution is the most prevalent in the migration sectors of the OECD member States. Due to the lack of physical borders in the Schengen Area, this database acts as a centralized point of communication between participating States to flag potentially dangerous people, illegal migrants or international criminals. This example of AI usage in the migration sector showcases a huge area of interest in the migration sector: its intersectionality with national defense.

As for the OECD member States that have not reported a usage of AI solutions in the migration sector, there are 6 (16%) OECD member States that have no reported usage of AI solutions (Columbia, Costa Rica, Ireland, Israel, Mexico, and Turkey). One of the discernable patterns possible is that Columbia, Costa Rica, and Mexico are all part of Latin America. The other discernible pattern is that 4 out of the 6 countries (Columbia, Costa Rica, Mexico, and Turkey) have a lower Gross Domestic Product (GDP) per capita. Indeed, they have an average GDP per capita of 12,131\$ which is considerably lower than the OECD average of 42,099\$³. They are also important migration pressure points as they have an average 223,450 inflow of foreign population and an average of 71,262 asylum requests. As such, these countries have an important annual

³ Annex: Table 5. Sources for the data are also available underneath the table.

number of migrants and refugees, but they may lack the financial means to implement AI solutions in order to improve the service delivery's efficiency.

b. The future of AI solutions in OECD member States' migration sector⁴

While it is important to assess the current situation of AI solutions in the migration sector, it is equally important to assess their future direction. The future direction of AI in migration varies from country to country, but they usually involve visa processing for increased efficiency, employment-related automation, fraud detection, identity recognition systems (through biometrics), and migration forecasting. At least 4 OECD member States are currently seeking to develop AI solutions to improve migration forecasting.

Migration forecasting involves the pre-emptive analysis of migration flows before they happen. This would allow countries to better prepare their public administrations for migration crises that may occur. In theory, this would increase efficiency of application processing as they could change their priorities in advance. The implications of migration forecasting could also be negative as it would allow countries to increase the strictness of their border control pre-emptively as well. In general, social movement surveillance by State authorities sets out some interesting ideas for policymaking.

3. Transparency measures

a. OECD member States' openness and accountability to the public⁵

In general, OECD member States have favorable policies regarding data openness. Indeed, 27 (58%) member States have implemented a medium-to-long term action plan to release data to the public; 7 (18%) countries haven't implemented any while information wasn't available for 9

⁴ Annex: Table 2. Sources for the data are also available underneath the table.

⁵ Annex: Table 3 and 4. Sources for the data are also available underneath the tables.

(24%) of them. By default, 27 (71%) countries have an open data policy in place within the limits of their governance and regulations; only 3 (8%) countries do not have an open by default government while information wasn't available for 8 (21%) of them.

The high number of countries that do not have any information confirming or denying their open data policies should be considered as non-open-data countries since it goes against the very premise of the concept of open data. In that case, 16 (42%) countries do not have any open data strategies for the medium-to-long term and 11 (29%) countries do not have any open data by default policies.

Furthermore, the open by default policy does not automatically mean that data related to the migration sector is readily available to the public. Indeed, for instance, despite Canada having an open by default policy, data, and information regarding AI practices in IRCC is not publicly available and they can only be requested through the Access to Information Act (Molnar & Gill, 2018).

As for the accountability portion of the data analysis, there can't be any conclusive assessments as no country has been found to be reporting periodically on their AI usage specifically in the migration sector. This may be because the data involved in this activity may be sensitive or that there are simply not enough advancements for AI in the sector which severely limits the capacity to report any findings.

Limitations to the data analysis

One important finding in this data analysis was the lack of information regarding the usage of AI in the migration sector. For instance, the OECD AI observatory recorded no information on migration-related AI policies among its member States while the latter do have AI strategies in the migration sector. Additionally, there is no database specific to AI uses in the migration sector nor

was there any databases on AI-related topics such as AI regulations in the migration sector. Overall, there is a lack of extensive databases focused on AI solutions from an international perspective. Some international databases exist on AI solutions, but they are spread across multiple sectors without any focus on migration. This could be attributed to two causes: AI in the migration sector is still relatively new and there is a lack of transparency on AI usage in the migration sector.

Indeed, for instance, access to information can be limited which may cause some limitations in the data collection of States' transparency and accountability measures on AI. This may also affect the data collection on national ambitions for the implementation of AI solutions as it is as limited as the countries' transparency allows it to be.

Furthermore, EU countries have disproportionately more data available on the topic of AI to the public than the rest of the OECD member States. This can be attributed to the fact that the EU has a heavier emphasis on open data initiatives than the rest of the OECD. As such, it is expected that the data analysis has a heavier focus on EU countries, especially since they also represent most of the OECD member States.

Discussion

Following the literature review and the data analysis, a few issues seem to need to be addressed in the near future. First, there is a lack of international leadership in the development of harmonized regulations regarding AI solutions. Second, AI technologies seem to be getting ahead of the development of regulatory frameworks. Third, some AI solutions seem to amplify biases that are already present in the real world. Fourth, new AI technologies, especially in the migration sector, seem to use databases that were originally not intended for those purposes. Fifth, migration forecasting seems to become the future orientation of digital migration and it has serious implications for the digital rights of migrants. Sixth, public policies and regulatory frameworks

regarding digital solutions such as AI in the migration sector should oversee the safety of both the migrants' settlement and post-arrival journeys. Finally, seventh, AI solutions in the migration sector may be linked to national defense ambitions by States.

There is a higher emphasis on European countries in this research project as they lead the regulatory framework, especially internationally, on AI solutions. Their regulations often set the policy example for international organizations and countries across the world. As such, it is important to include them at the forefront of this research. The various other countries in the OECD are just as important as they can be used as a point of comparison. While Europe does have a lead in the development of regulations, there is still an apparent absence of an international governing body overseeing the harmonization of international regulations, especially when the UN lacks an internal regulatory framework on AI as mentioned in the literature review (Fournier-Tombs, 2021).

The literature review and the data analysis segment of this research paper has an interesting finding: AI solutions are increasingly present in public administrations across the world generally for efficiency purposes. As the data shows, every OECD country has at least two AI policies and 80% of them have a national AI strategy. These national AI strategies imply multiple sectors. For instance, France seeks to increase investments in AI technologies as well as increase subsidies to companies in the AI industry for their country to become a world leader (OECD, 2022). In other countries, AI national strategies map out the areas of interest where AI could increase their public administrations' efficiency. More than 80% of OECD countries also at least have some form of AI solution in their migration department.

