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Between exploitation and resilience: Reconciling AI's role in surveillance capitalism and disaster risk management

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Abstract

Background: This study explores the paradoxical role of artificial intelligence as both a tool of exploitation within surveillance capitalism and a force for resilience in disaster risk management, highlighting the ethical and governance challenges that arise at the intersection of these domains.
Aims: This article aims to enable the ethical use of AI in DRM while insulating public systems from the structural harms of commercial data exploitation.
Methodology: Drawing from a comparative qualitative analysis of 35 academic sources, the study investigates how BigTech corporations and data brokers leverage AI to commodify personal data, consolidate informational power, and erode democratic agency.
Results: The present study critically examines the dual role of artificial intelligence in contemporary digital society, contrasting its exploitative deployment within surveillance capitalism with its constructive use in disaster risk management (DRM). Simultaneously, it highlights a parallel body of research showcasing AI's capacity to enhance early warning systems, situational awareness, and post-disaster recovery, especially in resource-constrained and climate-vulnerable regions.
Conclusion: To reconcile these conflicting trajectories, the article proposes the Public AI for Resilience (PAIR) framework—a governance model grounded in data sovereignty, public infrastructure, algorithmic explainability, and cross-sectoral collaboration. Ultimately, the article argues for a normative recalibration of AI governance that prioritizes equity, transparency, and collective resilience over market imperatives, demonstrating that AI's public good potential can be realized without surrendering to surveillance-based capitalism.

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1. Introduction

Shoshana Zuboff's seminal critique of surveillance capitalism offers a powerful and prescient warning about the expanding reach of data brokerage in the age of AI. She argues that the commodification of personal data—extracted from digital behaviors without meaningful consent—has become the foundation of a new economic logic in which corporate actors monetize prediction and control. This logic now permeates industries far beyond tech, from retail to beauty, where AI-driven personalization tools repackage surveillance as consumer empowerment while systematically obscuring their dependence on behavioral data extraction (Toosi et al., 2024). This dynamic, sustained by opaque data markets and consolidated BigTech power, threatens individual autonomy, democratic norms, and the very possibility of privacy. The scholarly literature has echoed Zuboff's concerns, drawing attention to the systemic risks posed by unregulated data brokerage, including the erosion of accountability, the proliferation of algorithmic manipulation, and the institutionalization of asymmetrical power relations.

The proliferation of social media platforms and an ever-increasing complicated patterns of their use (Shahghasemi et al., 2025) have significantly exacerbated the crisis of surveillance capitalism by intensifying both the scale and granularity of data extraction. Unlike traditional digital services, social media encourages continuous, often involuntary, self-disclosure through interactions, preferences, geolocation, and emotional expressions. These platforms are designed to maximize user engagement, not by enhancing social connection, but by transforming attention into a monetizable commodity through algorithmic profiling and behavioral prediction. This commodification carries demonstrated psychological costs, with studies linking platform design—from infinite scroll to like counters—to increased anxiety and body dissatisfaction, particularly among young users (Zamani et al., 2021). As scholars like Zuboff (2019), and Stjernfelt and Lauritzen (2020) argue, social media companies operate as data monopolies that commodify users' psychological states and social relationships, feeding vast surveillance infrastructures under the guise of personalization and community. This commodification of psychology is further weaponized by algorithmic systems that amplify idealized content and social comparison—manufacturing the very insecurities that drive compulsive engagement and deepen data extraction (Nosraty et al., 2021).

At the same time, a parallel body of scientific research highlights the promise of AI in serving public interest goals, particularly in the realm of DRM. From early warning systems and hazard prediction to real-time crisis response and post-disaster recovery, AI has been shown to significantly enhance the efficiency, speed, and precision of emergency interventions. Machine learning algorithms, natural language processing, and geospatial intelligence offer powerful tools for

integrating vast datasets and improving decision-making under conditions of uncertainty. Scholars emphasize that, when deployed with adequate oversight, these technologies can build resilience, protect vulnerable populations, and mitigate the impact of both natural and human-induced disasters. Yet technological solutions alone are insufficient—as evidenced by persistent workplace fatalities in hazardous industries, where media literacy has emerged as a critical tool to counter glamorized risk-taking behaviors and improve safety outcomes (Soroori Sarabi et al., 2020). This underscores the necessity of pairing AI-driven risk management with human-centered interventions that address behavioral and cultural factors.

This article brings these two literatures into critical dialogue. It contrasts the deeply troubling dynamics of AI-enabled surveillance capitalism and data commodification with the constructive applications of AI in disaster contexts. By comparing academic perspectives on AI's role in both domains, the article aims to formulate a middle-ground framework—one that retains the life-saving capabilities of AI for DRM while safeguarding against its misuse in exploitative data economies. Ultimately, the goal is to outline a normative approach that aligns technological innovation with principles of equity, accountability, and public good.

2. Methodology

This study employs a comparative qualitative content analysis of peer-reviewed academic literature to examine two distinct but intersecting scholarly discourses: (1) the critique of AI-enabled surveillance capitalism and data brokerage systems, and (2) the application of artificial intelligence in DRM. The research design was guided by a dual-purpose objective: to map key theoretical and empirical contributions within each domain and to identify normative tensions and points of convergence that could inform a balanced technological governance framework.

