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Border Boundaries: Navigating Migration and the Role of AI in Irregular Movements

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ABSTRACT

This study examines the impact of AI-driven technologies in migration management, focusing on surveillance, biometric identification, and predictive analytics at international borders. While these technologies enhance border security and streamline administrative processes, they also raise concerns about bias, data privacy, and ethical risks. In fact, if flawed, automated decision-making may lead to wrongful rejections and human rights violations.

A key challenge is balancing technological efficiency with human rights protections as AI-driven border control systems, if unregulated, can result in discriminatory outcomes and erode fundamental freedoms. Issues such as opaque decision-making, mass surveillance, and potential data misuse highlight the need for transparency and accountability in AI deployment.

As governments and institutions are being challenged in ensuring that AI in migration governance aligns with legal and ethical standards, international frameworks, including human rights treaties, emphasize the necessity of safeguards to prevent excessive surveillance and uphold migrants' rights. Therefore, AI use is rights-based if enhancing security without compromising due process, privacy, or fairness.

This study evaluates the benefits and risks of AI in border control, advocating for governance frameworks that integrate oversight, transparency, and ethical considerations. By aligning AI with humanitarian principles, migration policies can be both effective and just.

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Introduction

Migration is a fundamental aspect of human mobility, yet it continues to pose significant challenges for States seeking to regulate access to their territories. The advent of Artificial Intelligence (AI) in migration management has introduced innovative solutions that enhance security, improve efficiency, and support decision-making processes. However, the use of AI also requires a careful evaluation of its ethical, legal, and humanitarian implications.

International law mandates the protection of migrants' rights, including through the principle of non-refoulement, which prevents the return of individuals to countries where they may face harm. Hence, resorting to AI-based border control mechanisms that are not properly regulated by international and domestic legal frameworks may lead to unintended violations of fundamental rights, resulting from the process of automating complex decisions related to the assessment of individual cases and vulnerabilities without adequate human oversight. This study examines the integration of AI in migration governance, analyzing its role in enhancing border security and processing asylum applications. It critically evaluates the ethical challenges posed by AI-driven decision-making, particularly concerning bias, discrimination, and the potential infringement on fundamental rights. Additionally, the study explores the legal implications of AI-based migration policies, emphasizing the necessity for regulatory safeguards to ensure compliance with international human rights standards.

Furthermore, this research investigates the broader impact of AI on migration patterns, security frameworks, and States' obligations under international law. By addressing these key dimensions, the study contributes to the ongoing discourse on the responsible use of AI in migration governance, advocating for policies that balance technological innovation with ethical and legal imperatives.

AI at the Border: Balancing Security and Human Rights in Migration Governance

States have a legal obligation to prevent harm as well as the loss of life at sea, protecting migrants, refugees, and asylum seekers at international borders. Indeed, as confirmed by relevant case-law on this matter, there is no "human rights-free zones" and States

bear the responsibility to uphold fundamental rights regardless of an individual's status or vulnerability.

AI and emerging technologies are reshaping border management, offering tools for identity verification, migration trend analysis, and early warning systems. While AI can enhance migration governance, its misuse may reinforce discriminatory policies, enable mass surveillance, and contribute to human rights violations, including unlawful pushbacks and arbitrary detention with negative consequences on migrants and refugees' lives.

An implementation of AI that prioritizes transparency, accountability, and safeguards against bias ensures that humane and effective migration management can be ensured. Therefore, rather than individuals with vulnerabilities. This can be done for example through expanding safe, legal pathways, such as the case of the U.S.-Spain-Canada partnership in Latin America that effectively serves the objective of balancing security with human rights.

Since States practice and crises like COVID-19 have underscored both the potential and risks of AI in migration control, this study examines AI's role in border enforcement, its impact on asylum access, and related challenges such as disappearances, exploitation, and other transnational crimes such as trafficking in persons. It advocates for rights-based AI integration, alternatives to detention, and ethical return mechanisms that uphold human dignity. Ultimately, AI is hereby analyzed as instrumental to enhance border management while ensuring compliance with international legal obligations and the protection of fundamental rights.

