

## ***AI-Based Fraud Detection: Social Security in the Era of Society 5.0***

### ***Detecção de Fraudes com IA: Previdência Social na Era da Sociedade 5.0***

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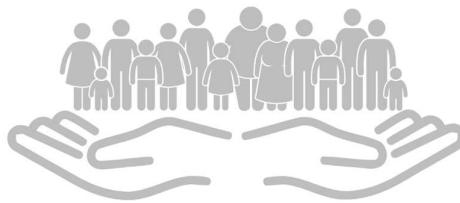
**ABSTRACT:** This article examines the transformation of Brazilian Social Security by Artificial Intelligence (AI) within the Society 5.0 paradigm. It discusses AI's potential to optimize public administration and strengthen social protection, with a particular focus on its effectiveness in detecting social security fraud, aiming to protect public funds and safeguard beneficiaries' dignity. Concurrently, the study explores the ethical and legal challenges inherent in this technological implementation, including data privacy and security, mitigating algorithmic bias, and the crucial need for accountability and human oversight of automated decisions. It concludes that the strategic adoption of AI represents a promising path towards more efficient and transparent public management, provided it is guided by principles of justice, equity, and respect for fundamental rights, thus paving the way for a truly inclusive Society 5.0.

**KEYWORDS:** Artificial Intelligence; Social Security; Fraud Detection; Society 5.0.

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**RESUMO:** Este artigo examina os impactos da Inteligência Artificial (IA) no âmbito da Previdência Social, especialmente no que se refere a implicações da utilização desta tecnologia na detecção de fraudes previdenciárias. Nele, discute-se o potencial da IA para otimizar a gestão pública e fortalecer a proteção social, com particular enfoque na sua eficácia para a detecção de fraudes previdenciárias, visando à proteção do erário e à salvaguarda da dignidade dos beneficiários. Paralelamente, o estudo explora os desafios éticos e jurídicos inerentes a essa implementação tecnológica, abordando a privacidade e segurança dos dados, a mitigação de vieses algorítmicos, e a crucial necessidade de responsabilidade e revisão humana das decisões automatizadas. Conclui-se que a adoção estratégica da IA representa um caminho promissor para uma gestão pública mais eficiente e transparente, desde que orientada por princípios de justiça, equidade e respeito aos direitos fundamentais, pavimentando o caminho para uma Sociedade 5.0 verdadeiramente inclusiva.

**PALAVRAS-CHAVE:** Inteligência Artificial; Previdência Social; Detecção de Fraudes; Sociedade 5.0.

## 1 INTRODUCTION

Brazilian Social Security, a foundational component of the national social protection framework, faces multifaceted structural challenges, including rising benefit demands, shifting demographics, and the imperative of long-term sustainability. In response, Artificial Intelligence (AI) and associated technologies, such as Big Data and Blockchain, are positioned as essential tools for enhancing administrative efficiency and legal security. The Society 5.0 paradigm promotes the integration of human expertise with the analytical power of intelligent systems, thereby optimizing processes and reallocating human resources to more complex cognitive tasks.

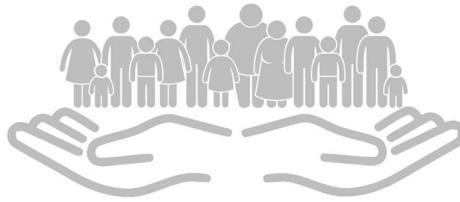
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In this sense, Artificial Intelligence (AI), a field of computer science dedicated to emulating human intelligence, operates through a binary system to interpret, organize, and give meaning to extensive datasets. However, its definition is multifaceted and evolves in parallel with technological advances, already integrated into daily life. Thus, AI can be understood both as a technological tool and as a domain of scientific investigation (Vicente; Flores, 2021).