The corpus of literature analyzed in this study was selected through purposive sampling from academic databases including Scopus, Web of Science, Google Scholar, and institutional repositories. For the surveillance capitalism and data brokerage component, inclusion criteria focused on studies published between 2010 and 2024 that explicitly address AI's role in commodification, data market structures, regulatory critiques, and socio-political implications. Similarly, for the DRM strand, articles were selected that evaluated AI applications across the disaster management cycle—preparedness, mitigation, response, and recovery—particularly emphasizing ethical considerations, technological efficacy, and contextual adaptability.

A total of 35 academic sources were reviewed, comprising journal articles, doctoral dissertations, working papers, and policy reports. These were systematically coded using NVivo to extract thematic

categories such as "data commodification", "algorithmic opacity", "public interest technology", "ethical governance", and "AI-enabled resilience". Cross-case comparison was used to analyze conceptual overlaps and tensions between the two bodies of literature. Attention was given to both epistemological framing and practical implications, allowing for the synthesis of insights into an integrative framework that bridges the divide between AI's exploitative and emancipatory potentials.

3. Findings

3.1. AI, BigTech corporations, and data brokerage crisis

Academics across disciplines—including sociology, political economy, legal studies, and critical data science—have consistently emphasized the central role of AI in amplifying the commodification, extraction, and algorithmic manipulation of personal data. Studies have documented how technology conglomerates like Google, Facebook, and Amazon, through vertical integration and expansive data ecosystems, have consolidated informational power, thereby reshaping markets, governance, and social norms. At the core of this crisis lies the data brokerage industry—operating largely beyond public scrutiny—which fuels opaque infrastructures of profiling, behavioral prediction, and digital segmentation.

Roderick (2014) provided a critical sociological analysis of the U.S. consumer data broker industry, arguing that its immense and largely invisible power constitutes a significant dimension of contemporary financial capitalism. Employing a neo-Gramscian framework, the article explored how the industry's consolidation of trillions of digital consumer records—amassed, analyzed, and traded—operates as a mechanism of discipline and control, particularly in the context of consumer finance and debt. Roderick argued that the data broker industry exemplifies how financial capital can shape public policy and social norms, embedding capitalist logics into the infrastructure of everyday life through datafication. The analysis foregrounded the historical and material underpinnings of the industry's rise, linking its growth to deregulation, technological advances, and a broader neoliberal political economy. Notably, Roderick examined how consumer profiling perpetuates asymmetries of knowledge and power, enabling forms of digital governance that are opaque and largely unaccountable. The article also drew attention to the industry's complicity in data breaches and its role in enabling predatory financial practices, which often exacerbate the vulnerabilities of indebted populations. Ultimately, Roderick called for greater scrutiny of the structural entwinement between data brokerage, consumer finance, and state regulatory failure, framing the industry as a potent site of disciplinary power in the digital age.

Crain (2016) critically evaluated the efficacy of transparency as a

regulatory strategy in the context of the U.S. data broker industry, arguing that structural limitations inherent to the commercial surveillance economy severely undermine its potential to meaningfully protect consumer privacy. Through a political economy lens, the article contended that transparency—while framed as a liberal democratic ideal designed to empower consumers—is fundamentally inadequate in confronting the entrenched commodification of personal information that characterizes data brokerage. Crain used the data broker industry as a case study to show how the extraction, aggregation, and monetization of consumer data are deeply embedded in opaque and unaccountable infrastructures, rendering transparency efforts symbolic at best and misleading at worst. The commodification process itself, rather than a lack of information disclosure, was identified as the root cause of power asymmetries between consumers and data-collecting entities. The article concluded by calling for a reconceptualization of privacy policy that shifts away from superficial transparency measures and toward more robust interventions grounded in the structural critique of surveillance capitalism. Crain argued that only by addressing the political and economic logics driving data commodification can privacy be meaningfully protected.

Christl (2017), in a detailed report for Cracked Labs, provided a comprehensive mapping of the vast and largely opaque ecosystem of corporate surveillance that underpins everyday digital interactions. The report examined how an extensive network of companies—from major platforms like Google and Facebook to data brokers, ad tech firms, and telecommunications providers—systematically collect, combine, analyze, and trade personal data on billions of individuals. Christl illustrated that this pervasive surveillance infrastructure is not only used for targeted advertising but also increasingly informs decisions in areas like finance, insurance, employment, and law enforcement. The study detailed how digital profiles, often composed of volunteered, observed, and inferred data, are compiled into predictive scores and segments that influence how individuals are categorized and treated. By unpacking practices such as real-time behavioral monitoring, cross-device tracking, identity resolution, and algorithmic personalization, the report revealed how corporate actors exploit data asymmetries for economic and strategic gain. Christl further highlighted the dangers of "mission creep", where data collected for one purpose is repurposed for entirely different, often opaque, uses—blurring the lines between marketing, risk management, and social control. The report concluded with a call for greater transparency, accountability, and structural reform to safeguard autonomy, equity, and democratic rights in an increasingly surveillant digital society.