Human Rights and Humanitarian Grounds for Entry

Beyond traditional entry visa categories (health, tourism, study, work), States may also grant admission to their territory based on human rights and humanitarian grounds. Among the reasons for admission, the principle of family unity is one ground and it is enshrined in the main human rights law instruments, such as the International Covenant on Civil and Political Rights (ICCPR) and the Convention on the Rights of the Child (CRC). Moreover, the principle of protection from harm provides another basis for entry into a State's territory. On this matter, relevant case law confirms that under certain circumstances, even non-nationals benefits from the right to remain in a country based on fundamental rights, such as safeguarding family life (ECHR). Consequently, as many migrants often do not meet the legal definition of "refugee" nor are entitled to international protection, and yet they face severe vulnerabilities related to climate displacement, economic hardship, or exposure to exploitation, violence and abuses, they are however not deprived from the safeguards of international standards.

Evidence shows that AI-powered systems are increasingly used by States to assess such vulnerabilities, identify at-risk individuals, and facilitate humanitarian protections. However, in most cases such methods are employed without human oversight, so that it becomes challenging to determine whether these technologies are effectively deployed while ensuring necessary safeguards to prevent discrimination, bias, and avoid wrongful rejections of individuals in need at the border.

In this regard, it is worth nothing that the Global Compact for Migration (GCM) highlights the importance for a rights-based approach to migration, advocating for expanded humanitarian pathways, whereby AI can support such avenues by streamlining case evaluations and enhancing border management in compliance with international standards and obligations. However, without an ethical human oversight, AI risks reinforcing exclusionary policies and undermining protections, potentially leaving many individuals in a legal void, especially those not meeting requirements to be considered as refugees or trafficking in persons victims under international law.

State practice is emblematic on this point, for example in Argentina, Brazil, Portugal, Germany, it clearly demonstrates that humanitarian considerations can justify a temporary residence, which may later lead to permanent status to safely reside in country, like in the case of Canada. In this context, AI-driven tools can assist in evaluating eligibility for such types of protection, but human oversight remains crucial to prevent unjust expulsion from the territory or limited access to essential rights by individuals in need. As technology shapes migration governance, States are progressively testing methods and tools to align with human rights principles to ensure fair, transparent, and non-discriminatory decision-making at borders, highlighting the opportunities and risks of integrating AI in border management, that are hereby illustrated.

AI in Border Management: Opportunities and Risks

The increasing adoption of AI in border management has transformed migration governance, offering enhanced security and efficiency. AI-powered systems streamline identity verification, predict migration trends, and automate decision-making in visa processing and removals. However, these advancements also pose significant risks, including privacy violations, biased decisionmaking, and potential human rights infringements. This section examines key AI applications in border control, highlighting both their benefits and the ethical and legal challenges they present.

AI technologies are increasingly deployed at borders, serving a variety of functions that range from identity verification to predictive modeling of migration trends, including: (1) automated border control systems, (2) predictive analytics, (3) AI-powered surveillance, (4) automated visa processing and other administrative tools for decision making. While these tools can enhance efficiency and security, they also pose significant risks if not implemented with adequate safeguards that are here exposed.

The Automated Border Control (ABC) Systems leverage AIdriven biometric authentication (such as

facial recognition and fingerprint scanning) to expedite traveler processing. While these systems improve efficiency, concerns regarding privacy infringements, data security, and potential racial or ethnic bias remain prevalent. On the other hand, Predictive Analytics employs AI algorithms to analyze historical migration data, forecasting migration trends and potential security threats.35 While these insights support policy decision-making, reliance on flawed or biased datasets may reinforce systemic discrimination and lead to inaccuracies in risk assessments.

AI-Powered Surveillance has also seen a significant rise, with AI-equipped drones, cameras, and motion sensors increasingly deployed to monitor border crossings.36 While these technologies enhance detection capabilities, they also raise concerns about mass surveillance, data misuse, and potential violations of privacy rights.

The Automated Visa Processing aims to reduce administrative burdens by utilizing AI-driven systems for visa and asylum application assessments. However, opaque algorithmic decision-

making processes risk unjust denials, depriving migrants and asylum seekers of due process and effective judicial remedies. For example, expulsion algorithms assist authorities in identifying individuals for removal based on predictive profiling. However, without human oversight, they may be prone to errors. In this sense, the lack of transparency in these systems heightens the risk of wrongful removals with negative impact on individuals' lives and safety, and raising serious concerns regarding accountability and compliance with human rights standards.

Against this backdrop, to mitigate these risks, AI-driven migration policies adopted by States can be more effective and rights-based if they are subject to rigorous oversight, including independent audits, transparent decision-making processes, and strict adherence to international human rights frameworks. Therefore, ensuring accountability in AI deployment is essential to balancing security with fundamental rights and ethical governance in migration management.