While the usage is skyrocketing across the world, the legal frameworks for ethical usage of AI and for the protection of privacy rights are not following suit. Some laws or acts are simply not up to date to protect users from the ethical risks and threats of AI solutions. For instance, while

the European Union has the Data Protection Impact Assessment (DPIA), it does not extend to certain risks posed by AI. For this reason, the European commission has proposed a draft for harmonized regulations regarding AI in the EU ([European Commission](#), 2021). It is some good steps in the right direction.

The issue in this example is that the governmental body apparently applies a legal framework after the implementation of AI solutions. Currently, AI solutions seem to be getting ahead of the States' capacity to introduce new legal frameworks which could potentially jeopardize the targeted populations' rights and disproportionately affect minority groups including newcomers and refugees. For instance, 9 OECD countries are currently using AI to manage migrant applications on different levels which includes the automation of application acceptance and rejection. Recalling AI usage in HR for hiring purposes from the literature review (Drage & Mackereth, 2022; Dastin, 2018), it is crucial to understand the effect of AI solutions on vulnerable groups. Such AI practices can potentially marginalize them even further. Evidently, the findings on AI solutions for hiring purposes can be used as an example to assess the automated migration application process as they are extremely similar contexts.

Biometric data collection has gained traction in various organizational practices in the migration sector, specifically for facial recognition as noted in the data analysis. This technology is often used for border control purposes. The main issue regarding biometrics and State-controlled AI solutions monitoring them lies partly in the data collection. As mentioned in the literature review (Ho-Sung, 2021), countries such as South Korea have been caught selling facial recognition data to private companies without the users' consent which brings us to the next point: data manipulation on data that was originally collected for different purposes.

Countries are vastly collecting data on newcomers which facilitates the implementation of AI solutions in order to analyze this data automatically. The Schengen Information System (SIS), for instance, continued to evolve as the countries were increasingly collecting information on anyone crossing the border. In this case, the collection and storage of fingerprints led to the introduction of the Automated Fingerprint Identification System (AFIS) where people were identified simply by their fingerprints (EMN, 2022). This example shows how AI solutions can easily be applied to any type of data that has already been collected. Future AI solutions in the migration sector may depend on databases that already exist. This poses a problem as these databases were created under regulations that do not account for the risks of AI solutions. This could potentially violate the purpose limitation principle.

On the topic of migration forecasting, it is important to highlight that outcomes may both be positive and negative. There may be increased efficiency from such an AI solution, but migration forecasting could also well be used for negative outcomes such as increasing border control. The data collection on migrants could also be detrimental to them, especially if migration forecasting is done on informal migration routes which are used by migrants seeking refuge in the EU. As it was previously mentioned in the literature review (Krilic, 2018), migrants face harsh consequences when they are caught by border control when using these informal routes.

This sets some important considerations, especially when we consider, as mentioned in the literature review (Mazzoli *et al.*, 2018), the fact that large population movements are already easily traceable through social media public data and that irregular migrants use ICTs to share migrant networks to occidental destinations. The use of these resources could greatly improve migration forecasting tools' accuracy if they aren't already implemented. Future public policies protecting

migrants' digital rights must consider these sensitive sources of information that could jeopardize thousands, if not millions, of migrants' lives.

Looking ahead, migration forecasting may become a necessary tool as migration evolves, especially considering the risks of heavy migration flows that may arise from climate change (Budiman & Marthin, 2020). Migration forecasting may become a necessary tool for public administrations to face additional migration challenges caused by climate change. It is, thus, highly important to establish the legal framework and regulations that must complement the research for migration forecasting.

Recalling the literature review on climate migration (Bettini *et al.*, 2017), it is also crucial to assess the OECD member States objectives for migration forecasting in the context of climate change as most countries appear to view climate migrants as a security threat more than anything else. In essence, a defensive ambition for the development of migration forecasting tools based on AI solutions should be questioned. Instead, migration forecasting should only be used as a tool predicting increased climate migrant influx to support the migration infrastructure to efficiently process applications.

Furthermore, as the migrants and potential newcomers often do not have the ability to defend their rights against digital solutions, it is essential to lay out regulations that may protect them legally. This is a pressing matter especially when law enforcement authorities have access to the databases as it is the case in Europe in various countries. As it was noted in the literature review (Vavoula, 2020), digital surveillance of migrants isn't only restricted to the settlement journey; it extends to post-arrival as well. As such, developments in digital rights must recognize the digital impacts on migrants both during the settlement journey and after their arrival in the host country.

Additionally, as countries tend towards State surveillance of migrants and irregular migrants through digital means, it is even more important to recognize the importance of safekeeping migrants' digital rights. Recalling the literature review (Vavoula, 2020), while certain digital solutions are aimed at irregular migrants, regular migrants that entered the country legally are also negatively impacted by these practices. Additionally, the criminalization of irregular migrants is putting them at risk of criminals and smugglers (Latonero & Kift, 2018). Automated solutions that aren't supported by a strong legal framework shouldn't be implemented, even if they are deemed beneficial for newcomers. This is essential to flag considering that such automated solutions can quickly be used against the well-being of potential migrants instead as it was the case with the project "Centaur" as mentioned in the literature review (Kilpatrick & Jones, 2022). The valorization of migrants and newcomers' rights are therefore needed more than ever.

Conclusion and recommendations

Conclusion

Over the recent decades, digital solutions have undoubtedly become an essential part of the migration sector. Through the literature review, we have put an emphasis on three different levels of digital presence in the migration sector: organizational ambitions and considerations for AI and digital solutions, refugees and migrants' use of ICTs, and surveillance of migrants by State authorities through digital means. The data analysis, on the other hand, focused on the importance of AI solutions in the OECD member States' migration departments.

The literature review as well as the data analysis has shown that while there is an increased interest to study AI solutions in an applied context for public administrations (Ubaldi *et al.*, 2019; Beduschi & McAuliffe, 2022), the immigration sector generally does not receive as much attention from academics as other sectors. Thus, this research paper lays out the basic areas of interest of AI

in the migration sector as well as a preliminary database capturing its recent applied instances in public administrations in OECD countries. Future research should consider documenting AI in migration and its effects on migrants to a greater extent. An extensive database could be beneficial as it would inspire different public administrations on the uses of AI in migration. It could also serve as the basis of a classification system for OECD countries where they are ranked based on their safe and ethical practice of AI solutions in the migration sector similar to the Digital Government Index as mentioned in the literature review.

Following the literature review and the data analysis on AI, we must ask ourselves if the focus on efficiency in our public administrations amidst the push towards public management is worth the potential infringement on ethics and privacy rights. AI solutions certainly seem attractive in numerous public administrations to make the service delivery more efficient by processing more applications. However, the quest for maximum efficiency in the immigration sector must be reconsidered as it removes the much-needed human connection between newcomers and service providers.