AI, as a cutting-edge digital technology, has the capacity to profoundly reshape existence and social structure, impacting individual well-being, equitable economic development, sustainability, and the safeguarding of rights and freedoms. Its algorithms, the operational substrate of every AI system, assume a central role with increasing penetration in the social, economic, political, and cultural spheres, shaping perspectives and actions (García-Orosa; Canavilhas; Vázquez-Herrero, 2023). In Brazil, this integration of AI is notable, with its application becoming increasingly central to decision-making in various sectors, including Law, where it already assists in digital investigations to identify and categorize vast volumes of data (Sarlet, 2024).

Given AI's transformative role in Society 5.0, this research is motivated by its substantial potential to optimize processes and enhance the integrity of complex systems, such as Social Security. The study examines the application of AI in detecting social security fraud, a persistent issue that undermines the system's financial sustainability and equity. It is essential to critically assess the ethical dilemmas associated with this technology to ensure that its implementation fosters an inclusive Society 5.0, where citizens' rights are safeguarded, and equitable access to social protection is maintained, thereby preventing the deepening of existing inequalities or the emergence of new forms of exclusion.

Accordingly, this article analyzes both the potential and the ethical dilemmas associated with implementing AI for fraud detection in the Social Security system. The analysis is framed by the Society 5.0 paradigm, which seeks to integrate advanced technologies to enhance human

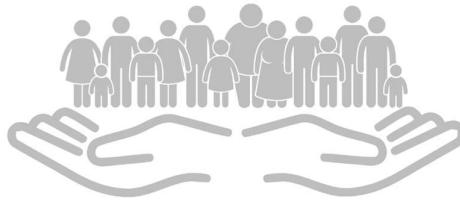
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well-being and address societal challenges. The study explores opportunities to optimize fraud detection, ethical concerns related to bias, transparency, and privacy, and the implications for the governance and regulation of AI. Methodologically, the research is structured as a literature review, drawing on bibliographic and documentary sources, including articles published between 2000 and 2025, as well as data from databases such as SciELO and Google Scholar.

## 2 SOCIAL SECURITY IN BRAZIL: FOUNDATIONS AND STRUCTURAL CHALLENGES

### 2.1 Concept and Importance of Social Security as a Protection System

The 1988 Federal Constitution enshrined an essential set of social rights, including health, social security, and social assistance (Article 6), recognizing the vulnerability inherent in the human condition at certain stages of life. In essence, these rights represent the State's commitment to support citizens and their dependents during times of vulnerability. Their primary purpose is to provide economic and social security in contingency situations, such as work incapacity, old age, involuntary unemployment, family responsibilities, or the loss of the provider due to imprisonment or death, guaranteeing a dignified existence and protecting the individual from the risk of abandonment (Monteiro, 2024).

The Brazilian Social Security System, established in Title VIII of the 1988 Fundamental Law, Chapter II, and specifically in Article 194, constitutes an integrated set of actions to ensure rights related to health, social security, and social assistance. According to Dorneles (2023), social security financing is based on social contributions, taxes, and other sources of revenue. The central purpose of this financial arrangement transcends mere operationalization; it lies in promoting social justice, mitigating socioeconomic inequalities, and guaranteeing a robust social protection network that supports the entire population in moments of vulnerability.

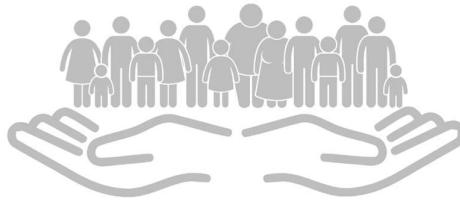
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Although social security, in its legal architecture, comprises three distinct pillars – health, social assistance, and social security – for the purposes of this analysis, the investigative scope is limited exclusively to Social Security. In this context, Camaro and Fernandes (2016) define it as a mandatory membership insurance policy, whose purpose is to provide individual or family support in the face of events beyond human control, such as death, illness, disability, and unemployment, mitigating helplessness through financial and welfare support.

