PUBLICAÇÃO 101

ISSN: 0101-9562
ISSN ELETRÔNICO: 2177-7055

SEQÜÊNCIA

Estudos jurídicos e políticos

Publicação do
Programa de Pós-Graduação em Direito da UFSC

VOLUME 46 ▪ ANO 2025

UFSC PPGD

SciELO

CAPES QUALIS A1

SEQÜÊNCIA – ESTUDOS JURÍDICOS E POLÍTICOS é uma publicação temática e de periodicidade quadrimestral, editada pelo Programa de Pós-Graduação Stricto Sensu em Direito da Universidade Federal de Santa Catarina – UFSC.

SEQÜÊNCIA – ESTUDOS JURÍDICOS E POLÍTICOS is a thematic publication, printed every four months, edited by the Program in law of the Federal University of Santa Catarina – UFSC.

Versão eletrônica: http://www.periodicos.ufsc.br/index.php/sequencia

Editora-Chefe: Norma Sueli Padilha

Editor Associado: José Sérgio da Silva Cristóvam

Editores Adjuntos: Priscilla Camargo Santos, Thanderson Pereira de Sousa

A publicação é indexada nas seguintes bases de dados e diretórios/
The Publication is indexed in the following databases and directories:

Base OJS
Base PKP
CCN (Catálogo Coletivo Nacional)
Dialnet
DOAJ (Directory of Open Access Journals)
EBSCOhost
Genamics Journalseek
Google Scholar
ICAP (Indexação Compartilhada de Artigos de Periódicos)
Latindex
LivRe!
ÖAW
OJS
PKP
Portal de Periódicos UFSC
Portal do SEER
ProQuest
SciELO
Scopus/Elsevier
Sherpa/Romeo
Sumarios.org
ULRICH'S
vLex

Ficha catalográfica

Seqüência: Estudos jurídicos e políticos. Universidade Federal de Santa Catarina. Programa de Pós-Graduação em Direito. n.1 (janeiro 1980)-.

Florianópolis: Fundação José Boiteux. 1980-.

Publicação contínua

Resumo em português e inglês

Versão impressa ISSN 0101-9562

Versão on-line ISSN 2177-7055

1. Ciência jurídica. 2. Teoria política. 3. Filosoia do direito. 4. Periódicos. I. Universidade Federal de Santa Catarina. Programa de Pós-graduação em Direito

CDU 34(05)

Catalogação na fonte por: João Oscar do Espírito Santo CRB 14/849

PUBLICAÇÃO 101

SEQÜÊNCIA

Publicação do
Programa de Pós-Graduação em Direito da UFSC

Estudos jurídicos e políticos

Ano XLIX
Volume 46

e108181
https://doi.org/10.5007/2177-7055.2025.e108181

ORIGINAL ARTICLE

Artificial Intelligence and Smart Cities: Ethical and Legal Foundations for Sustainable Development

Inteligência Artificial e Cidades Inteligentes: Fundamentos Ético-Jurídicos para o Desenvolvimento Sustentável

Andréa de Almeida Leite Marocco[1]
Cristiani Fontanela[1]
Thais Cristina Alves Costa[1]
[1]Universidade Comunitária da Região de Chapecó, Chapecó, Brazil.

Abstract: This article investigates the ethical and legal foundations that structure the right to innovation in the context of smart cities, with an emphasis on the use of technologies such as artificial intelligence (AI). The aim is to explore how technological advances can contribute to the sustainable, inclusive, and intelligent development of cities, while addressing normative challenges related to privacy, algorithmic transparency, digital vulnerability, and citizen participation. The objective is to propose normative guidelines and ethical parameters to support the consolidation of an innovative and responsible urban ecosystem, aligned with the principles of technological justice.

Keywords: Sustainable Development. Artificial Intelligence. Technological Justice. Smart Cities.

Resumo: Este artigo investiga os fundamentos ético-jurídicos que estruturam o direito à inovação no contexto das cidades inteligentes, com ênfase no uso de tecnologias como a inteligência artificial (IA). A proposta visa explorar como os avanços tecnológicos podem contribuir para o desenvolvimento sustentável, inclusivo e inteligente das cidades, considerando os desafios normativos relacionados à privacidade, à transparência algorítmica, à vulnerabilidade digital e à participação cidadã. O objetivo é propor diretrizes normativas e parâmetros éticos que auxiliem

Direito autoral e licença de uso: Este artigo está sob uma Licença Creative Commons. Com essa licença, você pode compartilhar, adaptar, para qualquer fim, desde que atribua a autoria da obra e forneça um link para a licença, e indicar se foram feitas alterações.

a consolidação de um ecossistema urbano inovador e responsável, em sintonia com os princípios da justiça tecnológica.

Palavras-chave: Desenvolvimento Sustentável. Inteligência Artificial. Justiça Tecnológica. Cidades Inteligentes.

1 INTRODUCTION

Contemporary cities are undergoing a rapid transformation through the integration of digital technologies into their infrastructure, management, and operations. Under the concept of smart cities, platforms based on artificial intelligence, big data, sensors, the Internet of Things (IoT), and automation are being widely used to optimize public services, increase urban efficiency, reduce costs, and promote environmental sustainability. The concept thus refers to the intensive incorporation of digital technologies with the aim of making cities more efficient, responsive, and connected. However, more than a mere technical or urban phenomenon, the smart city should be understood as a new legal and technological space, in which emerging forms of regulation, governance, and the exercise of power are mediated by algorithms and data, reconfiguring the relationships between the state, citizens, and the market.