Moreso, the data analysis has shown us that AI technologies in general and in the migration sector are still in their infancy. There is a noticeable trend of AI solutions' addition to governmental immigration services, but there is not enough regulation complementing them. There is, therefore, an urgent need for better regulations regarding AI solutions. Even though Canada is one of the world leaders in the implementation of AI solutions in its federal departments, there is still much more work needed to transform AI solutions into a safe and ethical practice while also increasing overall efficiency. The recommendations laid out in the following segment introduces the steps Canada should be taking in the near future.

Recalling the introduction of this paper, the initial hypothesis must be assessed. Initially, it was hypothesised that the lack of legal frameworks may negatively impact newcomers when AI solutions are being used on them. The paper tried to prove this hypothesis through two methods: the literature review and the data collection. The data collection showed the presence of various AI solutions used in the migration sector both currently and in the future, proving that migrants are, in fact, subject to these new technologies. The literature review showed the extent of AI solutions' negative impacts in various sectors including the migration one. Thus, there are reasonable grounds to believe that AI solutions in the migration sector will continue to evolve and there is already a lack of legal frameworks surrounding their usage. The research could further be developed through the analysis of national privacy, ethical, and digital regulations of OECD member States. The data collection would entail the collection of AI-related solutions' mentions in the aforementioned regulations. The data analysis would show us the amount of OECD member States that have enacted regulations that follow privacy and ethical guidelines for the protection of users subjected to AI solutions. The analysis would be limited to the migration sector, but it could potentially provide findings for AI usage in general.

Finally, a specific aspect of AI solutions in the immigration sector was not fully developed in this research paper: the international aspect. Data collection, especially for migration forecasting, for instance, requires inputs and surveys on international movement. Naturally, this type of AI solution requires a certain international coordination or, rather, it involves multiple parties across various nations and countries. In that instance, there is a dire need for international regulation to ensure the safe and ethical process of both data collection and data manipulation. Perhaps, an international organization overseeing the harmonization of regulations for AI across the world is needed. Such an organization should be inspired from already-existing international

organizations such as the International Civil Aviation Organization which oversees the harmonization of international civil aviation regulations. In fact, the IOM could potentially take the role of AI international regulation oversight in the migration sector or, in a broader and more ambitious way, an international organization with the purpose of overseeing international regulation on AI solutions in general.

Algorithms, automation, and data collection are part of the daily lives of billions of people across the world, but they are mostly unregulated and disproportionately affecting vulnerable groups. This can especially be true for the immigration sector. Research and awareness about the ethical dilemmas concerning AI solutions in the migration sector are crucial for the development of regulations. The subject is still in its early stages, but there is a growing interest and attention given to this issue. Now is the time for countries and organizations to implement changes.

Recommendations

The following segment serves as a list of recommendations to the Canadian government for the implementation of a regulatory framework and the future of AI solutions in the migration sector. These recommendations are based on the findings from both the literature review and the data analysis. Foremost, it must be recognized that Canada is one of the earliest adopters of AI solutions in the migration sector. They have mostly been used in the context of increasing efficiency in the public administration. It has also implemented various transparency measures to hold accountability to the public. There are, however, not enough efforts focusing on protecting the targeted populations' digital rights.

1. Databases must originally be for the purpose of AI solutions

Recalling the fact that AI solutions are often implemented or used on databases that were originally not intended for the purposes of automation and AI, databases must originally be for the

purpose of AI solutions. Using databases that violate the purpose limitation principle sets the wrong ethical precedent and it should be regarded as a violation of privacy rights. As such, it is recommended that existing databases should not be used for AI purposes without the consent of every single user. AI solutions should rather only be used on databases created for the purpose of automated solutions. Public administrations could regulate it through its implementation in privacy and data rights legislations. Transparency on methods of data collection is also important as it allows third-party observers to hold public administrations accountable if there's a breach of the purpose limitation principle.

2. Biometric data collection should be severely limited

Biometric data collection, especially facial recognition, must be severely limited and heavily regulated. Facial recognition based on AI-powered tools is often the source of bias against vulnerable groups and this may jeopardize the migration process of migrants. Ideally, such a technology should not be used even if it could potentially improve efficiency.

3. Information sharing to law enforcement authorities should be limited and regulated

Ethical problems arise when data that is collected on migrants and then shared to law enforcement authorities. Oftentimes, the vulnerable migrant groups are further marginalized when law enforcement authorities have access to such information as it was reviewed in the literature review.

4. Periodic reports on the AI's progress in the migration sector is necessary

In a bid of transparency and accountability, countries that wish to implement AI solutions in their migration sector must report periodically on the technology's progress. There must be an assessment of the successes as well as the failures of the technology.

5. Automation in the migration sector should not have a national defense agenda

To protect the migrants and refugees' human rights, automation in the migration sector should not have any national defense ambitions. Automated surveillance systems at borders infringe on human privacy rights and it goes against the very essence of immigration. The criminalization of migrants and refugees may endanger their lives, especially when automated systems are involved. For instance, the development of migration forecasting technologies should not be used for the purposes of fortifying border control.