## 2.2 Structures and Principles of the Brazilian Social Security System

The Brazilian Social Security System, outlined by the 1988 Federal Constitution, is a complex arrangement that combines different models of social protection. Although the universality of coverage and service is a guiding principle of social security, Social Security differs from health and social assistance programs in requiring prior funding. This characteristic, essential for its sustainability and reinforced by Constitutional Amendment No. 20/1998, restricts social security protection to contributors and their dependents.

This legal structure, however, harmonizes the contributory model — applied to urban social security, where benefits depend on contributions — with universalism for rural health and social security, and selectivity for social assistance. The distinction favoring rural workers is justified by their particular labor characteristics, such as the arduous nature of their work and their role in food security, aligning with international subsidy trends (Schwarzer, 2000). In short, the principle of contributory funding structures Brazilian Social Security, with the notable exception of special insured persons, whose right is based on the social relevance of their activity and on the fundamental principles of Social Security (Rangel, 2009).

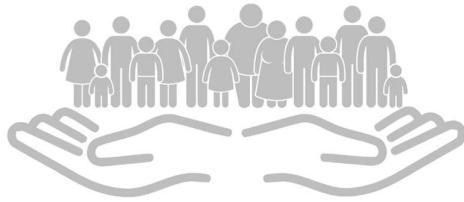
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## 2.3 The Challenge of Fraud and its Impact on the Sustainability of Social Security

The analysis of the vulnerabilities of the Brazilian social security system is an issue of undeniable social relevance, widely debated in the literature. The system's weaknesses, such as insufficient controls and difficulties in detecting fraud, create an environment conducive to the practice of social security crimes, harming both beneficiaries and society as a whole.

The fraudulent obtaining of benefits and the falsification of documents cause significant harm to the community, eroding the sustainability and trust in the social protection system. In this scenario, effective action by oversight bodies and the implementation of robust prevention policies to combat these criminal practices become imperative. The integrity of Social Security, therefore, has a direct impact on social justice and the safety of millions of Brazilians, justifying the investigation of innovative tools, such as Artificial Intelligence, to strengthen fraud detection and protect the future of the system (Domingues, 2023).

The adoption of advanced technologies, such as data analysis, is an essential step in modernizing Social Security and aligns with the ideals of the 5.0 Revolution, which seeks to optimize complex processes through artificial intelligence. In combating social security fraud, these tools open a window into vast datasets, revealing patterns that would otherwise escape the human eye. This enhanced detection capacity not only safeguards the system's resources, ensuring its vitality for the future, but also paves the way for a more equitable society, a central aspiration of Society 5.0. Therefore, the following chapters will be dedicated to unraveling the contours of Artificial Intelligence and its influence on the digital transformation of Social Security, laying the groundwork for the subsequent analysis of the promises and ethical challenges inherent in its application to fraud detection.

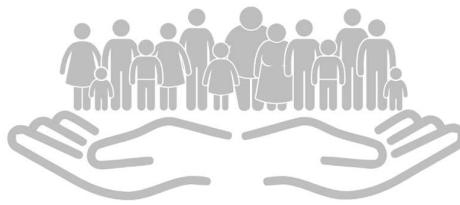
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### 3 ARTIFICIAL INTELLIGENCE AND SOCIETY 5.0 IN PUBLIC MANAGEMENT

Technological advancements are reshaping all aspects of society, including Public Administration. The current digital landscape, propelled by Artificial Intelligence (AI), presents significant opportunities to strengthen the relationship between the State and citizens. Nevertheless, it also raises valid concerns regarding the effects of automation within the public sector. Against this backdrop of ongoing change and the imperative to optimize public services, this section examines the emergence of AI and its contribution to the development of Society 5.0, highlighting the evolving paradigm of public management.