Parkinson (2018) conducted a comprehensive investigation into the definitional ambiguities and access challenges surrounding personal data, proposing a conceptual framework to better understand the

digitally extended self—the totality of data that describes an individual across digital systems. The research was driven by concerns over the inconsistent use of terminology, conceptual vagueness, and limited comprehension of how personal data categories interrelate, especially amidst expanding corporate and governmental data practices. Employing a lexicological analysis, Parkinson developed a model to categorise and structure the digitally extended self, subsequently validating this model against authoritative literature. To empirically explore the accessibility of personal data, Parkinson utilized an auto digital ethnographic method, requesting personal data from a purposive sample of UK-based organisations across various sectors, later expanding to include EU and international entities. This exercise revealed significant inconsistencies in how personal data is managed and disclosed, highlighting the structural and procedural barriers that inhibit individuals from accessing their full data profiles. Further, the study identified substantial variation in organisational responses based on sector and geography. To contextualise these empirical findings, Parkinson conducted semi-structured interviews with nine experts, including lawmakers, data protection officers, and IT professionals. Content analysis of the interviews suggested that both unwillingness and incapacity—particularly within governmental organisations—contributed to subpar performance in responding to subject access requests.

Koski and Pantzar (2019), in their ETLA Working Paper, analyzed how large U.S.-based technology firms—collectively referred to as GAFAMI (Google, Apple, Facebook, Amazon, Microsoft, and IBM)—have shaped the emergence and expansion of global data markets through strategic innovation and acquisitions. The authors identified four key data-intensive domains: financial services, health (particularly wearables), location-based services, and AI, showing how each has been central to the growth of personal data-driven business models. They documented an exponential rise in personal data-related patent filings, particularly in AI, since 2011, reflecting escalating corporate investment in data monetization technologies. GAFAMI's acquisition strategies revealed a consistent pattern of buying firms beyond their core market areas, particularly in AI, advertising, and health, thereby internalizing external knowledge and extending control over emergent data-intensive sectors. Notably, over 700 acquisitions were recorded between 2005 and 2017, with firms like Google and IBM leading in both volume and strategic targeting. The study also noted a diversification in product lines—ranging from health apps to smart devices—as a means of embedding users more deeply into their respective data ecosystems. The authors concluded that these firms are not only consolidating dominance in existing digital markets but are also instrumental in constructing and controlling new ones, raising concerns about innovation bottlenecks, market concentration, and the

future trajectory of the global data economy. This extractive approach contrasts sharply with responsible corporate models that prioritize workforce education as both ethical imperative and strategic advantage—a framework proven to generate sustainable value while mitigating societal harms (Zamani et al., 2024). Such dominance further extends into knowledge production, as evidenced by Google's strategic funding of academic research to normalize its data practices—effectively shaping scholarly discourse to align with corporate interests (Sarfi et al., 2021).

Stjernfelt and Lauritzen (2020) critically examined the role of tech giants—particularly Facebook—as dominant ad brokers, exposing how their surveillance-driven business models leverage intimate user data for commercial gain. The chapter highlighted a 2017 incident in which internal Facebook documents, leaked to *The Australian*, revealed that the company had offered advertisers access to targeting tools capable of identifying 6.4 million emotionally vulnerable teenagers as young as 14. These users were reportedly in states described as "worthless", "insecure", "stressed", or "anxious", tracked through their digital behavior including messages, images, and online interactions. This example served as a case study illustrating how platform capitalism monetizes users' psychological states by converting emotional vulnerabilities into marketable advertising segments. The authors argued that such practices epitomize a deeply troubling intersection between surveillance, commodification, and manipulation in contemporary data economies. Beyond ethical concerns, they also pointed to the structural opacity and unaccountability that shield tech giants from meaningful scrutiny, raising urgent questions about consent, exploitation, and the moral boundaries of algorithmic advertising. Stjernfelt and Lauritzen ultimately called for stronger regulatory oversight and public awareness to confront the disproportionate power these companies wield over both user data and the shaping of online discourse. This manipulation extends beyond advertising into social ecosystems, where studies show influencer algorithms actively reshape behavioral norms—prioritizing appearance- and wealth-based values through the same exploitative engagement models (Nosrati et al., 2023). These models now permeate platform labor markets, as seen in Iran's Instagram economy where 'fame monetization' frameworks—despite their veneer of entrepreneurialism—reinforce dependency on algorithmic visibility and precarious income streams, replicating surveillance capitalism's core asymmetries (Arsalani et al., 2024).

Hoskins (2021) conducted a critical examination of Brazil's *Marco Civil da Internet*, a globally celebrated legislative framework for digital rights, and argued that despite its international acclaim, the law ultimately failed to secure a substantively civic Internet. Framing his analysis within the theoretical lens of informational capitalism, Hoskins

contended that the Marco Civil accommodated rather than disrupted the structural inequalities inherent in this system. The dissertation deployed a combined discourse and political-economic approach, analyzing interviews with key stakeholders, policy documents, and discursive materials to trace the symbolic and material power relations that shaped the bill. The research identified that while the Marco Civil was portrayed as a democratic milestone, it was constrained by a dominant paradigm of digital rights—centered on individualized freedoms, market-based solutions, and technical fixes—that aligned closely with the interests of corporate actors and neoliberal state policies. Rather than enshrining collective civic protections, the law perpetuated consumption-oriented and privatized notions of rights. Furthermore, Hoskins emphasized that the law's development must be understood within Brazil's peripheral position in the global system of informational capitalism. This peripheral status conditioned both the vulnerabilities the legislation aimed to address and the compromises it ultimately embodied. The study concluded that digital rights frameworks like the Marco Civil, while symbolically progressive, risk becoming vehicles that legitimize existing power structures unless grounded in collectivist, structural, and context-sensitive principles. Hoskins called for a reconceptualization of digital rights that resists their co-optation by the logics of informational capitalism. These findings reveal how digital systems routinely convert human activity into commodified data flows while systematically excluding marginalized populations from meaningful participation (Mohammadi et al., 2025).