Bibliography

- Bartikowski, B., Laroche, M., Jamal, A. & Yang, Z. (2018). The type-of-internet-access digital divide and the well-being of ethnic minority and majority consumers: A multi-country investigation. *Journal of Business Research*, 82, 373-380. DOI: <https://doi.org/10.1016/j.jbusres.2017.05.033> [Accessed on December 4th 2022]
- Beduschi, A. & M. McAuliffe. (2022). Chapter 11: Artificial Intelligence, Migration and Mobility: Implications for Policy and Practice. In United Nations (Eds.), *World Migration Report 2022*.
- Bettini, G., Gioli, G. & S. L. Nash. (2017). One step forward, two steps back? The fading contours of (in)justice in competing discourses on climate migration. *The Geographical Journal*, 183(4), 348-358.
- Bijak, J., Disney, G., Findlay, A. M., Forster, J. J., Smith, P. W. F. & A. Wiśniowski. (2019). Assessing time series models for forecasting international migration: Lessons from the United Kingdom. *Journal of Forecasting*, Vol. 38(5), pp.470-487. DOI: <https://doi.org/10.1002/for.2576>. [Accessed on December 4th 2022]
- Boas, I. *et al.* (2021). Climate migration myths. *Nature climate change*, 9(12), 1-12.
- Bock, J. G., Haque, Z. & K. A. McMahon. (2020). Displaced and dismayed: how ICTs are helping refugees and migrants, and how we can do better. *Information Technology for Development*, vol. 26(4), 670-691, DOI: <https://doi.org/10.1080/02681102.2020.1727827>. [Accessed on December 4th 2022]
- Borket, M., Fisher, K. E. & Eiad Yafi. (2018). The Best, the Worst, and the Hardest to Find: How People, Mobiles, and Social Media Connect Migrants In(to) Europe. *Social Media + Society*, Vol. 4(1), pp. 1-11. DOI: 10.1177/2056305118764428.
- Bradford, A. (2012). The Brussels Effect. *Northwestern University Law Review*, Vol. 107(1), pp. 1-68.
- Broeders, D. (2007). The New Digital Borders of Europe: EU Databases and the Surveillance of Irregular Migrants. *International Sociology*, vol. 22(1), p. 71-92. DOI: 10.1177/0268580907070126.
- Budiman, L. & A. Marthin. (2020). The discourse of climate migration: Unraveling the politics of ASEAN's environmental policies. *Pacific Journalism Review*, 26(2), 35-51.
- Calabrese, F., Diao, M., Di Lorenzo, G., Ferreira Jr., J. & C. Ratti. (2013). Understanding individual mobility patterns from urban sensing data: A mobile phone trace example. *Transportation Research*. Vol. 26, pp. 301-313. DOI: <https://doi.org/10.1016/j.trc.2012.09.009>. [Accessed on December 4th 2022]
- Catanzariti, M. (2020). Chapter 13: Enhancing Policing through Algorithmic Surveillance in *The Fight Against Impunity in EU Law* by L. Marin & S. Montaldo (eds.). Hart Publishing. pp. 239-255.
- Dastin, J. (2018). Amazon scraps secret AI recruiting tool that showed bias against women. *Reuters*. Website: <https://reut.rs/2Od9fPr>. [Accessed on December 4th 2022]
- Drage, E. & K. Mackereth. (2022). Does AI Debias Recruitment? Race, Gender, and AI's "Eradication of Difference". *Philosophy & Technology*, Vol. 35(4), pp 1-25. DOI:
- Editorial. (2017). Data on movements of refugees and migrants are flawed. *Nature*. Vol. 543, pp. 5-6. <https://doi.org/10.1038/543005b>. [Accessed on December 4th 2022]
- Ertl, B., Csanadi, A. & C. Tarnai. (2020). Getting closer to the digital divide: An analysis of impacts on digital competencies based on the German PIAAC sample. *International*

- Journal of Educational Development*, Vol. 78, p. 1-10. DOI: <https://doi.org/10.1016/j.ijedudev.2020.102259>. [Accessed on December 4th 2022]
- European Commission. (2022). The use of digitalisation and artificial intelligence in migration management: EMN-OECD Inform. *European Migration Network*. 16 p.
- European Migration Network (EMN). (2022). Annual Report on Migration and Asylum 2021. *European Union*, 58 p.
- Flavell, A. & M. T. Chazalnoël. (2014). *IOM Outlook On Migration, Environment and Climate Change*. International Organization for Migration. [Accessed on December 4th 2022]
- Fournier-Tombs, E. (2021). Towards a United Nations Internal Regulation for Artificial Intelligence. *Big Data & Society*, Vol. 8(2), pp. 1-5. DOI: 0.1177/20539517211039493.
- Frontex. (2015). 710 000 migrants entered EU in first nine months of 2015. *Europa*. URL: <https://frontex.europa.eu/media-centre/news/news-release/710-000-migrants-entered-eu-in-first-nine-months-of-2015-NUiBkk>. [Accessed on December 4th 2022]
- Galis, V. & V. Makrygianni. (2022). Analog flows in digital worlds: ‘Migration multiples’ and digital heterotopias in Greek territory. *Political Geography*, Vol. 95, p. 1-10. DOI: <https://doi.org/10.1016/j.polgeo.2022.102599>. [Accessed on December 4th 2022]
- Gill, L. & P. Molnar. (2018). *Bots at the Gate: A Human Rights Analysis of Automated Decision-making in Canada’s Immigration and Refugee System*. University of Toronto’s International Human Rights Program. 81 p.
- Gillespie, M., Osseiran, S. & M. Cheesman. (2018). Syrian Refugees and the Digital Passage to Europe: Smartphone Infrastructures and Affordances. *Social Media + Society*, Vol.4(1), pp. 1-12. DOI: <https://doi.org/10.1177/2056305118764440>. [Accessed on December 4th 2022]
- Government of Canada. (2022). CIMM – Digital Platform Modernization. *IRCC*. URL: <https://www.canada.ca/en/immigration-refugees-citizenship/corporate/transparency/committees/cimm-mar-03-2022/digital-platform-modernization.html>. [Accessed on December 4th 2022]
- Government of Canada. (2022). Directive on Automated Decision-Making. *Treasury Board of Canada*. URL: <https://www.tbs-sct.canada.ca/pol/doc-eng.aspx?id=32592§ion=html> [Accessed on December 4th 2022]
- Hankaew, S., Phithakkitnukoon, S., Demissie, M. G., Kattan, L., Smoreda, Z. & C. Ratti. (2019). Inferring and Modeling Migration Flows Using Mobile Phone Network Data. *IEEE Access*, Vol. 7, pp. 164746-164758. DOI: 0.1109/ACCESS.2019.2952911.
- Harris, K. (2017). Nearly half of illegal border-crossers into Canada are from Haiti. *CBC News*. Website: <https://www.cbc.ca/news/politics/haiti-border-crossers-canada-irregular-1.4414781?vfz=medium%3Dsharebar>. [Accessed on December 4th 2022]
- Harwell, D. (2019). FBI, ICE find state driver’s license photos are a gold mine for facial-recognition searches. *The Washington Post*. URL: <https://www.washingtonpost.com/technology/2019/07/07/fbi-ice-find-state-drivers-license-photos-are-gold-mine-facial-recognition-searches/>. [Accessed on December 4th 2022]
- Immigrant Services Calgary (ISC). (2022). Annual Report: 2021-2022. URL: <https://www.immigrantservicescalgary.ca/wp-content/uploads/2022/08/Annual-report-2022.pdf>. [Accessed on December 4th 2022]