Despite its benefits, these technological advances raise urgent ethical, legal, and social challenges: who designs and controls these technologies? How can we ensure transparency, equity, and accountability in automated decisions that directly impact urban life? This article is based on the hypothesis that digital urban environments, structured under the logic of smart cities, operate systematically and can produce vulnerabilities. Such risks are intensified in contexts of weak ethical and legal regulation, where innovation is treated solely as an economic value rather than a right. In this scenario, our aim is to propose normative guidelines and ethical parameters that support the consolidation of a sustainable and inclusive urban ecosystem,

aligned with the principles of human rights-centered digital governance, as proposed by Mark Latonero (2018). The approach adopted is theoretical and normative, grounded in international documents (UN, SDGs), specialized literature (Dignum, Fineman, Greenfield), and with a focus on the Brazilian context.

To this end, the first section will present the smart city as an urban model based on the integration of digital technologies into public management, which, although promising greater efficiency and innovation, raises important ethical and legal challenges. The second section will analyze the main problems associated with this model, focusing on issues of transparency, privacy, fundamental rights, and citizen participation. Finally, the article will assess the viability of guidelines capable of addressing such shortcomings, promoting more sustainable, inclusive, and equitable urban development.

2. THE SMART CITY AS A NEW LEGAL AND TECHNOLOGICAL SPACE

The concept of the smart city refers to a model of urban organization in which physical infrastructure and public services are extensively integrated with advanced digital technologies, with the aim of promoting operational efficiency, environmental sustainability, economic development, and improved quality of life (Greenfield, 2013; Harrison & Donnelly, 2011). This transformation is manifested through the use of interconnected devices (Internet of Things), big data analytics, artificial intelligence, cyber-physical systems, cloud-based digital platforms, and sensor networks, applied to areas such as urban mobility, public safety, waste management, environmental monitoring, health, education, and participatory governance.

It is a city based on the ability to collect, process, and interpret large volumes of data in real time, enabling automated interventions or algorithmically driven decisions. In its technical-operational

dimension, the smart city represents a transition from the traditional urban model to a responsive, data-oriented infrastructure capable of anticipating demands, optimizing resources, and reducing public and environmental costs. In this sense, the term "smart" does not refer to conscious intelligence, but rather to an interconnected and autonomous system aimed at enhancing urban management through integrated digital technologies (Harrison & Donnelly, 2011).

The idea of the smart city gained momentum in the late 1990s and early 2000s, driven by major technology corporations, such as IBM, Cisco, Siemens, and Microsoft—that began offering integrated digital solutions to complex urban problems (Tassiola, 2019; 2018). With the convergence of critical urban infrastructure and digital networks, these companies promoted a "technosolutionist" approach to social issues, betting on connectivity and automation as central pillars of urban transformation (Sekala, 2020). The concept was rapidly adopted by governments, international organizations, and urban planners, becoming a global reference model, especially after the popularization of the internet, mobile devices, and cloud computing. While this model has introduced significant technological advances to urban dynamics—supported by many scholars (Solove, 2004; Anderson, 2011)—it has also drawn criticism. As Greenfield asserts:

> Out of all the potentials our moment might give rise to, and all the modes in which we might choose to use networked information technology in our cities, the narrative of the smart city as it is currently being articulated and advanced to us represents some of the least interesting and the most problematic. (Greenfield, 2013).

Contrary to what the author suggests, this does not appear to be the least interesting case, but it is certainly one of the most problematic. The fact is that, more than a merely technical or administrative advancement, the smart city must be understood as a new legal and technological space, where unprecedented forms of regulation,

normative production, algorithmic governance, and the exercise of both public and private power emerge (Khosla, 2020). This new urban paradigm introduces complex challenges for law, ethics, and democratic theory, as the operation of automated systems and decision-making algorithms directly impacts fundamental rights such as privacy, equality, security, citizen participation, and freedom of expression. The massive and continuous collection of data, combined with the opacity of artificial intelligence systems, demands new forms of accountability, transparency, and distributive justice in order to prevent "urban intelligence" from being captured by corporate interests or instrumentalized for surveillance and social control.

Therefore, understanding the smart city means recognizing not only its innovative potential, but also the urgent need to reconfigure the legal and institutional frameworks that regulate urban and digital space, placing human dignity and fundamental rights at the center of the debate on the future of cities.

3 ETHICAL AND LEGAL CHALLENGES IN THE GOVERNANCE OF URBAN ARTIFICIAL INTELLIGENCE

The various applications of artificial intelligence have introduced new ways of managing the world, bringing numerous benefits such as the optimization and automation of processes, increased productivity, reduced human error, lower operational costs, support for indicator analysis and decision-making, enhanced marketing campaigns, real-time environmental monitoring, among others. These are also major advantages when applied to smart cities. However, it is crucial not to overlook the negative implications of AI with respect to non-technical aspects of human development. Scholars interested in understanding the consequences of AI usage—beyond just smart cities—also debate the practical effects of its application in human contexts. This

is especially true for AI models based on deep learning techniques. According to Dignum:

> The machine learning technique, a subfield of AI that underpins most current AI model implementations, known as deep learning neural networks (DLNNs), or simply deep learning, due to their inspiration from the biological brain, is a probabilistic statistical model with two categories: predictive AI and generative AI. (Dignum, 2019, p. 22)

Given this dual function - predicting and generating information/data—we must consider not only the advantages of AI, but also its limitations and challenges. As Kaufman (2024, 2022, 2021, 2019) points out, the challenges related to AI are multifaceted and encompass complex issues ranging from transparency and accountability to privacy and equity (Bostrom, 2014; Russell & Norvig, 2020; Brynjolfsson & McAfee, 2014). These concerns are especially relevant when it comes to cities that implement such technologies.