#### 3.1 Society 5.0: Connecting Technology and Human Purpose

Following the examination of Social Security's foundational elements and structural challenges, attention shifts to the transformative influence of Artificial Intelligence (AI) within the context of Society 5.0. This phase represents both a conceptual and practical progression from Industry 4.0, which emphasized automation and connectivity via cyber-physical systems. Society 5.0 advances this trajectory by fostering collaboration between humans and intelligent machines to address complex social issues and enhance both individual and collective well-being. In this framework, AI extends human capabilities, facilitating the development of more adaptable, resilient, and personalized environments where technology serves humanitarian objectives (Kappes, 2023).

In this context of technological advancement, integrating Artificial Intelligence (AI) with the interests of legal professionals, particularly in Social Security, requires careful consideration of algorithmic morality. Adherence to stringent ethical standards throughout all stages of AI development and implementation in the legal-social security domain is essential. Such diligence

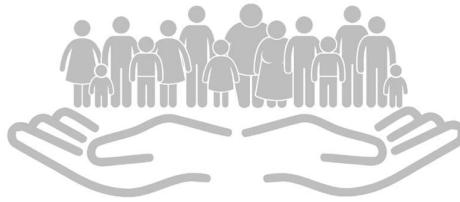
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is required to prevent or mitigate adverse effects and risks, thereby ensuring that technological innovation upholds the principles of justice and equity that are fundamental to social protection.

### 3.2 Artificial Intelligence as an Instrument of Efficiency in Public Management

Artificial Intelligence (AI), as a constantly evolving set of technologies, emerges as the main driver of digital transformation in public administration, aligning directly with the purposes of Society 5.0. Its essence lies in its ability to process, analyze, and infer knowledge from vast, complex volumes of data, attributes that fundamentally distinguish it from traditional automation. This ability to extract intelligence from heterogeneous information enables AI to optimize processes, identify patterns, and support decision-making in ways and on scales unattainable by human cognition.

In this context, the principle of efficiency, fundamental to the State's actions, assumes a prominent role. The activities of public authorities, particularly in social policies such as Social Security, aim to ensure efficiency and the effectiveness of fundamental rights and the dignity of the human person. In this context, efficient administrative action is an essential instrument for the realization of the fundamental right to development, as proposed by Bresser-Pereira (2008).

Given this scenario, the intersection with technology is evident: new tools such as AI enhance administrative performance, elevating it to excellence. This combination of technology and efficiency not only reduces bureaucracy in services, increases transparency, and ensures greater agility and equity in access to social rights, but also consolidates the intelligent governance already underway in the Brazilian context. Several government initiatives incorporate AI to modernize their services and better align them with the needs of the

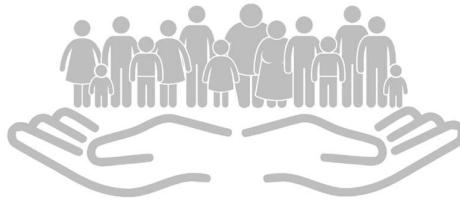
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population, demonstrating a clear trend and the transformative potential of this synergy (SAVÉRIO, 2003).

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The capabilities inherent to Artificial Intelligence, which align with the objectives of Society 5.0 to enhance human well-being, introduce a range of complex ethical opportunities and challenges. These considerations are particularly salient when applying AI to fraud detection within Social Security. While the technology offers significant potential to identify patterns and anomalies in large datasets and thereby protect system integrity, it is equally important to address critical concerns such as algorithmic bias, transparency in decision-making, and the protection of individual rights.

#### 4 THE ETHICAL CHALLENGES OF ARTIFICIAL INTELLIGENCE IN DETECTING SOCIAL SECURITY FRAUD

Recognizing the transformative potential of Artificial Intelligence (AI) and the novel perspective introduced by Society 5.0 in public management, it is essential to examine the complex ethical and legal challenges arising from its implementation in Social Security. While the adoption of intelligent systems offers significant promise for process optimization and system integrity, particularly in fraud detection, it also necessitates careful consideration of the

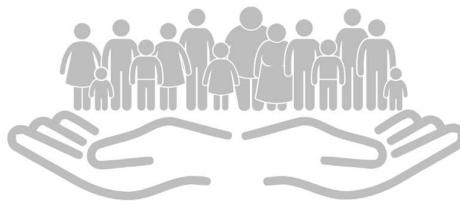
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boundaries of automation, the protection of fundamental rights, and the preservation of human dignity. The current context requires legal frameworks to anticipate and mitigate the risks associated with these technologies, ensuring that innovation remains aligned with the principles of justice and equity central to social protection.