Mehrpouya (2021) undertook a practice-led doctoral investigation that critically examined surveillance capitalism and knowledge monopolies through the lens of critical software design. Drawing on the philosophy of technology and Science and Technology Studies (STS), Mehrpouya argued that contemporary modes of surveillance and commodification of data have redefined subjectivity and governance, giving rise to a new form of "cyborg ontologies". The thesis developed four original critical design works—*Zaytoun*, *Philodox*, *Maladox*, and *Open Bubble*—each interrogating different dimensions of datafication and algorithmic control. These artifacts were designed to provoke reflection and resistance, exposing the mechanisms by which internet platforms surveil, commodify, and manipulate user behavior. *Zaytoun* critiqued the quantification of suffering in conflict zones, *Philodox* parodied the authority of search engines, *Maladox* imagined speculative cyborg diseases to highlight our entanglement with digital systems, and *Open Bubble* attempted to blur the filter bubbles created by algorithmic personalization. Mehrpouya emphasized the affective, sensory, and spatial dimensions of engagement in critical design, advocating for practices that create "pauses" for critical reflection rather than prescribing specific utopian futures. The work contributes theoretically to debates on technological governance and practically to the field of

critical design by illustrating how creative digital interventions can both reveal and disrupt surveillance infrastructures.

Gorman, Schafer, Tsao, and Ghosh (2021) analyzed the national security implications of unregulated data practices in the United States, arguing that the country's fragmented, sector-based data governance has created significant vulnerabilities exploitable by authoritarian regimes. The authors detailed how adversarial states like China and Russia leverage data flows—including through legal and illicit means—to enhance state surveillance capabilities, influence democratic discourse, and undermine national resilience. In contrast to the EU's unified GDPR framework, the U.S. lacks comprehensive federal regulation, resulting in a patchwork of inconsistent state-level protections. The paper offered five federal policy proposals aimed at securing data infrastructure while maintaining openness for innovation: (1) creating a national registry for third-party data brokers, (2) limiting the sale of biometric and genomic data to entities linked to authoritarian regimes, (3) implementing cybersecurity requirements tied to the quantity and sensitivity of data collected, (4) providing small businesses with tax credits for cybersecurity investment, and (5) mandating breach reporting to federal authorities. Each proposal was supported by a nuanced discussion of benefits and drawbacks, grounded in both national security and democratic principles. The authors concluded that safeguarding democracy in the information age demands a recalibration of data policy that integrates national security concerns with privacy protections, transparency, and a coherent regulatory framework. Such recalibration must also address AI literacy asymmetries—particularly in the Global South where infrastructural disparities and policy fragmentation hinder equitable participation in digital governance, despite localized efforts to redefine AI literacy as a tool for sovereignty and civic empowerment (Khodabin & Arsalani, 2025).

Mishra (2021) critically investigated the opaque operations of the data brokering industry, highlighting its profound implications for privacy, autonomy, and ethical governance in the digital age. The article framed data brokers as entities operating in legal and ethical grey zones, often beyond the reach of accountability, while constructing detailed digital profiles—or "digital doppelgangers"—of individuals without their knowledge or consent. Mishra emphasized the structural gaps in existing legal frameworks that enable the persistence of such practices, particularly focusing on India's regulatory environment, where data protection legislation remains nascent and underdeveloped. The author argued that this regulatory inertia has allowed the unchecked growth of data brokerage, presenting both a privacy risk and a governance failure. Drawing on Sandra Wachter's theory of an ex-ante right to reasonable inference, the article advanced the need to distinguish between legitimate and illegitimate uses of inferred data, especially as such inferences increasingly determine individuals' access to credit,

employment, insurance, and other vital services. Mishra concluded by advocating for targeted legal reforms that address both the commercial exploitation of data and the ethical boundaries of algorithmic profiling, emphasizing the urgent necessity of establishing clear regulatory standards for a sector that wields disproportionate informational power.

Taylor et al. (2022) examined the structural and normative challenges of regulating contemporary data markets, which they argue remain conceptually opaque and under-theorized despite their growing social and economic significance. The authors sought to illuminate the complex dynamics of these markets by drawing upon insights from sociological and legal research on market formation, actor configurations, and regulatory strategies. They investigated how different types of data—personal, behavioral, and inferred—are traded among a diverse array of actors including tech companies, data brokers, and public institutions. The paper outlined the definitional and empirical challenges of capturing the extent and operation of the data market, emphasizing its fragmented and transnational nature. To contextualize regulatory possibilities, the authors drew analogies from regulatory frameworks in the food and pharmaceutical industries, highlighting how these models might inform efforts to govern the data economy. They contended that effective regulation of data markets requires not only increased transparency and accountability, but also a fundamental normative reorientation. Instead of privileging the economic valorization of data, regulation should prioritize aligning data practices with the rights, values, and needs of the individuals and communities implicated in data collection and use. The authors concluded that only through such a normative shift can regulatory frameworks meaningfully address the power asymmetries and societal risks embedded in the current data economy. These asymmetries are exacerbated by sector-specific implementation challenges—including infrastructural limitations, regulatory ambiguities, and uneven digital readiness—which collectively distort the operational realities of data markets (Khodabin et al., 2023).