In this regard, it is essential to consider the inherent challenges associated with different uses of technology in smart cities. Among them, the following stand out: i. the problem of explainability; ii. privacy and data protection; iii. data bias, and, iv. citizen participation (cf. Kaufman, Junquilho, Reis, 2023; Kaufman, Coelho, 2023; Goodfellow, Bengio, Courville, 2016).

The explainability problem (i) in AI refers to the difficulty of understanding and explaining how and why an AI model arrives at specific decisions. In many machine learning models, especially those based on deep neural networks, decisions can be highly complex and difficult to interpret. These models operate with vast amounts of data and parameters that are not directly accessible or comprehensible to humans, resulting in a "black box" that obstructs the analysis of how conclusions are drawn. This lack of transparency becomes a critical issue when AI is used in high-stakes contexts—such as healthcare, justice, or finance—where understanding the reasoning behind a

decision is crucial for ensuring accountability, fairness, and trust. Legally, this clashes with the principle of explainability, which upholds the individual's right to know why they were judged in a certain way, for instance.

In their book *Deep Learning* (2016), researchers Ian Goodfellow, Yoshua Bengio, and Aaron Courville discuss the difficulty of making neural network models more interpretable and explainable. They point out that while such models can deliver highly accurate predictions, the lack of explainability creates challenges regarding user trust, regulatory compliance, and the ability to identify and fix flaws in the model. Kaufman also emphasizes that the opacity of AI models can become a barrier to holding developers and users accountable, especially when the technology's decision-making processes are difficult to trace. This gives rise to what Goodfellow et al. (2016) refer to as the interpretability problem. Such phenomena stem from the complexity of algorithms that exceed human cognitive capacity, making it difficult to understand how input data leads to final outcomes. Even though legislative and judicial efforts increasingly attempt to guarantee the right to explainability—especially when constitutional norms recognize it as a fundamental right—meeting such demands is not always technically feasible.[1] (Jaakkola, 2020).

The situation becomes even more complex when systems are developed by private companies protected by trade secrets, creating a dilemma between accuracy and transparency. This legal challenge also emerges as a moral issue regarding the attribution of responsibility among the individuals involved. Coeckelbergh (2020) discusses this concern by addressing responsibility in AI systems, arguing that users and developers must be able to explain the decisions generated

[1] In addition to initiatives from the Legislative and Executive branches, the Judiciary must enhance its tools to identify the agents responsible for specific incidents, as well as improve the mechanisms used to assess the extent of the resulting harm and its impact.

by these systems, since trust in technology depends on understanding its logical and functional foundations.

This gives rise to a fundamental dilemma: when an AI system makes a harmful or incorrect decision, who should be held accountable? This question permeates much of the current debate on the attribution of moral and legal responsibility in cases involving failures in AI models (Villani, 2018; Barredo Arrieta et al., 2020; Frazão & Goettenauer, 2021). A clear example of this can be seen in the case of autonomous vehicles. In the event of an accident, who should be held liable? The manufacturer, the programmer, the patent holder, or the buyer? Although still in an early stage, Brazil's Bill No. 2,338 of 2023 attempts to regulate AI-related responsibilities, but it remains insufficient. Despite extensive debate and the lack of consensus on the matter, this question is only possible because we assume a moral standpoint in which individuals are, to varying degrees, vulnerable to such negative outcomes.

This also applies to issues of privacy and data security (ii). The mass collection of information used to train AI models can compromise individuals' privacy, often without their full consent. Kaufman (2022) emphasizes that balancing the use of such data with the right to privacy is a fundamental challenge, since "cybersecurity must be strengthened to prevent abuses such as the misuse of sensitive information" (Zuboff, 2019, p. 45). These concerns are widely discussed in international forums such as the World Economic Forum (2020) and the European Union Agency for Cybersecurity (ENISA), both of which advocate for enhanced cybersecurity measures to protect sensitive data and prevent abuse.

Data security and the right to privacy are central issues in the context of AI, given the growing use of technologies that process large volumes of personal and sensitive information. This is because AI implementation frequently depends on access to data that may include details about individuals' habits, preferences, and even intimate behaviors. In this regard, protecting such data is essential to ensure

that individuals' right to privacy is respected. Brazil's General Data Protection Law (LGPD) of 2018 and the European Union's General Data Protection Regulation (GDPR) of 2016 are examples of legal frameworks that aim to balance technological innovation with the protection of citizens' privacy, establishing obligations for companies using AI. However, as algorithms become more sophisticated, new challenges emerge - such as the misuse of sensitive information for behavioral manipulation - requiring ongoing adaptation of public policies and regulations to ensure that the benefits of AI do not come at the expense of privacy violations. [2]

Data bias and algorithmic discrimination deserve particular attention due to their negative implications. AI systems are trained on large volumes of data, but if these data sets contain historical or social biases, the AI may learn and perpetuate these patterns (Mendes, Mattiuzzo & Fujimoto, 2021). This can result in discriminatory automated decisions that disproportionately affect marginalized groups. As Cozman and Kaufman (2022) warn, discriminatory bias occurs when certain groups are systematically disadvantaged based on gender, ethnicity, or socioeconomic status.