- International Organization for Migration. (2020). *World Migration Report 2019*.
https://publications.iom.int/system/files/pdf/wmr_2020.pdf [Accessed on December 4th 2022]
- IRCC. (2022). *Departmental Plan 2022-2023*. Retrieved from IRCC. Website:
<https://www.canada.ca/content/dam/ircc/documents/pdf/english/pub/dp-pm-2022-2023-eng.pdf>. [Accessed on December 4th 2022]
- K. Leurs & K. Smets. (2018). Five Questions for Digital Migration Studies: Learning From Digital Connectivity and Forces Migration In(to) Europe. *Social Media + Society*, Vol. 4(1), pp. 1-16. DOI: <https://doi.org/10.1177/2056305118764425>. [Accessed on December 4th 2022]
- Keung, N. (2020). How artificial intelligence is changing asylum seekers' lives for the worse. *Toronto Star*. URL: https://www.thestar.com/news/canada/2020/11/08/how-artificial-intelligence-is-changing-asylum-seekers-lives-for-the-worse.html?utm_source=share-bar&utm_medium=user&utm_campaign=user-share. [Accessed on December 4th 2022]
- Kilpatrick, J. & C. Jones. (2022). A clear and present danger: Missing safeguards on migration and asylum in the EU's AI Act. *Statewatch*. 46 p.
- Klippenstein, K. & S. Sirota. (2021). The Taliban Have Seized U.S. Military Biometrics Devices. *The Intercept*. URL: <https://interc.pt/2UtAIY8>. [Accessed on December 4th 2022]
- Kutscher, N. & L. Kress. (2018). The Ambivalent Potentials of Social Media Use by Unaccompanied Minor Refugees. *Social Media + Society*, Vol. 4(1), pp. 1-10. DOI: <https://doi.org/10.1177/2056305118764438>. [Accessed on December 4th 2022]
- Sanchez-Querubin, N. & R. Rogers. (2018). Connected Routes: Migration Studies with Digital Devices and Platforms. *Social Media + Society*, Vol. 4(1), pp. 1-13. DOI: <https://doi.org/10.1177/2056305118764427>. [Accessed on December 4th 2022]
- Kuziemski, M. & G. Misuraca. (2020). AI governance in the public sector: Three tales from the frontiers of automated decision-making in democratic settings. *Telecommunications policy*, vol. 44(6), pp. 1-13. DOI: <https://doi.org/10.1016/j.telpol.2020.101976>. [Accessed on December 4th 2022]
- Latonero, M. & P. Kift. (2018). On Digital Passages and Borders: Refugees and the New Infrastructure for Movement and Control. *Social Media + Society*, Vol. 4(1), pp. 1-11. DOI: <https://doi.org/10.1177/2056305118764432>. [Accessed on December 4th 2022]
- Mazzoli *et al.* (2020). Migrant Mobility Flows Characterized with Digital Data. *PloS One*, vol. 15(3), p. 1-20. DOI: <https://doi.org/10.1371/journal.pone.0230264>. [Accessed on December 4th 2022]
- Molnar, P. (2019). New technologies in migration: human rights impacts. *The Ethics issue*, (61), pp. 7-9.
- Nalbadian, L. (2022). An eye for an 'I': a critical assessment of artificial intelligence tools in migration and asylum management. *Comparative Migration Studies*, Vol. 10(32), pp. 1-23. DOI: <https://doi.org/10.1186/s40878-022-00305-0>. [Accessed on December 4th 2022]
- Nalbadian, L. (2021). Using Machine-Learning to Triage Canada's Temporary Resident Visa Applications. *Working Papers*, Ryerson Centre for Immigration and Settlement & Canada Excellence Research Chair in Migration and Integration, 18 p.
- Napierała, J., Hilton, J., Forster, J. J., Carammia, M. & J. Bijak. (2021). Toward an Early Warning System for Monitoring Asylum-Related Migration Flows in Europe. *International Migration Review*. Vol. 56(1), pp. 33-62. DOI: 0.1177/01979183211035736.

- OECD. (2020). Digital Government Index: 2019 results. *OECD Public Governance Policy Papers No. 03*, 68 p.
- OECD. (2022). *International Migration Outlook 2022*. 46th Edition. 407 p.
- Ortega, D., Fernandez-Isabel, A., Martin de Diego, I., Conde, C. & E. Cabello. (2020). Dynamic facial presentation attack detection for automated border control systems. *Computers & Security*, Vol. 92, pp. 1-10. DOI: <https://doi.org/10.1016/j.cose.2020.101744>. [Accessed on December 4th 2022]
- Picheta, R. (2018). Passengers to face AI lie detector tests at EU airports. *CNN*. URL: <https://edition.cnn.com/travel/article/ai-lie-detector-eu-airports-scli-intl/index.html>. [Accessed on December 4th 2022]
- Pötzschke, S. & M. Braun. (2016). Migrant Sampling Using Facebook Advertisements: A Case Study of Polish Migrants in Four European Countries. *Social Science Computer Review*. Vol. 35(5), pp. 633-653. DOI: <https://doi.org/10.1177/0894439316666262>. [Accessed on December 4th 2022]
- Salo-Pöntinen, H. & P. Saariluoma. (2022). Reflection on the human role in AI policy formulations: how do national AI strategies view people? *Discover Artificial Intelligence*, Vol. 2(3), pp. 1-24. DOI: <https://doi.org/10.1007/s44163-022-00019-3>. [Accessed on December 4th 2022]
- Sanchez del Rio, J., Moctezuma, D., Conde, C., Martin de Diego, I. & E. Cabello. (2016). Automated border control e-gates and facial recognition systems. *Computers & Security*, Vol. 62, pp. 49-72. DOI: <http://dx.doi.org/10.1016/j.cose.2016.07.001>. [Accessed on December 4th 2022]
- Tao, W. (2022). IRCC Lifts the Lid (a Bit) on their Artificial Intelligence-based TRV Triaging Process. *Heron Law Offices*. URL: <https://heronlaw.ca/ai-in-canadian-immigration-law/>. [Accessed on December 4th 2022]
- Topak, Ö. E., Bracken-Roche, C., Saulnier, A. & David Lyon. (2015). From Smart Borders to Perimeter Security: The Expansion of Digital Surveillance at the Canadian Borders. *Geopolitics*, Vol. 20(4), DOI: <https://doi.org/10.1080/14650045.2015.1085024>. [Accessed on December 4th 2022]
- Tyler, H. (2022). The Increasing Use of Artificial Intelligence in Border Zones Prompts Privacy Questions. *Migration Policy Institute*. URL: <https://www.migrationpolicy.org/article/artificial-intelligence-border-zones-privacy>. [Accessed on December 4th 2022]
- Ubaldi, B., Le Fevre, E. M., Petrucci, E., Marchionni, P., Biancalana, C., Hiltunen, N., Intravaia, D. M. & C. Yang. (2019). State of the art in the use of emerging technologies in the public sector. *OECD Working Papers on Public Governance*. No. 31. 73 p. DOI: <https://doi.org/10.1787/932780bc-en>. [Accessed on December 4th 2022]
- UNHCR. (1951). *1951 Refugee Convention*.
- Upadhay, A. K. & K. Khandelwal. (2018). Applying Artificial Intelligence: Implications for Recruitment. *Strategic HR Review*, vol. 17(5), pp. 255-258. DOI: <http://dx.doi.org/10.1108/SHR-07-2018-0051>. [Accessed on December 4th 2022]
- Vavoula, N. (2020). Chapter 12: Stepping Up the Fight against Impunity in EU Law: Access to Immigration Databases by National Law Enforcement Authorities and Europol in *The Fight Against Impunity in EU Law* by L. Marin & S. Montaldo (eds.). Hart Publishing. pp. 209-238