The integrity of the Brazilian social security system, a crucial pillar of social protection, is frequently weakened by vulnerabilities that culminate in illicit acts. This problem has been widely recognized and dissected in the national legal literature, which points to gaps in controls and the difficulty in identifying fraud as a catalyst for social security crimes. Such crimes, by diverting vital resources, not only harm legitimate beneficiaries and tarnish the hope of support in moments of greatest human fragility, but also impose a substantial burden on the community.

The fraudulent obtaining of benefits and document forgery represent a scourge that urgently requires incisive oversight and the development of robust preventive policies. It is in this context of urgency and the search for safeguards that Artificial Intelligence, although promising, demands an in-depth analysis of its inherent ethical challenges when applied to Social Security.

#### 4.1 Privacy and Data Security: The Legal Imperative and Cyber Vulnerability

Despite the promising opportunities digitalization offers for Social Security, its implementation, especially with Artificial Intelligence, entails substantial risks to beneficiaries' data privacy and security, requiring proactive vigilance and mitigation. The massive collection of information, while optimizing fraud detection, can lead to excessive monitoring and open the door to cyber threats such as phishing and malware, requiring continually renewed security strategies. Furthermore, the inappropriate use of data and the potential for algorithmic biases require transparency, explicit consent, and rigorous privacy protocols, such as encryption. Only

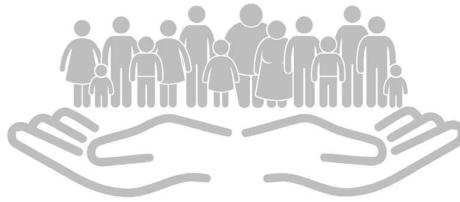
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in this way will technology serve justice and human dignity without becoming a source of vulnerability for citizens (Tavares, 2025).

In this digital transformation, information security transcends the technical dimension and becomes an ethical and legal imperative. To safeguard data integrity and public trust in the system, the following are fundamental: implementing cyber incident response plans, collaborating with external experts, and adhering to data protection regulations. Furthermore, regular evaluation of the technological infrastructure and continuous software updates are indispensable for correcting vulnerabilities. In the interconnected web of Society 5.0, protecting individual privacy requires robust, informed consent mechanisms that guarantee citizens' autonomy over their data and the full exercise of informational self-determination.

#### 4.2. Algorithmic Biases and the Challenge of Indirect Discrimination

The complexity of Artificial Intelligence (AI) systems, especially in machine learning, introduces the delicate problem of algorithmic biases. These biases can arise from the selection of training data that, by their nature, carry historical inequalities, or from flaws in the algorithm design, resulting in the perpetuation or amplification of veiled discriminations (Lopes, 2023).

In the context of Social Security, the application of biased algorithms represents a substantial risk to equality and the dignity of the human person, fundamental principles of Social Law. Such systems can inadvertently deny access to benefits and violate fundamental rights. The opacity of these decision-making processes, the algorithmic "black box," exacerbates the risk by hindering the auditing and contesting of decisions.