Reviglio (2022) offered a critical and interdisciplinary analysis of the largely opaque and under-regulated data broker industry, positioning it as a central pillar of surveillance capitalism. Drawing on legal, political, and economic perspectives, the article examined how data brokers aggregate, infer, and commodify vast quantities of personal information—often without users' knowledge or consent—fueling systems of profiling, behavioral prediction, and market segmentation. Reviglio emphasized that data brokers are not merely marketing intermediaries, but key actors shaping data flows and enabling discriminatory practices, erosion of privacy, and potential national security risks. The paper traced the legal vacuum around these actors, contrasting the weak regulatory landscape in the United States with the comparatively stronger—but still inadequate—framework of

the EU's GDPR. Highlighting the limitations of individual consent and self-management models, the article called for systemic reforms including standardized global legal definitions, oversight authorities, protections against harmful inferences, and recognition of privacy as a collective good. Reviglio ultimately proposed a reimagining of data governance—possibly through a new international social contract for data—that balances innovation with rights-based protections and democratic accountability. This pattern reflects a broader capitalist phenomenon where societal norms become codified into extractive markets—whether through data brokerage or beauty standards—transforming collective values into private profit while systematically obscuring the resulting harms (Nosraty et al., 2020).

Manokha (2023) critically examined the General Data Protection Regulation (GDPR), challenging its prevailing status as the global "gold standard" for data protection. While acknowledging the regulation's formal recognition of individual ownership of personal data, the author argued that the GDPR ultimately operates within and reinforces a neoliberal framework. Specifically, the regulation was shown to support the organization of a commodified data market, wherein private data continues to be a source of substantial profit for corporate actors. Moreover, Manokha asserted that the GDPR exemplifies neoliberal governmentality by establishing a regulatory framework that delegates the responsibility for managing data-related risks to individuals, framing this devolution as a form of empowerment. These regulatory shortcomings take on geopolitical significance as studies demonstrate how inadequate governance frameworks exacerbate technological dependencies and limit nations' capacity to contest data sovereignty in an AI-driven world (Rahmatian, 2025). The article further analyzed how the GDPR entrenches asymmetrical power relations between service providers and users. The reliance on user consent—typically granted through the acceptance of lengthy and complex terms of service (ToS)—was critiqued as a mechanism that renders data collection and monetization legally permissible while masking the coercive dynamics at play. For many users, particularly those engaged in platform-based work, the option to reject ToS is practically unavailable due to the essential nature of the services offered. Consequently, the act of consent becomes largely performative, sustaining the commodification of personal data under the pretense of informed choice. Manokha concluded that the GDPR, rather than mitigating the excesses of data capitalism, may instead legitimize and stabilize them through its neoliberal underpinnings. This critique resonates with non-Western scholars' analyses of how dominant AI governance frameworks—even those ostensibly protective like GDPR—often institutionalize epistemic hierarchies, privileging Eurocentric models of data sovereignty while marginalizing alternative visions (Hosseini & Sakhaei, 2025).

Cespedes (2023) critically explored the emerging use of geofence warrants in abortion-related criminal investigations following the U.S. Supreme Court's decision in *Dobbs v. Jackson Women's Health Organization*, which overturned *Roe v. Wade*. The article addressed the novel intersection of reproductive rights and digital surveillance technologies, with particular attention to the legal, ethical, and constitutional concerns raised by law enforcement's use of geofence warrants—a form of reverse-location warrant that compels tech companies to provide data on all mobile devices within a specified area during a set time period. Rather than focusing on the settled constitutional dimensions of geofence warrants, Cespedes highlighted the unresolved legal status of this investigative tool and its potential implications for individuals in states with criminal abortion bans. The article demonstrated how geofence warrants could be used to track individuals who visit reproductive health clinics, thereby enabling targeted prosecutions and eroding privacy rights under the Fourth Amendment. Cespedes critically analyzed current jurisprudence, noting that while courts have not yet declared geofence warrants unconstitutional, their sweeping nature often lacks the particularity and probable cause required by the Fourth Amendment. The paper emphasized that these warrants disproportionately expose innocent individuals to government scrutiny. In conclusion, the article advocated for proactive legislative intervention at both state and federal levels to curb the potential misuse of geofence warrants in post-*Roe* abortion enforcement. By raising awareness of the surveillance risks inherent in such technology, Cespedes underscored the urgent need for robust legal safeguards to protect reproductive autonomy and digital privacy in the United States.