AI, Border Controls and the Ethics of Migration Management States have the sovereign authority to regulate entry and presence within their borders, but this power is constrained by international human rights obligations, particularly the principle of nonrefoulement, which prohibits returning individuals to countries where they may face persecution or harm. The integration of AI in border surveillance and entry control is fundamentally transforming migration governance, introducing sophisticated monitoring systems that raise profound ethical and legal concerns. AI-driven border surveillance relies on biometric identification, facial recognition, and real-time data analysis to track and monitor individuals crossing borders. Advanced AI-powered cameras, drones, and motion sensors enable authorities to conduct continuous surveillance, drastically increasing their capacity to detect unauthorized movements and entry across borders. While these technologies enhance security and operational efficiency, they also expand the scope of mass surveillance, raising concerns about privacy violations, data misuse, and the disproportionate targeting of certain groups. In many cases, the deployment of AI surveillance systems lacks sufficient oversight, leading to potential abuses, such as arbitrary detention, racial profiling, and unlawful pushbacks.

In parallel, AI is increasingly being used to automate entry control mechanisms through predictive analytics, risk assessments, and automated visa and asylum processing. Predictive models analyze vast datasets to forecast migration patterns and assess potential security threats. However, these systems often rely on historically biased or incomplete data, reinforcing discriminatory migration policies and flagging individuals from specific nationalities or ethnic groups as high- risk. While intended to streamline bureaucratic procedures, automated visa and asylum processing systems suffer from opaque decision-making processes that can result in unjust denials, depriving individuals of due process and effective judicial remedies. Consequently, AI-driven entry control mechanisms further exacerbate concerns about excessive exclusion, wrongful removals, and violations of the right to seek asylum, particularly when decisions are made without meaningful human oversight.

Hence, the widespread adoption of AI in border surveillance and entry control underscores the need for robust regulatory frameworks, transparency, and accountability mechanisms. Without stringent safeguards, AI-driven migration governance risks transforming border control into a system of automated exclusion, prioritizing security over fundamental rights. Under these conditions, an ethical AI deployment would thus mean ensuring that technological advancements enhance border management, though without compromising privacy, fairness, or human dignity. This goal and the prevention of human rights violations can be achieved provided that States establish independent oversight bodies, enforce transparency in AI decision-making, and align migration policies with international legal standards.

Navigating Maritime Pushbacks, Extradition Risks and Immigration Detention in the Age of Algorithmic Governance The use of AI in border control is rapidly expanding, including in maritime migration management, where pushbacks at sea also pose serious legal and ethical challenges. While States maintain sovereignty over their borders also in the context of the sea, their obligations under extraterritorial jurisdiction require them to uphold human rights beyond their territorial waters. However, AI- powered surveillance, including drones, satellite tracking, and automated vessel identification systems, enables authorities to detect and intercept migrants before they reach the territorial waters and access a place of safety, often leading to practices that violate the principle of non-refoulement and other applicable international standards, particularly the duty to render assistance to vessels and persons in distress at sea. This is a fundamental principle of law of the sea enshrined in article 98 United Nations Convention on the Law of the Sea (UNCLOS). On this point, the 2012 Hirsi Jamaa v. Italy case before the European Court of Human Rights (ECtHR) established that States remain responsible for individuals intercepted outside their territorial waters. Despite this decision's orientation, AI-driven border control has facilitated pushbacks that compromise asylum seekers'opportunity to claim for protection, thus effectively outsourcing border enforcement while evading legal accountability. Furthermore, States may increasingly rely on AI-driven risk assessments and automated alerts to justify inaction in responding to distress signals at sea, further undermining international obligations to rescue those in peril.

Beyond maritime borders, AI is also reshaping extradition and removal processes, raising critical concerns about human rights protections. The Soering v. United Kingdom ruling by the ECtHR established that extradition can be prohibited if it exposes individuals to inhumane treatment or risks of persecution. Yet, AI-driven legal decision-making tools are now being employed to assess deportation risks, predict potential persecution upon return, and automate removal orders. These systems, if not subject to rigorous oversight, risk disregarding individual circumstances and violating fundamental rights, including the right to private and family life under Article 8 of the European Convention on Human Rights (ECHR). Automated assessments may fail to consider humanitarian exemptions, medical needs, or social integration factors, leading to wrongful decisions of expulsion and removals. The opaque nature of AI decision-making further exacerbates concerns about accountability and due process, as migrants and refugees may be denied meaningful recourse to challenge adverse decisions.