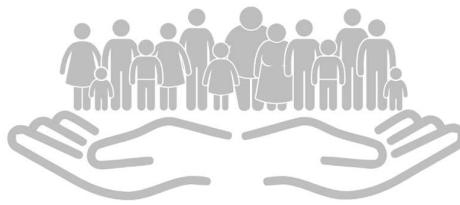
To ensure that AI advances justice and social inclusion rather than perpetuating exclusion, it is essential to prioritize equity in both system design and data selection. Achieving this objective necessitates regular ethical audits and ongoing model validation by

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multidisciplinary teams. The increasing autonomy of AI in decision-making raises complex questions about responsibility and accountability. Therefore, the right to human review of high-impact automated decisions is indispensable, ensuring that algorithmic efficiency does not compromise due process or the primacy of fair decision-making. The respective technological transformations are reflected in the public sector, demanding robust governance, clear regulatory frameworks, and the appreciation of human skills that complement automation. Ensuring that AI serves justice and inclusion is the essential premise for understanding how this technology, as an ally of public administration, can be effectively employed to benefit society.

## 5 ARTIFICIAL INTELLIGENCE: OPPORTUNITIES AND PERSPECTIVES FOR SOCIAL SECURITY

### 5.1 AI and Big Data in the Detection and Prevention of Social Security Fraud: Tools and Applications

Despite ethical and operational challenges, Artificial Intelligence (AI) represents a strategic and indispensable tool for improving Social Security management, infusing greater efficiency and security into the fight against fraud. The effectiveness of AI is fundamentally driven by its ability to process and analyze substantial volumes of data, known as Big Data, continuously generated by digital initiatives such as Meu INSS and INSS Digital.

The digitization of services, as exemplified by platforms such as Meu INSS, demonstrates the potential of technology to reduce bureaucracy in accessing social security rights and, consequently, to organize information into a valuable dataset for analysis and the detection of irregularities. The INSS Digital project complements this transformation, focusing on the complete digitization of documents and processes. This not only results in significant gains in agility in the service and processing of benefits, but also expands the available database, creating a more traceable and rich environment for oversight.

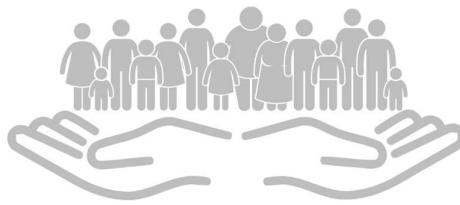
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The analysis of social security Big Data, orchestrated by Artificial Intelligence, offers multifaceted benefits, especially regarding the integrity of the system. By processing these large volumes of data, AI identifies anomalous patterns and suspicious behaviors indicative of fraud, ensuring proactive protection of the social security system's resources. This occurs because AI can correlate complex and voluminous information that human analysis would not capture, revealing fraud networks and deviations much more effectively. Additionally, AI's predictive capabilities, powered by Big Data, enable it to forecast vulnerability trends and identify the areas most susceptible to fraud using historical and real-time data.

To optimize fraud detection and prevention, AI uses specific algorithms to analyze pension Big Data. Among these, Machine Learning and Deep Learning stand out.

Machine Learning, a subfield of Artificial Intelligence, enables systems to learn autonomously from data, identify patterns, and support decision-making. This capability, which transcends human analysis, is crucial for agile, scalable detection of irregularities and for protecting the integrity of pension resources. In the context of fraud prevention, this unfolds into algorithms trained on historical data that recognize risk profiles in new applications or identify atypical anomalies that may indicate new types of fraud (Da Costa, 2023).

Additionally, Deep Learning, a subfield of Machine Learning, processes large volumes of data using multilayer neural networks to achieve accurate classifications (Alzubadi et al., 2021). This approach enhances the analysis of complex data and unstructured information, increasing the accuracy in detecting sophisticated fraud. Furthermore, Natural Language Processing (NLP), another branch of AI, allows systems to understand and analyze the textual content of documents (requests, reports), identifying inconsistencies or linguistic patterns that may signal irregularities.

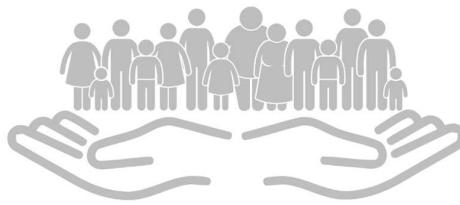
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This enables public administration to allocate oversight resources strategically, acting preventively and with greater focus. Finally, by enabling faster, more accurate fraud identification, AI directly contributes to the recovery of misappropriated funds and to the optimization of resource allocation, strengthening the system's solvency and ensuring that the benefits reach the citizens entitled to them.