Staszkiewicz (2023) critically examined the ethical and policy dimensions of personal data exchanges, emphasizing how the rise of data-intensive technologies—particularly big data analytics and machine learning—has reshaped power dynamics between individuals and corporate actors. Her thesis argued that current regulatory frameworks inadequately protect consumer privacy, failing to address the moral hazards, informational asymmetries, and coercive market conditions that characterize digital interactions. Through an interdisciplinary approach bridging philosophy, economics, and law, Staszkiewicz developed three key analyses: first, a principal-agent framework revealing how consumers (principals) entrust their data to firms (agents) despite misaligned incentives and poor transparency; second, an argument for imposing fiduciary duties of care, loyalty, and confidentiality on data-handling firms; and third, a critique of industry concentration, advocating for antitrust measures to reduce corporate dominance and foster competition based on privacy-enhancing features. She further contended that prevailing consent mechanisms—typically reliant on complex and opaque privacy notices—fail to constitute

meaningful informed consent, especially given behavioral research on the privacy paradox and user malleability. The study concluded by proposing comprehensive reforms including stronger default privacy protections, consumer education on data rights, and systemic regulatory restructuring aimed at restoring informational self-determination and democratic accountability in the digital economy.

Zook and Spangler (2023) explored the political economy of data through the lens of transparency practices in data broker platforms, arguing that transparency is not inherently democratizing but rather a strategic discursive and infrastructural tool that enables the commodification and financialization of data. Framing their analysis around the 2007–2008 global financial crisis (GFC), the authors posited the crisis as a "crisis of data", one that precipitated the rise of FinTech firms that rely on reconstructing trust through curated transparency. Drawing on case studies of BlackRock and dv01, both major players in the debt data ecosystem, the article illustrated how transparency functions as a set of contingent practices—namely, building relationality, increasing granularity, managing directionality, and creating legibility—that transform opaque datasets into actionable financial assets. These practices do not inherently lead to greater equity or accountability; instead, they serve to stabilize and legitimate data as a tradable commodity in increasingly financialized markets. The authors critiqued the assumption that increased transparency guarantees better governance, arguing instead that it often conceals power asymmetries and reinforces platform dominance in data-intensive markets. By revealing how transparency is operationalized in service of data valuation and market control, Zook and Spangler offered a critical geography of data infrastructures, urging scholars and policymakers to reassess the emancipatory claims often associated with open data discourses.

Bapte and Katkhede (2024), in their report for Oregon State University, provided an extensive ethical analysis of algorithmic media recommender systems used across major digital platforms such as Netflix, YouTube, Instagram, and Reddit. The authors examined how these AI-driven systems, designed to optimize user engagement, raise significant ethical and social concerns, including the reinforcement of filter bubbles, data privacy risks, algorithmic bias, and the amplification of sensational or polarizing content. By contextualizing these systems within the frameworks of surveillance capitalism and user manipulation, the report critiqued how recommendation algorithms operate under opaque mechanisms that prioritize platform profitability over user well-being and informed consent. A critical section of the report focused on power imbalances and justice implications, highlighting how recommender systems often marginalize independent content creators, exacerbate existing societal inequalities, and compromise user autonomy by shaping preferences through opaque,

data-driven profiling. Technically, the authors provided a detailed overview of how recommendation systems evolved from collaborative filtering to deep learning models, incorporating explainability and context-aware techniques. Despite the technological sophistication, the report underscored the necessity for increased transparency, fairness, user empowerment, and regulatory oversight to mitigate the ethical challenges posed by these systems. The study concluded with a call for ethically-grounded innovation in recommender systems, emphasizing interdisciplinary collaboration to realign their design with democratic and inclusive values. These findings underscore the urgent need for media literacy to counterbalance algorithmic manipulation—equipping users to recognize and resist the psychological hooks embedded in recommendation systems (Sakhaei et al., 2023).

Hutchinson, Suwana, and McTernan (2024) examined how social, technological, and political developments have converged to solidify the dominance of data-driven capitalism—specifically surveillance capitalism—in the global social media landscape. The authors argued that this convergence prioritizes corporate data extraction and commodification practices at the expense of individual privacy. While the implications of such systems have been extensively critiqued in the Global North, the chapter highlighted how their consequences are still unfolding in the Global South, where regulatory structures are often weaker and platform governance more complex. The chapter also explored the dual pressures facing social media companies: on one hand, the drive to monetize user data through algorithmic personalization and surveillance; on the other, the growing political and societal demands for content moderation, especially to combat misinformation and harmful content. This tension between freedom of expression and the need for privacy and content oversight was positioned as a central concern in current policy debates. The authors emphasized that navigating these tensions requires greater scrutiny of how platform governance aligns—or conflicts—with democratic values, particularly in diverse geopolitical contexts. These systemic tensions reveal a fundamental paradox of digitalization—where tools promising connection often exacerbate structural inequalities, demanding media literacy initiatives that empower critical engagement while addressing differential vulnerabilities across populations (Sakhaei et al., 2024).