> A result is considered biased when the system exhibits a systematic error ("statistical bias" or "algorithmic discrimination"). Like any statistical model, deep neural networks are designed to generalize from a sample—in this case, samples formed from large datasets or big data. Bias refers to the error that may occur in this generalization process (Cozman & Kaufman, 2022).

Discriminatory bias arises when the same group of people is consistently affected, such as with gender or ethnic bias. Hao (2019)

[2] In addition to Brazil's General Data Protection Law (Law No. 13,709/2018) and the European Union's General Data Protection Regulation (GDPR) of 2016, which came into force in 2018, there are other international laws that aim to address the issue of data protection - such as the California Consumer Privacy Act (CCPA, 2020) and China's Personal Information Protection Law of 2021-which seek to partially mitigate threats to privacy.

notes that detecting such bias requires understanding its origins, recognizing that it is often mistakenly attributed solely to biased training data, when in fact it can emerge at multiple stages of the process. This may occur during problem framing, when a developer translates a goal into computable language, or during data collection, when datasets are unrepresentative or reflect societal prejudices, or even in the selection and preparation of databases. However, even once bias is detected, correcting it is difficult—especially when systems are already in full operation (Hao, 2019). There is also discriminatory bias arising from data production, such as the predominance of users from developed countries who have greater access to technology and social networks. This leads to image datasets biased toward lighter skin tones, as well as the failure to disaggregate data by gender and/or the default treatment of men as the "standard human" (Perez-Criado, 2021).

Finally, there is the issue of adequate citizen participation to ensure truly smart cities. This problem arises because the consolidation of smart cities often relies on a technocratic, data-driven logic that tends to marginalize citizens from the decision-making process. The implementation of AI-based solutions and large-scale data collection rarely includes broad participatory processes, which undermines fundamental democratic principles. According to Mark Latonero (2018), the absence of effective channels for communities to express concerns about the use of emerging technologies contributes to the erosion of public trust and the deepening of social inequalities. This deficit in citizen participation undermines the inclusive potential of smart cities, turning their systems into tools of control and surveillance—particularly against already vulnerable populations.

Moreover, the lack of public engagement directly affects the legitimacy and fairness of automated decisions that shape urban life. In his critique of smart cities, Greenfield (2013) warns of the risk that they become "closed systems" driven by technical metrics and corporate interests, ignoring local social dynamics. For Virginia Dignum (2019), responsible AI governance requires not only technical

transparency but also deliberative inclusion, ensuring that systems reflect collective values rather than purely efficiency-driven criteria. The United Nations (2022), in its People-Centered Smart Cities report, reiterates that citizen participation is essential to ensure that urban technologies are aligned with the promotion of equity, social justice, and institutional trust.

4 NORMATIVE GUIDELINES AND ETHICAL PARAMETERS FOR THE RIGHT TO INNOVATION GUIDELINES BASED ON INTERNATIONAL BEST PRACTICES

The use of artificial intelligence (AI) in smart cities represents a significant advancement in the optimization of processes, decision-making, and the delivery of public services. However, this technological innovation also raises a range of ethical, legal, and social challenges that cannot be ignored. Among the main issues are the lack of explainability in automated systems, threats to privacy and personal data protection, risks of algorithmic discrimination, and—above all—the deficit of citizen participation in decision-making processes. Deep learning–based AI models often operate as "black boxes," with logic inaccessible to users, thereby compromising transparency and accountability (Goodfellow et al., 2016; Dignum, 2019). Additionally, the massive use of sensitive data without informed consent challenges existing legal frameworks such as Brazil's LGPD and the European GDPR (Zuboff, 2019). Data bias, when not detected and corrected, perpetuates historical and social inequalities, disproportionately affecting already marginalized groups (Cozman & Kaufman, 2022; Hao, 2019). Finally, the absence of effective participatory mechanisms in the governance of urban technologies reduces citizens to mere recipients of technocratic decisions, undermining democratic principles and social justice.

Given this scenario, what normative guidelines are needed to ensure a truly intelligent city-one that embraces technological

inclusion and citizen participation? To answer this question, we return to the warnings of Latonero (2018), Greenfield (2013), and the United Nations (2022), who emphasize that a truly smart city must be built on principles of transparency, inclusion, and active community engagement, ensuring that the benefits of innovation are distributed in an equitable and responsible manner.