Another pressing issue in AI-driven migration control is the expansion of immigration administrative detention, often used by arrival States to manage individuals (whether migrants or refugees) deemed to be present in country in irregular status. Unlike criminal detention, which is based on punitive measures, immigration detention primarily serves an administrative function for border management.

However, legal safeguards in practice remain weak, and States frequently apply detention arbitrarily, without proper consideration of an individual's circumstances. Under international law, detention must be a last resort, and alternatives should always be explored first. The United Nations High Commissioner for Refugees (UNHCR) and the Inter-American Court of Human Rights emphasize that detention deprives individuals of liberty and should never be applied indiscriminately. The ICCPR further mandates that deprivation of liberty is applied as reasonable, necessary, and proportionate measure, underscoring the need for case-by-case assessments rather than blanket detention policies.

AI presents both opportunities and risks in alternatives to immigration detention. Electronic monitoring systems powered by AI can track individuals' compliance with immigration requirements, potentially reducing reliance on physical detention facilities. However, human rights organizations caution that these measures can still amount to deprivation of liberty, particularly if they impose excessive restrictions on movement. AI can also enhance communitybased case management programs, improving efficiency in legal assistance, social services, and compliance monitoring. In fact, studies indicate that migrants who receive case-by-case support rather than detention are more likely to comply with immigration procedures, proving that non-custodial alternatives can be both humane and effective. Furthermore, AI-powered risk assessment tools are increasingly used to determine flight risk and public safety concerns. While these tools may improve efficiency, their reliance on historical data and algorithmic predictions still raises concerns about bias, transparency, and fairness. Like for migration management at large, the automation of detention decisions, without proper human oversight, may lead to unjustified punitive measures and exacerbate existing inequalities in migration enforcement.

At an international level, the rapid deployment of AI in migration governance has sparked intense debates on human rights implications. Organizations such as Amnesty International have documented how AI-driven border control can deepen inequalities and facilitate the exclusion of vulnerable populations. The absence of regulatory safeguards and independent oversight mechanisms increases the risk that AI can be used as a tool for automated exclusion rather than a mechanism for protection. Instead, AI-driven migration management guided by principles of transparency, human oversight, and legal accountability might be an effective tool to prevent the erosion of fundamental rights. To this end, States could implement independent audits, establish safeguards against algorithmic bias, and ensure that AI systems align with refugee and human rights law, particularly the obligations of non-refoulement and the right to seek asylum. Without these safeguards, AI risks becoming an instrument for systemic discrimination, undermining the very principles of justice and due process that compelling migration governance seeks to uphold.

Automating Asylum: The Promise and Peril of AI-Driven Refugee Protection

Refugees fleeing persecution often cross borders irregularly, lacking visas or other immigration documentation. Despite this, international law and the already mentioned principle of non- refoulement prohibit their rejection at borders if they face serious harm and persecution upon return. However, access to asylum varies significantly across States and jurisdictions, and the growing reliance on AI-driven tools in migration management presents both opportunities and ethical dilemmas.

AI-powered screening systems are increasingly employed to identify asylum seekers, assess risks, and streamline application processing.

By analyzing vast datasets that utilize also travel patterns, biometric information, and case histories these tools aim to expedite decisionmaking and enhance efficiency. AI in this context presents the advantages of facilitating early identification of protection needs, automating legal assessments to reduce processing times, and strengthening border surveillance to combat trafficking in persons. However, despite these potential benefits, AI- driven asylum mechanisms raise critical concerns regarding bias, transparency, and the risk of wrongful denials. Automated risk assessment tools in such sensitive area may reinforce discriminatory patterns, misinterpret cultural and linguistic nuances, and exclude genuine asylum seekers due to flawed algorithms. Like in the case of migration management as a whole, without proper safeguards, AI could become a mechanism of exclusion rather than enhancing protection. The challenge is further compounded by States' discretionary power over humanitarian visas. As demonstrated in M.N. and Others v. Belgium before the ECtHR, governments can legally deny visa applications even when humanitarian grounds are evident, leaving asylum seekers with no safe alternatives, and forcing them onto perilous migration routes. Indeed, AI-driven border surveillance may exacerbate this situation by identifying and preventing unauthorized entries, effectively restricting access to asylum rather than facilitating protection.