3.2. AI for disaster risk management

A growing body of academic literature underscores the transformative potential of AI in DRM, highlighting its capacity to enhance decision-making across all phases of the disaster cycle. From peer-reviewed journal articles to policy-focused reports, scholars consistently emphasize AI's utility in improving early warning systems, optimizing emergency response, supporting post-disaster recovery, and informing

proactive mitigation strategies. Research demonstrates how AI techniques—such as machine learning, natural language processing, and geospatial analysis—enable the integration and analysis of vast, complex datasets, thereby facilitating real-time situational awareness, predictive modeling, and efficient resource allocation. These capabilities are particularly vital in contexts characterized by rapid-onset hazards and data scarcity. Despite acknowledging limitations related to ethical risks, algorithmic bias, and infrastructural disparities, the academic consensus remains clear: when responsibly implemented, AI represents a powerful tool for strengthening resilience and reducing disaster impacts. This section reviews key scholarly contributions that validate AI's relevance in DRM, while critically examining the conditions necessary for its equitable and effective deployment.

Ogie, Castilla Rho, and Clarke (2018) conducted a systematic literature review to explore the role of AI in disaster risk communication, emphasizing its potential to enhance citizen and emergency responder engagement through more effective information dissemination. The review categorized existing research into two primary domains: (1) prediction and monitoring to support early warning systems, and (2) information extraction and classification to improve situational awareness during disaster events. Studies within the first category commonly employed machine learning algorithms to anticipate hazards and generate timely alerts, thereby facilitating proactive responses. The second category focused on using AI techniques such as natural language processing and data mining to analyze large volumes of unstructured data—such as social media posts and sensor feeds—for real-time event detection and information curation. These capabilities were shown to be particularly valuable in rapidly evolving crisis environments, where timely and accurate communication is critical. The authors also highlighted several open challenges, including data quality issues, interpretability of AI models, and the need for adaptive frameworks that can function effectively across diverse geographic and socio-political contexts. The paper concluded with a call for more interdisciplinary research and the development of robust AI tools tailored to local needs, with an emphasis on scalability, transparency, and ethical considerations. These findings offer a foundation for future research aimed at leveraging AI to enhance the clarity, relevance, and timeliness of disaster risk communication.

Izumi et al. (2019) investigated the landscape of innovations in disaster risk reduction (DRR), highlighting both technological and process-based innovations and their integration into policymaking. The study was framed by the Sendai Framework's emphasis on science and technology in DRR and addressed persistent gaps in translating scientific advancements into practice, especially in developing contexts. Through a survey of 228 stakeholders—including academics, government officials, NGO workers, and private sector actors—the

authors identified the most impactful DRR innovations. These included community-based disaster risk reduction (CBDRR), geographic information systems (GIS) and remote sensing, hazard mapping, disaster risk insurance, and indigenous DRR technologies. Notably, both high-tech products (e.g., drones, disaster-resilient materials) and participatory approaches (e.g., assessments, national platforms) were found to be critical, emphasizing that effective DRR innovations extend beyond purely technological solutions. The study proposed a tripartite framework for advancing DRR innovation: fostering regular multi-stakeholder networking, promoting coproduction of knowledge between researchers and practitioners, and strengthening the role of academia in communicating actionable science. The authors called for broader dissemination of effective innovations, capacity building to support implementation, and further research into emerging tools, including artificial intelligence, particularly for climate-related disasters. The findings underscore the importance of aligning innovation with local needs and governance structures to ensure sustainable and inclusive DRR strategies.

Deparday et al. (2019) produced a practical guidance report for the World Bank, examining the role of machine learning (ML)—a subset of artificial intelligence—in enhancing evidence-driven DRM. The report aimed to demystify ML for a diverse audience including project managers, policy makers, and data scientists by illustrating its relevance, utility, and limitations within DRM contexts. The authors began by framing the complexity of DRM, which necessitates the integration of diverse data sources and models, such as for weather forecasting, seismic hazard mapping, and urban exposure assessments. In this context, ML was presented as a valuable tool capable of uncovering complex patterns in large, heterogeneous datasets to support tasks ranging from real-time hazard detection to long-term risk analysis. The report highlighted how ML has benefited from rapid advances in computational power and data availability, enabling applications such as remote sensing-based damage detection, social media data analysis for situational awareness, and dynamic risk modeling. Through DRM-specific case studies, the authors showcased how ML has been applied to flood prediction, landslide susceptibility mapping, and building damage classification following disasters. Importantly, the report cautioned that ML should not be viewed as a panacea; it requires careful design, validation, and contextual understanding, particularly to avoid biases and ensure interpretability. The document concluded with practical recommendations and resources for DRM professionals looking to adopt ML approaches responsibly and effectively.

Sun, Bocchini, and Davison (2020) conducted a comprehensive review of the applications of AI in disaster management, analyzing its use across the four key phases: mitigation, preparedness, response, and

recovery. The study catalogued a wide range of AI techniques—such as machine learning, deep learning, expert systems, and evolutionary algorithms—and examined how these tools support data-driven decision-making in disaster contexts. The review revealed that the majority of AI applications are concentrated in the response phase, where technologies such as image recognition, natural language processing, and predictive analytics are deployed to assist with real-time situational awareness, search and rescue operations, and damage assessments. In the mitigation and preparedness phases, AI has been utilized for hazard modeling, risk assessment, and early warning systems, contributing to the identification of vulnerable areas and proactive planning. Recovery applications, though less prevalent, include post-disaster damage estimation and resource allocation. The study also presented examples of practical AI-based decision support tools that are operational or under development, highlighting their potential to improve disaster resilience. However, the authors noted several challenges that limit widespread implementation, including data scarcity, interoperability issues, lack of transparency in AI models, and the need for greater collaboration between AI developers and disaster management professionals. They concluded by calling for future research focused on developing robust, interpretable, and context-sensitive AI solutions that address the specific needs of disaster-prone communities.