According to Latonero, "A human rights-based frame could provide those developing AI with the aspirational, normative, and legal guidance to uphold human dignity and the inherent worth of every individual regardless of country or jurisdiction" (2018, p.1). He argues that the development and implementation of AI systems often occur without public consultation or the involvement of affected communities, which reduces the democratic legitimacy of algorithmic decisions. This point is crucial for smart cities, where technologies are frequently adopted without considering deliberative citizen participation (2018, p.4). One of the resulting problems is the potential for mass surveillance, especially in urban environments outfitted with smart cameras, sensors, and facial recognition technologies, all typical of smart cities. Latonero associates this with the erosion of civil liberties and increased vulnerability for marginalized groups. In response, he advocates for clear mechanisms of accountability so that governments and corporations can be held responsible for the decisions made by AI systems. This is particularly relevant in smart cities, where algorithms influence policies related to mobility, public safety, housing, and social welfare. [3]

One of Latonero's central contributions (2018) to the ethical governance of artificial intelligence is the proposal to place human

[3] Although he does not directly address "smart cities" as a concept, Latonero provides an essential normative framework for thinking about these cities through the lens of human rights, social inclusion, algorithmic transparency, and participatory governance. His focus is on ensuring that the use of AI—wherever it occurs—respects human dignity, something that is fully applicable to smart cities (Latonero, 2018).

rights at the core of technological decision-making, especially in high-risk contexts such as public safety, facial recognition, and urban surveillance—all commonly present in smart cities. To operationalize this principle, he proposes the use of Human Rights Impact Assessments (HRIAs) as a normative and preventive tool. HRIAs make it possible to anticipate the potential negative effects of technologies on fundamental rights, promoting a proactive approach to mitigating harms such as discrimination, digital exclusion, and privacy violations. Rather than relying solely on technical or commercial parameters, public policies should be guided by values such as dignity, equality, and citizen participation, ensuring that technological innovation does not come at the expense of social justice.

On the other hand, Adam Greenfield (2013) offers a powerful critique of how the concept of the "smart city" has been developed and implemented, especially by large technology corporations. For Greenfield, the dominant vision of the smart city is highly technocratic, centralized, and driven by commercial interests, which undermines its democratic legitimacy and its ability to promote social justice. He argues that "many smart city proposals treat urban spaces as systems to be optimized by algorithms, sensors, and big data - without considering the experiences, desires, and real needs of the people who inhabit these spaces" (2013, p. 235). In this sense, he denounces the risk of an "urbanization without citizens," where individuals are treated as data points and variables rather than political agents (2013, p. 236). A central point of his critique is the exclusion of citizenship from decision-making processes. According to Greenfield, smart cities are often implemented "top-down" by governments and private companies, without public consultation, minimizing transparency and weakening democratic principles.

Greenfield also highlights how the intensive use of surveillance technologies—such as cameras, sensors, and facial recognition software—can transform cities into spaces of continuous surveillance, with serious implications for privacy, freedom, and human dignity. This

surveillance is often justified in the name of security or efficiency but ends up reinforcing preexisting inequalities and marginalizations. In opposition to this, Greenfield advocates for clear ethical guidelines. It is important to note that Greenfield (2013) is not opposed to the use of technology in cities, but rather to the idea of a "smart" city without social, political, and ethical intelligence. He argues that true urban intelligence lies in citizen participation, transparency, social justice, and the collective construction of urban spaces. [4]

Finally, the United Nations, through UN-Habitat, emphasizes that smart cities must be people-centered and based on human rights, with a focus on participatory governance, security, and appropriate regulation of urban technologies (2022). In this regard, the UN-Habitat program People-Centred Smart Cities proposes that technology in cities should serve the needs of communities (not the other way around) by empowering residents and encouraging public consultation, co-creation, and collaboration between governments, citizens, and companies.

Building on all of this, the international guidelines under development (projected for 2025) emphasize that local smart city strategies should include legal and institutional structures for public consultation, community partnerships, and effective mechanisms for citizen involvement. The recommendations call for digital infrastructure and data platforms to include disaster recovery plans, cybersecurity protocols, privacy safeguards, and non-binding regulatory frameworks to ensure reliability and protection against abuses in AI systems and urban technologies. Therefore, a truly smart city must be sustainable, inclusive, and just, and this is only possible when: urban technologies are subject

[4] The author denounces the capture of the smart city concept by major technology companies (such as IBM, Cisco, Siemens), which sell standardized and closed solutions to governments, often without considering the local context. This makes cities dependent on private vendors, lacking technological autonomy and citizen control over the data that is generated.

to transparent and participatory governance, with real channels for community engagement and empowerment; cities adopt measures for digital security, privacy, and resilience, protecting communities from surveillance, misuse, and technical failures; and when the central focus lies on the needs and rights of citizens, not merely on commercial interests or isolated technical efficiency.

5 CONCLUSION

In light of the challenges and possibilities brought by emerging technologies – especially artificial intelligence – it becomes essential to rethink the role of law and ethics in shaping smart cities. Participatory and transparent governance, as well as digital inclusion as a public policy, are fundamental conditions for these cities to develop in a fair and democratic manner. It has been observed that, although there is a substantial body of international literature on ethics and artificial intelligence, the discussions remain largely at the conceptual level, with limited attention to the concrete effects of technology deployment in urban contexts. In the Brazilian scenario, critical analyses of the negative impacts of AI on vulnerable populations – and the specific challenges faced by a developing country – are still scarce. Brazil faces the imperative of aligning its urban and technological policies with democratic principles, ensuring transparency, accessibility, and citizen participation in automated decision-making processes. Thus, analyzing the ethical and legal foundations of the right to technological innovation in smart cities means contributing to the promotion of technological justice, the mitigation of digital vulnerabilities, and the strengthening of truly inclusive and sustainable urban development.