## 5.2 Application Scenarios and Best Practices: National and International Perspectives

Digital transformation in Social Security transcends national borders, with several countries already implementing advanced technologies to improve their social protection systems. These examples demonstrate the potential for efficiency, transparency, and security that the synergy between technology and public administration can generate.

Sweden, for example, stands out for its use of Big Data and Artificial Intelligence (AI) in its Social Security Agency, Försäkringskassan. There, data analysis identifies fraudulent patterns and predicts demand for benefits, while AI optimizes request processing, increasing administrative efficiency. Digital health platforms, such as Min Doktor, illustrate the system's interconnectivity, enabling online consultations and digital access to records, thereby facilitating more fluid and citizen-centered management (Tavares, 2025).

Finally, Denmark, known for its "Flexicurity" model, which balances labor market flexibility with robust social security, also adopts enabling technologies. The "NemID," a digital identity system, ensures secure access to public and private services, including social benefits. Furthermore, the Jobnet platform connects unemployed individuals with employers and support services, streamlining reintegration into the labor market and, consequently, the management of social security benefits (Tavares, 2025).

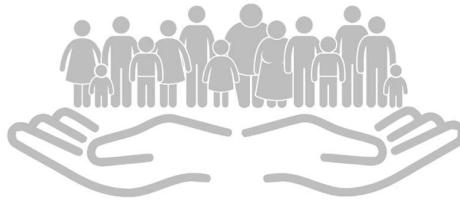
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These practical examples, both national (reaffirming Meu INSS and INSS Digital as crucial databases) and international, unequivocally demonstrate how technology can reshape social protection systems, making them more efficient, transparent, and accessible. The implementation of innovations such as Big Data, Artificial Intelligence, and digital platforms not only refines the administration and delivery of benefits but, crucially, ensures that public resources are directed with maximum effectiveness to those who truly depend on them, consolidating trust in the social security system.

### **5.3 Transparency, Trust, and Governance: The Enabling Role of Blockchain and the Construction of a Social Security Society 5.0**

The journey towards a more efficient and fraud-resilient Social Security system, driven by Artificial Intelligence, converges on strengthening transparency and consolidating citizen trust. AI, by its very nature, illuminates administrative processes: by optimizing and systematizing routines, it makes them inherently clearer and more traceable, raising accountability to a new level of objectivity. This operational clarity not only dispels the perception of bureaucratic slowness but also improves beneficiaries' access to information, reducing informational asymmetries and strengthening legal security.

In this context, Blockchain technology emerges as a pillar of reliability and legal integrity. It functions as a distributed and immutable digital ledger, where each transaction or social security data (contribution histories, eligibility records, benefit payments) is cryptographically sealed and validated by a decentralized network. This structure guarantees protection against fraud, prevents tampering or falsification, and promotes transparency across all processes. The immutability of records and decentralized auditability eliminate dependence on centralized intermediaries, strengthening accountability and citizens' trust in the integrity and fairness of

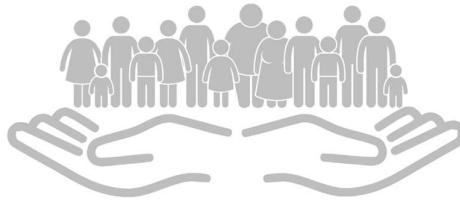
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the system, ensuring that social rights are managed with maximum fairness and respect for due process (De Filippi and Wright, 2018).

Furthermore, in contexts such as income transfer programs and social benefit payment systems, Blockchain possesses unique potential. Its architecture allows funds to reach recipients directly, eliminating unnecessary intermediaries. This inherent characteristic not only increases transparency at each stage of the financial flow but also directly reduces inequalities, ensuring that social assistance is delivered more effectively, integrally, and without diversion, strengthening citizens' trust in the effectiveness of public policies.