- Vavoula, N. (2021). Artificial Intelligence (AI) at Schengen Borders: Automated Processing, Algorithmic Profiling and Facial Recognition in the Era of Techno-Solutionism. *European Journal of Migration*, Vol. 23(4), pp. 457-484. DOI: 10.1163/15718166-12340114.
- Wachter, S., Mittelstadt, B. & L. Floridi. (2017). Why a Right to Explanation of Automated Decision-Making Does Not Exist in the General Data Protection Regulation. *International data privacy law*, Vol. 7(2), pp. 76-99. DOI: 10.1093/idpl/ix005.
- Zavratnik, S. & S. C. Krilic. (2018). Digital routes, “Digital migrants”: From empowerment to control over refugees’ digital footprints. *Družboslovne Razprave*, Vol. 34(89), p. 143-163.

Data Collection References

- Bansak, K., Ferwerda, J., Hainmueller, J., Dillon, A., Hangartner, D., Lawrence, D. & J. Weinstein. (2018). Improving Refugee Integration Through Data-driven Algorithmic Assignment. *Science*, Vol. 359(6373). DOI: 10.1126/science.aao4408.
- Dirksen, N. & S. Takahashi. (2020). Artificial Intelligence in Japan: Actors, Market, Opportunities and Digital Solutions in a Newly Transformed World. *Ministry of Economic Affairs and Climate Policy*. 38 p.
- European Commission. (2021). AD HOC QUERY ON 2021.34 Use of artificial intelligence or new technologies in reception facilities. *European Migration Network*. 24 p.
- European Commission. (2022). Annual Report on Migration and Asylum 2021. *European Migration Network*. 58 p.
- European Commission. (2022). The use of digitalisation and artificial intelligence in migration management: EMN-OECD Inform. *European Migration Network*. 16 p.
- European Union. (2022). Schengen Information System. *European Data Protection Supervisor*. URL: https://edps.europa.eu/data-protection/european-it-systems/schengen-information-system_en#list. [Accessed on December 4th 2022].
- Government of Korean Republic. (2022). Automated Immigration Clearance Service (SES). *Ministry of Justice : Korea Immigration Service*. URL : https://www.immigration.go.kr/immigration_eng/1859/subview.do [Accessed on December 4th 2022].
- Lee, K. M. & J. Lee. (2020). Plan to build AI-based Immigration Control System Announced. *Korea.net*. URL: <https://www.korea.net/NewsFocus/Sci-Tech/view?articleId=188025>. [Accessed on December 4th 2022].
- McDonald, H. (2019). AI systems for granting UK visas is biased, rights groups claim. *The Guardian*. URL: <https://www.theguardian.com/uk-news/2019/oct/29/ai-system-for-granting-uk-visas-is-biased-rights-groups-claim>. [Accessed on December 4th 2022].
- McLean, J & R. Mackenzie. (2019). Digital Justice in Australian visa application processes? *Alternative Law Journal*, Vol. 44(4), DOI: <https://doi.org/10.1177/1037969X19853685>. [Accessed on December 4th 2022].
- Miroff, N. (2022). Powered by artificial intelligence, ‘autonomous’ border towers test Democrats’ support for surveillance technology. *The Washington Post*. URL: <https://www.washingtonpost.com/national-security/2022/03/11/mexico-border-surveillance-towers/> [Accessed on December 4th 2022].

- Nalbandian, L. (2022). An eye for an ‘I’: a critical assessment of artificial intelligence tools in migration and asylum management. *Comparative Migration Studies*. Vol. 10(32). DOI: <https://doi.org/10.1186/s40878-022-00305-0>. [Accessed on December 4th 2022].
- OECD. (2020). Digital Government Index: 2019 results. *OECD Public Governance Policy Papers*. 69 p.
- OECD. (2022). *International Migration Outlook 2022*. 46th Edition. 407 p.
- OECD. AI Policy Observatory. URL: <https://oecd.ai/en/dashboards/overview>. [Accessed on December 4th 2022].
- World Bank. (2022). GDP per capita (current US\$). URL: <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD>. [Accessed on December 4th 2022].

Annex

Note: In the following tables, there are links embedded in some cases. These links will provide you the exact source where it was found. For instance, the links in table 3 will provide you the exact webpage of the concerned countries on the OECD AI Policy Observatory website. The links in table 2 will lead you to external sources when it was needed as the main source of information did not hold any information. When no information was found on a country in the following tables, there is an “N/A” mention.

Table 1. Inflow of foreign populations and asylum requests based on OECD member States

| OECD Member States | General Migration | |
|--------------------|---------------------------------------|-----------------------------------|
| | Inflows of foreign population in 2019 | Number of Asylum requests in 2022 |
| Australia | 155,800 | 14,150 |
| Austria | 135,000 | 36,750 |
| Belgium | 129,500 | 19,610 |
| Canada | 341,200 | 23,370 |
| Chile | 254,100 | 2,500 |
| Colombia | 206,700 | 15,940 |
| Costa Rica | 7,800 | 108,430 |
| Czech Republic | 63,300 | 1,060 |
| Denmark | 42,300 | 2,020 |
| Estonia | 11,000 | 80 |
| Finland | 24,200 | 1,370 |
| France | 254,200 | 103,810 |
| Germany | 1,345,900 | 148,240 |
| Greece | 95,400 | 22,660 |
| Hungary | 55,300 | 40 |
| Iceland | 9,500 | 870 |
| Ireland | 61,700 | 2,620 |
| Israel | 33,200 | 1,930 |
| Italy | 264,600 | 43,910 |
| Japan | 592,000 | 2,410 |
| South Korea | 438,200 | 2,330 |

| | | |
|----------------|-----------|---------|
| Latvia | 6,600 | 580 |
| Lithuania | 19,700 | 3,910 |
| Luxembourg | 25,100 | 1,360 |
| Mexico | 40,500 | 131,420 |
| Netherlands | 215,200 | 24,830 |
| New Zealand | 124,700 | 420 |
| Norway | 44,600 | 1,620 |
| Poland | 163,200 | 6,240 |
| Portugal | 129,200 | 1,350 |
| Slovakia | 2,500 | 330 |
| Slovenia | 27,600 | 5,220 |
| Spain | 664,600 | 62,070 |
| Sweden | 98,200 | 10,180 |
| Switzerland | 140,600 | 13,300 |
| Turkey | 578,500 | 29,260 |
| United Kingdom | 346,400 | 56,470 |
| United States | 1,031,800 | 188,860 |

Source: OECD. (2022). *International Migration Outlook 2022*. 46th Edition. 407 p.