Considering this situation, to ensure that AI strengthens rather than undermines refugee protection, strict safeguards need to be in place. In this way it is possible to ensure that AI-generated decisions remain transparent and subject to human oversight to prevent opaque and unjust rejections. Bias mitigation strategies could enhance the use of data reflecting diverse asylum cases, thus avoiding discriminatory patterns. Additionally, robust accountability mechanisms attached to the asylum system facilitate a legal oversight and appeals in cases where AI decisions affect and negatively impact fundamental rights of the concerned individuals.

While AI has the potential to enhance asylum procedures, its effectiveness is contingent upon being aligned with human rights principles. Without ethical implementation and regulatory oversight, AI risks becoming an instrument of exclusion, reinforcing border securitization at the expense of the right to seek for international protection.

Safeguarding the Right to Return in AI-Driven Migration Systems Similar to the right to seek international protection from persecution, the right to return, enshrined in Article 12(4) of the ICCPR, could be swayed if resorting to the use of AI-tools and methods. This right guarantees individuals the ability to re-enter their country based on nationality or other substantial ties, including whether the individuals benefits from long-term residency, being applicable also in cases of statelessness. In contemporary migration governance, AI-driven systems are increasingly influencing return processes, from border surveillance and biometric tracking to risk assessments and digitalized readmission case management. While these technologies aim to streamline migration management, they raise significant ethical and legal concerns.

AI systems used in return procedures risk perpetuating biases, reinforcing discriminatory policies, and making opaque decisions that lack due process. Automated risk assessments may categorize individuals based on flawed or incomplete datasets, leading to wrongful removals from a State in violation of non-refoulement obligations and other duties to protect. Furthermore, the reliance on AI in migration enforcement can reduce human oversight, making it difficult for returnees to challenge decisions that impact their fundamental rights.

As States and international organizations integrate AI into migration control, it is crucial to ensure that return policies remain rights-based. Transparency, accountability, and safeguards against bias are also safeguards to be embedded in AI systems to prevent exacerbating vulnerabilities. In this sense, an ethical AI implementation prioritizes the dignity and agency of returnees, ensuring that technological advancements do not undermine human rights but rather contribute to fair and just migration processes.

Conclusion

As migration dynamics evolve in the age of advanced technologies, AI stands at the intersection of security, efficiency, and human rights within border management. This study underscores the critical role AI plays in shaping modern migration governance, offering potential solutions for enhancing border security and streamlining administrative processes. However, the implementation of AI-driven systems also introduces profound ethical, legal, and humanitarian challenges that require urgent attention.

In the pursuit of technological progress, a steadfast commitment to the preservation of fundamental human rights is required. Migration is inherently a human experience, and the use of AI in managing migration movements cannot be separated from the principles of dignity, fairness, and transparency. As demonstrated throughout this study, the unregulated or unchecked application of AI in border control systems can exacerbate existing inequalities, leading to discriminatory outcomes, breaches of privacy, and violations of migrants and refugees' rights. Therefore, a rights- based approach is not only a legal imperative but also a moral one. AI systems can serve this goal if designed and deployed in a manner that enhances, rather than undermines, due process, privacy protections, and access to justice.

The integration of AI into migration management requires to be accompanied by robust governance frameworks that prioritize oversight, accountability, and transparency. This includes ensuring that AI technologies are regularly assessed for bias, accuracy, and fairness, and that migrant populations are provided with avenues for recourse in cases of wrongful rejections or detention. In this context, international and domestic legal frameworks are constantly evolving to address the challenges posed by AI, ensuring that these technologies align with international human rights standards, including the principle of non-refoulement and the right to seek for international protection from persecution.

Moreover, while AI presents opportunities for greater efficiency and enhanced decision-making, States are faced with the concrete risk to overshadow the need for human empathy and discretion in migration processes. Indeed, border control systems driven by algorithms cannot replace the nuanced understanding of migration's complex and multifaceted nature, which can only be provided by human intelligence. Therefore, there is an urgent need for an inclusive approach that incorporates both technological advancements and human rights considerations, ensuring that the protection of migrants and refugees is safeguarded within these rapidly evolving systems.

As States continue to refine their migration policies and AI technologies, it is imperative that they do so with the utmost respect for the human dignity of all migrants and refugees. By embedding human rights safeguards within AI-driven border management, it is possible to strike a balance between security and justice, ensuring that AI serves as a tool for humane, effective, and rights- based migration governance. This study, therefore, calls for an international consensus on the ethical use of AI in

migration governance, advocating for policy frameworks that align technological innovation with human rights obligations. In this way, AI can become a force for good, upholding both the security of States and the rights of migrants in a rapidly changing world [1-33].

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