In short, the opportunities presented by Artificial Intelligence, anchored in Big Data and complemented by Blockchain, paint a promising picture for Social Security. Transparency in security practices and data management is not just a technical ideal; it is the foundation for inspiring unwavering trust among beneficiaries. It is therefore imperative to establish a culture of responsibility intrinsic to digital security, with accountability mechanisms that are not only clear but also auditable. Only in this way can Public Social Security consolidate itself as a robust, fair system fully aligned with the principles of an inclusive Society 5.0, where technology primarily serves the well-being and dignity of the citizen (Pedro, 2023).

## 6 FINAL CONSIDERATIONS

The research undertaken in this study analyzed the complex relationship between Brazilian Social Security and the emerging Artificial Intelligence (AI), envisioning a future aligned with the precepts of Society 5.0. The process demonstrated the structural challenges that historically have weakened the integrity of the social security system, while highlighting AI as a fundamental tool to improve public management and strengthen social protection.

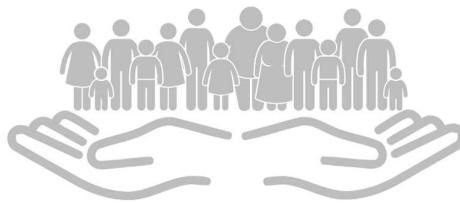
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It was found that the Public Administration cannot remain oblivious to the continuous digital transformation. Information systems, now integrated and enhanced by AI, represent a significant advance, promising not only the optimization of bureaucratic functions but also the construction of a more transparent State, where the management of data and resources translates into greater accountability and control over the manager's actions. This perspective contrasts with the traditional view, which often overvalues criminal law and judicialization as primary solutions to multifaceted problems such as fraud. It has been argued that such measures, while necessary, should be considered a last resort, since various experiences, including those abroad, demonstrate an unfavorable cost-benefit balance, with limited impact on retribution and effective crime prevention.

In this context, Artificial Intelligence emerges as an invaluable tool in detecting social security fraud, giving the Public Administration an unprecedented analytical and predictive capacity. The application of AI enables the identification of complex patterns, the anticipation of risks, and proactive action, minimizing resource misappropriation and protecting public funds. This technological advancement transcends mere operational efficiency; it reflects a commitment to the realization of fundamental rights, as safeguarding social security resources ensures the effectiveness of social support for its legitimate beneficiaries, strengthening human dignity.

In summary, this study affirms that the strategic deployment of Artificial Intelligence offers a promising approach to addressing vulnerabilities within Social Security, supporting Public Administration in achieving more efficient, transparent, and equitable management. Innovation is positioned as a catalyst for a modernized State that better serves its population. Nevertheless, such modernization must remain grounded in the principles of human dignity, fundamental rights, and the pursuit of a just and inclusive society.

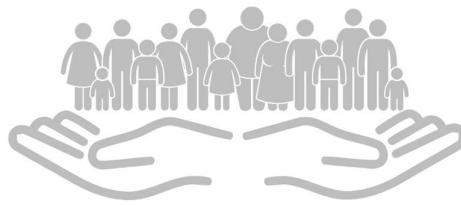
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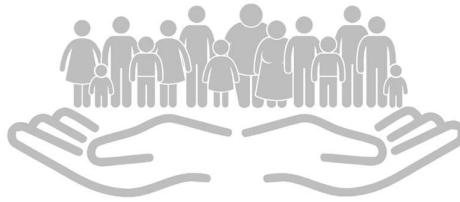
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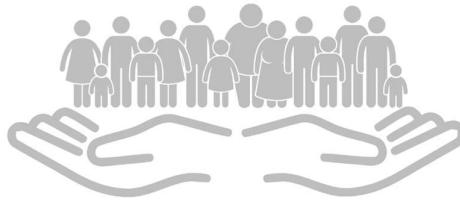
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