Table 2. Presence of current and future automated systems in the OECD member States' public administration⁶

| OECD Member States | Presence of automation or AI systems (Y/N) | | |
|--------------------|--|--|---|
| | | Which specific usage? | Does this State have any plans of implementing automation in migration? |
| | Australia | Y | Fraud detection, Chatbot, Application management system |
| Austria | Y | Translation tools, Schengen Information System (SIS) | N/A |
| Belgium | Y | Translation tools, Schengen Information System (SIS) | Automated research tool to validate breeder documents, NADINE (open-source employment AI) |
| Canada | Y | Fraud detection, Chatbot, Application management system | N/A |
| Chile | Y | Chatbot | N/A |
| Colombia | N | N/A | N/A |
| Costa Rica | N | N/A | N/A |
| Czech Republic | Y | Translation tools, Schengen Information System (SIS) | N/A |
| Denmark | Y | Schengen Information System (SIS) | N/A |
| Estonia | Y | Automated biometric identification system (ABIS) , Schengen Information System (SIS) | N/A |
| Finland | Y | Fraud detection (TIKKA), Migration flow predictions, Complexity of application assessment, Application estimated cost, Chatbot (Kamu), Schengen Information System (SIS) | N/A |

⁶ **Note:** In this table, there are links embedded in some cases. These links will provide you the exact source where it was found. When no information was found on a country in the following tables, there is an “N/A” mention.

| | | | |
|-------------|---|---|---|
| France | Y | [TESTING] migration management, Schengen Information System (SIS) | Document fraud detection in the ANEF portal (accessible to all administrations and services), chatbot, NADINE (open-source employment AI) |
| Germany | Y | Language and dialect identification (DIAS), Identity verification, Schengen Information System (SIS) | Migration forecasting |
| Greece | Y | Border questioning (iBorderCtrl), Schengen Information System (SIS) | NADINE (open-source employment AI) |
| Hungary | Y | Facial recognition, Fraud detection, Border questioning (iBorderCtrl), Schengen Information System (SIS) | Speech recognition (identity recognition system) |
| Iceland | Y | Schengen Information System (SIS) | N/A |
| Ireland | N | N/A | AI for customer queries (chatbot), data mining |
| Israel | N | N/A | N/A |
| Italy | Y | Schengen Information System (SIS) | NADINE (open-source employment AI) |
| Japan | Y | Facial recognition, Immigration management | N/A |
| South Korea | Y | Border control | Immigration control system |
| Latvia | Y | Language and knowledge proficiency (Tidle Speech Recognition System), Border questioning (iBorderCtrl), Chatbot virtual assistant, fraud detection, Schengen Information System (SIS) | Migration forecasting |
| Lithuania | Y | Facial recognition, Application management system (MIGRIS), Fraud detection (D4FLY), Schengen Information System (SIS) | Migration forecasting |
| Luxembourg | Y | Schengen Information System (SIS) | NADINE (open-source employment AI) |
| Mexico | N | N/A | N/A |
| Netherlands | Y | Fraud detection (IND), Application management system (IND, behandelautomaat), Schengen Information System (SIS) | Migrant identification (with database DEMS), AI-Project COA |
| New Zealand | Y | Border control | N/A |

| | | | |
|----------------|---|--|---|
| Norway | Y | Schengen Information System (SIS) | N/A |
| Poland | Y | Schengen Information System (SIS) | N/A |
| Portugal | Y | Translation tools, Schengen Information System (SIS) | N/A |
| Slovakia | Y | Translation tools, Schengen Information System (SIS) | N/A |
| Slovenia | Y | Schengen Information System (SIS) | N/A |
| Spain | Y | Translation tools, Schengen Information System (SIS) | Migratory flow analysis, Labour market needs analysis, NADINE (open-source employment AI) |
| Sweden | Y | Schengen Information System (SIS) | N/A |
| Switzerland | Y | Refugee integration [PILOT] | N/A |
| Turkey | N | N/A | N/A |
| United Kingdom | Y | Visa application approval | NADINE (open-source employment AI) |
| United States | Y | Fraud detection, border control | Biometric data collection |

Sources:

- European Commission. (2022). The use of digitalisation and artificial intelligence in migration management: EMN-OECD Inform. *European Migration Network*. 16 p.
- European Union. (2022). Schengen Information System. *European Data Protection Supervisor*. URL: https://edps.europa.eu/data-protection/european-it-systems/schengen-information-system_en#list. [Accessed on December 4th 2022].
- European Commission. (2022). Annual Report on Migration and Asylum 2021. *European Migration Network*. 58 p.
- McLean, J & R. Mackenzie. (2019). Digital Justice in Australian visa application processes? *Alternative Law Journal*, Vol. 44(4), DOI: <https://doi.org/10.1177/1037969X19853685>. [Accessed on December 4th 2022].
- Dirksen, N. & S. Takahashi. (2020). Artificial Intelligence in Japan: Actors, Market, Opportunities and Digital Solutions in a Newly Transformed World. *Ministry of Economic Affairs and Climate Policy*. 38 p.
- Government of Korean Republic. (2022). Automated Immigration Clearance Service (SES). *Ministry of Justice : Korea Immigration Service*. URL : https://www.immigration.go.kr/immigration_eng/1859/subview.do [Accessed on December 4th 2022].
- Lee, K. M. & J. Lee. (2020). Plan to build AI-based Immigration Control System Announced. *Korea.net*. URL: <https://www.korea.net/NewsFocus/Sci-Tech/view?articleId=188025>. [Accessed on December 4th 2022].
- European Commission. (2021). AD HOC QUERY ON 2021.34 Use of artificial intelligence or new technologies in reception facilities. *European Migration Network*. 24 p.