As we have seen, the smart city cannot be reduced to a logic of efficiency and control, under the risk of becoming a space of perpetual surveillance, algorithmic opacity, and digital exclusion. As Greenfield (2013) warns, many smart cities adopt a technocratic architecture that

disregards social dynamics and marginalizes citizen participation, operating through closed systems driven by corporate interests. When not regulated by democratic norms, this model tends to transform the urban space into a "digital black box", detached from the real needs of the population.

For the smart city to truly become a space for the realization of rights, it must be anchored in constitutional and democratic principles, especially the dignity of the human person. As Latonero (2018) emphasizes, placing human rights at the center of AI governance is a necessary condition to mitigate risks of discrimination, exclusion, and violations of fundamental freedoms. His proposal of Human Rights Impact Assessments (HRIAs) offers a normative tool that allows for the anticipation and containment of the adverse effects of technology, fostering ethically responsible innovation. The United Nations (2022), through the People-Centered Smart Cities program, further reinforces that digital urban development must be grounded in citizen participation, digital inclusion, and transparent governance, in alignment with the Sustainable Development Goals (SDGs), particularly SDG 9 (industry, innovation, and infrastructure) and SDG 11 (sustainable cities and communities).

Therefore, the smart city is not merely a "connected city," but a city that recognizes digital rights as an extension of fundamental rights, and that implements public policies aimed at mitigating technological vulnerabilities, strengthening digital citizenship, and building fair, accessible, and democratic urban ecosystems. The challenge for contemporary law is thus to ensure that urban innovation is regulated by ethical and legal principles, guided by technological justice, social equity, and the centrality of the human person.

REFERENCES

ANDERSON , M.; Anderson, SL *Ética da máquina* . Cambridge: Cambridge University Press, 2011.

AWAD, Edmond; DSOUZA, Sohan; KIM, Richard; SCHULZ, Jonathan; HENRICH, Joseph; SHARIFF, Azim; BONNEFON, Jean-François e RAHWAN, Iyad (2018). "The Moral Machine Experiment". *Nature*, vol. 563, Nov. 2018.

ARRIETA, Alejandro Barredo et al. Explainable Artificial Intelligence (XAI): Concepts, taxonomies, opportunities and challenges toward responsible AI. *Information fusion*, v. 58, p. 82-115, 2020.

BOSTROM, N. *Superinteligência: Caminhos, Perigos, Estratégias*. Oxford: Oxford University Press, 2014.

BRASIL. Lei nº 13.709, de 14 de agosto de 2018. *Lei Geral de Proteção de Dados*

Pessoais (LGPD). Brasília, DF: Presidência da República, [2020]. Disponível em: https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2020/lei/l14020.htm. Acesso em: 14 abr. 2025.

BRASIL. Senado Federal. Projeto de Lei n. 2.338 de 2023. Disponível aqui. Acessado em 17 de julho de 2025.

COECKELBERGH, Mark. Artificial Intelligence, Responsibility Attribution, and a Relational Justification of Explainability. *Science and Engineering Ethics*, 2019. Disponível em: https://link.springer.com/article/10.1007/s11948-019-00146-8. Acesso em: 12 abr. 2025.

COECKELBERGH, Mark. *AI Ethics*. Cambridge, MA: MIT Press, 2020.

COSTA, T.A; BARBOSA, E. "Faces of responsibility and moral agency in a pandemic age." *Moral Challenges in a Pandemic Age*. Routledge 239-260, 2023.

CRIADO, J. Inteligencia artificial (y administración pública). *EUNOMÍA*. Revista en Cultura de la Legalidad, n. 20, p. 348-372, 2021.

SCHIEFLER, Eduardo André Carvalho; CRISTÓVAM, José Sérgio da Silva; SOUSA, Thanderson Pereira de. Administração Pública digital e a problemática da desigualdade no acesso à tecnologia: Digital Public Administration and the problem of inequality in access to technology. *International Journal of Digital Law*, Belo Horizonte, v. 1, n. 2, p. 97–116, 2020.

DIGNUM, Virginia. *Responsible artificial intelligence:* how to develop and use AI in a responsible way. Cham: Springer, 2019.

DIMAGGIO, P., HARGITTAI, E., NEUMAN, W. R., & ROBINSON, J. P. Social implications of the Internet. Annual review of sociology, 27(1), 307-336, 2021.

FINEMAN, M. *The Vulnerable Subject and the Responsive State*.

FLORIDI, Luciano *et al. The ethics of algorithms:* Mapping the debate, 2016. Disponível em: https://journals.sagepub.com/doi/full/10.1177/2053951716679679. Acesso em: 4 abr. 2025.

FLORIDI, Luciano. An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations. *Minds and Machines*, v. 28, p. 689-707, 2018. Disponível em: https://link.springer.com/article/10.1007/s11023-018-9482-5. Acesso em: 4 abr. 2025.

FLORIDI, Luciano; COWLS, Josh. A United Framework of Five Principles for AI in Society. *Harvard Data Science Review*, 2019. Disponível em: https://hdsr.mitpress.mit.edu/pub/ l0jsh9d1/release/7. Acesso em: 4 abr. 2025.

FRAZÃO, Ana; GOETTENAUER, Carlos. Black box e o direito face à opacidade algorítmica. Barbosa, Mafalda Miranda. *Direito Digital e Inteligência Artificial*. Indaiatuba: Editora Foco, Edição do Kindle, v. 79, 2021.

GINTIS, Herbert; BOWLES, Samuel; BOYD, Robert. *Moral Sentiments and Material Interests: The Foundations of Cooperation in Economic Life*. Cambridge, MA: MIT Press, 2006.

GREENFIELD, A. *Against the Smart City*. Do Projects, 2013.

GOODFELLOW, Ian et al. *Deep learning*. Cambridge: MIT Press, 2016.

GUIMARÃES, Hellen, "Nos erros do reconhecimento facial". *Racismo*, 2021.

HARRISON, C.; DONNELLY, I. A. A Theory of Smart Cities. In: Proceedings of the 55th Annual Meeting of the International Society for the Systems Sciences, 2011.

JAAKKOLA, E. "Designing conceptual articles: four approaches". Teoria/ Conceitual. 2020.

HAO, Karen. Intelligent Machines: This is how AI bias really happens - and why it's so hard to fix. *MIT Technology* Review, 2019.

HONT, I.; IGNATIEFF, M. *Wealth and Virtue*: The Shaping of Political Economy in the Scottish Enlightenment. Cambridge: Cambridge University Press, 1983.

KAUFMAN, D. Logic and foundations of artificial intelligence and society's reactions to maximize benefits and mitigate harm. *Filosofia Unisinos,* v.25, p.25110, 2024.

KAUFMAN, D. *Desmistificando a inteligência artificial*. BH:Autêntica, 2022.

KAUFMAN, D. Inteligência Artificial e os desafios éticos: a restrita aplicabilidade dos princípios gerais para nortear o ecossistema de IA. *PAULUS:* Revista de Comunicação da FAPCOM. São Paulo, 5(9), 2021.

KAUFMAN, D. *A inteligência artificial irá suplantar a inteligência humana?* São Paulo: Estação das Letras e Cores, 2019.

KAUFMAN, D. COELHO, Alexandre. Regular a IA, mas sem precipitação. *Valor Econômico*, 2023.

KAUFMAN, D.; JUNQUILHO, Tainá; REIS, Priscila. Externalidades negativas da inteligência artificial: conflitos entre limites da técnica e direitos humanos. *Revista de Direitos e Garantias Fundamentais*, v. 24, n. 3, p. 43-71, 2023.

KHOSLA, R. Technology, health, and human rights: a cautionary tale for the post-pandemic world. *Health Human Rights*, v.22, n.2, p.63–66, 2020. Disponível em: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7762924/. Acesso em: 16 de julho de 2025.

LATONERO, M. *Governing Artificial Intelligence:* Upholding Human Rights & Dignity. Data & Society, 2018.

LIAO, M. (Ed.) Ethics of Artificial Intelligence. Oxford Press, 2020.

LIU, X.; MERRIT, J. *Shaping the Future of the Internet of Bodies*: New challenges of technology governance. Briefing Paper. World Economic Forum, 2020.

MARTÍ, B., La vulnerabilidad relacional: análisis del fenómeno y pautas de intervención. *Redes – Revista hispana para el análisis de las redes sociales*, Vol.11, N°4, 2006.

MENDES, Laura Schertel; MATTIUZZO, Marcela; FUJIMOTO, Mônica Tiemy. Decisões automatizadas e proteção contra a discriminação na Lei Geral de Proteção de Dados brasileira. In: *Rechtsdurchsetzung und Prozess, Globalisierung und Digitalisierung.* Nomos Verlagsgesellschaft mbH & Co. KG, 2021. p. 49-80.

MITCHELL, M. *Artificial Intelligence:* A Guide for Thinking Humans. NY: Farrar, Straus and Giroux, 2019.

MOKANDER, Jacob; FLORIDI, Luciano; Ethics – Based Auditing to Develop Trustworthy AI. *Minds and Machines*, 2021.

PEREZ-CRIADO, Caroline. *Invisible Women*: Data Bias in a World Designed for Men. US: Abrams Press, 2021.

SEKALALA, Sharifah. DAGRON, Stéphanie. FORMAN, Lisa. MEIER, Benjamin Mason. "Analyzing the human rights impact of increased digital public health surveillance during the COVID-19 crisis". Health Human Rights, v. 22, n. 2, p. 7 – 20, dez. 2020. Disponível em: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7762901/. Acesso em: 16 de julho de 2025.

SOLOVE, D. *The digital person*: technology and privacy in the information age. New York: New York University Press, 2004.

TASIOULAS, John. Exiting the Hall of Mirrors: Morality and Law in Human Rights. In: CAMPBELL, Tom. BOURNE, Kylie. *Political and Legal Approaches to Human Rights*. New York: Routledge, 2018.

TASIOULAS, John. "First Steps Towards an Ethics of Robots and Artificial Intelligence". *Journal of Practical Ethics*, v. 7, n. 1, p. 49-83, 2019. Disponível em: http://www.jpe.ox.ac.uk/wp-content/uploads/2019/06/Tasioulas.pdf. Acesso em: 30 de Junho de 2025.