- Nalbandian, L. (2022). An eye for an 'I': a critical assessment of artificial intelligence tools in migration and asylum management. *Comparative Migration Studies*. Vol. 10(32). DOI: <https://doi.org/10.1186/s40878-022-00305-0>. [Accessed on December 4th 2022].
- Bansak, K., Ferwerda, J., Hainmueller, J., Dillon, A., Hangartner, D., Lawrence, D. & J. Weinstein. (2018). Improving Refugee Integration Through Data-driven Algorithmic Assignment. *Science*, Vol. 359(6373). DOI: 10.1126/science.aao4408.
- McDonald, H. (2019). AI systems for granting UK visas is biased, rights groups claim. *The Guardian*. URL: <https://www.theguardian.com/uk-news/2019/oct/29/ai-system-for-granting-uk-visas-is-biased-rights-groups-claim>. [Accessed on December 4th 2022].
- Miroff, N. (2022). Powered by artificial intelligence, 'autonomous' border towers test Democrats' support for surveillance technology. *The Washington Post*. URL: <https://www.washingtonpost.com/national-security/2022/03/11/mexico-border-surveillance-towers/> [Accessed on December 4th 2022].

Table 3. AI national strategies and policies in the OECD member States⁷

| OECD Member States | Does this State have a national AI strategy? How many national policies? | How many national AI policies? |
|--------------------|---|--------------------------------|
| Australia | Y | 31 |
| Austria | Y | 8 |
| Belgium | N | 21 |
| Canada | Y | 13 |
| Chile | Y | 11 |
| Colombia | Y | 30 |
| Costa Rica | N | 7 |
| Czech Republic | Y | 8 |
| Denmark | Y | 12 |
| Estonia | Y | 9 |
| Finland | Y | 11 |
| France | Y | 33 |
| Germany | Y | 33 |
| Greece | N | 3 |
| Hungary | Y | 14 |
| Iceland | Y | 4 |
| Ireland | Y | 8 |
| Israel | N | 8 |
| Italy | Y | 9 |
| Japan | Y | 23 |
| South Korea | Y | 14 |
| Latvia | Y | 5 |
| Lithuania | Y | 4 |
| Luxembourg | Y | 6 |
| Mexico | N | 6 |

⁷ **Note:** In this table, there are links embedded in some cases. These links will provide you the exact source where it was found. When no information was found on a country in the following tables, there is an “N/A” mention.

| | | |
|----------------|-------------------|----|
| Netherlands | Y | 12 |
| New Zealand | N | 8 |
| Norway | Y | 17 |
| Poland | Y | 3 |
| Portugal | Y | 10 |
| Slovakia | N | 2 |
| Slovenia | Y | 6 |
| Spain | Y | 15 |
| Sweden | Y | 13 |
| Switzerland | Y | 5 |
| Turkey | Y | 32 |
| United Kingdom | Y | 55 |
| United States | Y | 69 |

Source: OECD. AI Policy Observatory. URL: <https://oecd.ai/en/dashboards/overview>.
 [Accessed on December 4th 2022].

Table 4. Open data strategies and open by default initiatives in OECD member States⁸

| OECD Member States | Transparency | |
|--------------------|------------------------------------|---------------------------------|
| | Open Data Strategy | Open by default |
| Australia | N/A | N/A |
| Austria | N | N |
| Belgium | Y | Y |
| Canada | Y | Y |
| Chile | Y | Y |
| Colombia | Y | Y |
| Costa Rica | N/A | N/A |
| Czech Republic | Y | Y |
| Denmark | Y | Y |
| Estonia | Y | Y |
| Finland | N | Y |
| France | Y | Y |
| Germany | Y | Y |
| Greece | Y | Y |
| Hungary | N/A | N/A |
| Iceland | N | N |
| Ireland | N | Y |
| Israel | Y | Y |
| Italy | Y | Y |
| Japan | Y | Y |
| South Korea | Y | Y |
| Latvia | Y | Y |
| Lithuania | Y | Y |
| Luxembourg | Y | Y |
| Mexico | N/A | N/A |

⁸ **Note:** In this table, there are links embedded in some cases. These links will provide you the exact source where it was found. When no information was found on a country in the following tables, there is an “N/A” mention.

| | | |
|----------------|-----|-----|
| Netherlands | Y | Y |
| New Zealand | Y | Y |
| Norway | N | Y |
| Poland | N/A | N/A |
| Portugal | N | Y |
| Slovakia | N/A | Y |
| Slovenia | Y | Y |
| Spain | Y | Y |
| Sweden | N | N |
| Switzerland | N/A | N/A |
| Turkey | N/A | N/A |
| United Kingdom | Y | Y |
| United States | N/A | N/A |

Source:

OECD. (2020). Digital Government Index: 2019 results. *OECD Public Governance Policy Papers*. 69 p.

Table 5. GDP per Capita of OECD member States in 2019 (USD\$)⁹

| OECD Member States | GDP per Capita in 2021 (USD\$) |
|--------------------|--|
| Australia | 59,934 |
| Austria | 53,268 |
| Belgium | 51,768 |
| Canada | 52,051 |
| Chile | 16,502 |
| Colombia | 6,131 |
| Costa Rica | 12,508 |
| Czech Republic | 26,379 |
| Denmark | 67,803 |
| Estonia | 27,281 |
| Finland | 53,983 |
| France | 43,519 |
| Germany | 50,802 |
| Greece | 20,277 |
| Hungary | 18,773 |
| Iceland | 68,384 |
| Ireland | 99,152 |
| Israel | 51,430 |
| Italy | 35,551 |
| Japan | 39,285 |
| South Korea | 34,758 |
| Latvia | 20,642 |
| Lithuania | 23,433 |
| Luxembourg | 135,683 |
| Mexico | 9,926 |

⁹ **Note:** In this table, there are links embedded in some cases. These links will provide you the exact source where it was found. When no information was found on a country in the following tables, there is an “N/A” mention.

| | |
|----------------|--------|
| Netherlands | 58,061 |
| New Zealand | 48,802 |
| Norway | 89,203 |
| Poland | 17,841 |
| Portugal | 24,262 |
| Slovakia | 21,088 |
| Slovenia | 29,201 |
| Spain | 30,116 |
| Sweden | 60,239 |
| Switzerland | 93,457 |
| Turkey | 9,587 |
| United Kingdom | 47,334 |
| United States | 69,288 |

Source: World Bank. (2022). GDP per capita (current US\$). URL: <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD>. [Accessed on December 4th 2022].