TASIOULAS, John. "Saving Human Rights from Human Rights Law". *Vanderbilt Law Review,* v. 52, n. 5, p. 1167–1207, nov. 2019.

UNITED NATIONS HUMAN SETTLEMENTS PROGRAMME, UN-Habitat. People-Centered Smart Cities: Harnessing Technologies for Sustainable Development, 2022.

VAYENA, E. TASIOULAS, J. "The dynamics of big data and human rights: the case of scientific research". *Philosophical Transactions of the Royal Society: Mathematical, Physical and Engineering Sciences*, v.374, n.2083, p.1–14, 2016.

VILLANI, Cédric. *For Meaningful Artificial Intelligence:* Towards a French and Eu- ropean Strategy. ariforhumanity.fr, 2018. Disponível em: https://www.ai4eu.eu/news/mea- ningful-artificial-intelligencetowards-french--artificial-and-european-strategy. Acesso em: 10 jan. 2025.

WIGGINS, B. A. *Managing risk, managing race.* University of Minnesota, 2013.

ANDRÉA DE ALMEIDA LEITE MAROCCO

Doctorate and Master's Degree in Law from the Graduate Program in Law at the Federal University of Santa Catarina (PPGD/UFSC). Graduated in Law (2005) and Portuguese/English Language and Literature (2002) from the University of Western Santa Catarina. Specialist in Public Law (2009) and Language Teaching Methodology (English, Portuguese, and Spanish). Specialist in Higher Education Teaching; Full Professor in the undergraduate and Stricto Sensu Graduate Program in Law at the Community University of the Chapecó Region - UNOCHAPECÓ. Vice-Dean of Teaching, Research, and Extension at the Community University of the Chapecó Region - Unochapecó. Undergraduate student in Business Administration. Lawyer.

Work address: Unochapecó, Chapecó Campus. Servidão Anjo da Guarda, nº 295-D, Efapi, 89809-900, Chapecó, SC, Brazil.

ORCID ID: https://orcid.org/0000-0001-9273-6178

E-MAIL: andream@unochapeco.edu.br

CRISTIANI FONTANELA

Doctorate and Master's degree in Law from the Federal University of Santa Catarina (UFSC), with postdoctoral internship at the University of Bournemouth, England. Coordinator of the Stricto Sensu Graduate Program in Law and the Center for Innovation and Technology Transfer at Unochapecó. Professor in the Stricto Sensu Graduate Program in Accounting and Administration at Unochapecó. Visiting professor at the University of Bournemouth, England. Lawyer. Researcher at the Law, Democracy, and Citizen Participation Research Group and the Business Competitiveness Research Group at Unochapecó. She has experience in the areas of intellectual property, technology transfer, and innovation.

Work address: Unochapecó, Chapecó Campus. Servidão Anjo da Guarda, nº 295-D, Efapi, 89809-900, Chapecó, SC, Brazil.

Orcid id: https://orcid.org/0000-0003-2253-8891

E-mail: cristianifontanela@unochapeco.edu.br

THAIS CRISTINA ALVES COSTA

She graduated in Philosophy (bachelor's degree) from the Federal University of São João del-Rei (UFSJ), with a scholarship from PIBIC/FAPEMIG - Minas Gerais Research Support Foundation. She graduated in Law from the Catholic University of Pelotas (UCPel), with academic mobility at the Faculty of Law of the University of Lisbon (FDUL). She is a specialist in Philosophy from the Federal University of Ouro Preto (UFOP) and Literacy Practices from the Federal University of São João del-Rei (UFSJ). Master's degree in Philosophy from the graduate program in Philosophy at the Federal University of Pelotas (UFPel), having been a full CAPES scholarship recipient. Master's degree in Law from the Federal University of Rio Grande (FURG), with academic mobility at the University of North Carolina - Chapel Hill (UNC). She was a professor of undergraduate Philosophy EAD at the Federal University of Pelotas in 2017 and 2018. She holds a PhD in Philosophy from the Federal University of Pelotas (UFPel), with a CAPES scholarship.

Work address: Unochapecó, Chapecó Campus. Servidão Anjo da Guarda, nº 295-D, Efapi, 89809-900, Chapecó, SC, Brazil.

Orcid id: https://orcid.org/0000-0002-1274-0431

E-mail: costa.thaisalves@gmail.com

Received: 07/31/2025
Accepted: 12/18/2025

Editor in charge:
Dr. Thanderson Pereira de Sousa

Data Availability

The authors declare that all data used in the research are available in a public repository, in accordance with open science practices. Revista Sequência encourages the sharing of research data that ensures transparency, reproducibility, and verification of published results, while respecting applicable ethical principles. Thus, the disclosure of information that allows the identification of research subjects or compromises their privacy is not required. Data sharing should, therefore, prioritize scientific integrity and the protection of sensitive data, ensuring the publication of results without undue exposure of participants.

This work is licensed under a Creative Commons Attribution 4.0 International License.

Authors grant Revista Sequência exclusive rights of first publication, with the work being licensed under the Creative Commons Attribution 4.0 International License. The license authorizes third parties to remix, adapt, and/or create from the published work, indicating credit to the original work and its initial publication. Authors are permitted to enter into separate additional contracts for non-exclusive distribution of the version published in Revista Sequência, indicating, in any case, the authorship and initial publication in this journal.