Kemper and Kemper (2020) presented a comprehensive analysis of emerging technologies—specifically sensor fusion, GIS, and AI—in the context of DRM. The paper underscored the growing frequency and intensity of both natural and anthropogenic disasters due to urbanization and climate change, highlighting the need for advanced geospatial tools and integrated systems across all phases of DRM: mitigation, preparedness, response, and recovery. The authors explored the applications and advantages of a wide array of spatial data technologies, including thermal imaging, LiDAR, radar, hyperspectral and optical satellite sensors, aerial imagery, UAV-based systems, and oblique camera systems. These tools contribute to rapid data acquisition and enhanced situational awareness. A key emphasis was placed on the synergy between these sensors and GIS environments, which enables efficient risk assessment, emergency planning, and real-time mapping. Moreover, the integration of AI and machine learning, particularly for geospatial risk analysis and post-disaster assessment, was identified as a pivotal advancement. Applications included landslide susceptibility mapping, flood prediction, and filtering social media data for relevant information during crises. The paper advocated for interdisciplinary cooperation and metadata management to maximize the value of these technologies. It concluded that combining multi-sensor platforms, AI methods, and GIS software significantly improves DRM capabilities and supports sustainable development by enhancing data-driven decision-making and community resilience.

Gevaert et al. (2021) examined the intersection of AI and DRM, emphasizing the ethical implications surrounding fairness, accountability, and transparency (FAccT). The perspective highlighted how AI, particularly when integrated with geospatial data in DRM, introduces risks related to bias, diminished transparency, and weakened local accountability. The authors pointed out that AI systems used in DRM often rely on data from satellites, drones, and social media, which may not fully capture or represent vulnerable populations, especially in low- and middle-income countries (LMICs). This underrepresentation can lead to biased models and exclusionary aid distribution. Additionally, the complexity of AI models may reduce interpretability, hindering the ability of stakeholders—including local communities and governments—to understand, challenge, or trust the outcomes. The paper advocated for context-aware, inclusive AI practices that incorporate local knowledge and values into algorithm design and validation processes. The authors further recommended fostering interdisciplinary collaboration between data scientists and experts in ethics and social sciences to ensure AI applications in DRM align with humanitarian principles and promote epistemic justice. By tracing the historical evolution of humanitarianism, the article also proposed a shift towards "neoclassical humanitarianism", which reconciles technical advancements with human-centered values. This approach underscores the importance of local participation and diverse value systems in shaping ethical AI for DRM. The perspective ultimately calls for integrating FAccT principles in a way that respects cultural contexts, enhances accountability, and reduces the epistemic injustice that often arises when affected populations are excluded from technological decision-making. These challenges mirror AI's dual-edge across sectors—while offering transformative potential in fields from disaster response to healthcare, its implementation consistently grapples with systemic inequities that demand interdisciplinary, value-sensitive governance frameworks (Toosi et al., 2025; Bahmani & Javaheri Tehrani, 2025).

Abid et al. (2021) conducted a systematic review to explore the role of AI in enhancing disaster management, emphasizing its integration with geographic information systems (GIS) and remote sensing (RS) technologies. The review analyzed literature from 2015 to 2020, drawing on major databases including Scopus, Web of Science, and Science Direct, ultimately synthesizing 100 studies after a rigorous screening process. The findings underscored AI's applicability across all four phases of disaster management—mitigation, preparedness, response, and recovery—with a predominant focus on the response phase. AI techniques such as machine learning, deep learning, robotics, and convolutional neural networks were highlighted for their effectiveness in tasks like hazard prediction, damage assessment, social media data analysis, and emergency logistics. GIS and RS were shown

to significantly support spatial analysis and visualization, enhancing situational awareness and real-time decision-making. The study also introduced the MOBILISE platform, an AI-powered, multi-agency system for disaster risk reduction, offering functionalities such as VR-based hazard mapping and real-time data visualization. Challenges identified included data integration, model accuracy, real-time processing, and the need for multi-disciplinary collaboration. The authors concluded that AI, when combined with advanced geospatial technologies, holds substantial promise for transforming disaster management, particularly in enabling faster and more informed responses, and advocated for ongoing research and infrastructure development to optimize these tools' practical deployment. However, real-world implementation faces systemic barriers, as evidenced by studies of Global South contexts where institutional fragmentation, geopolitical exclusions, and interoperability gaps undermine AI's potential despite technical advancements (Soroori Sarabi, 2025). Studies emphasize that realizing this transformative potential requires parallel investments in workforce training and ethical frameworks, as AI implementation consistently depends on both technical capabilities and human expertise (Tomraee et al., 2024).

Hosseini, Khodabin, Soroori Sarabi, and Sharifipoor Bgheshmi (2021) carried out a systematic review to investigate the role of artificial intelligence (AI) in disaster risk management (DRM), with particular emphasis on the ongoing need for professional education in this area. From an initial pool of 105 studies, they selected and analyzed 37 peer-reviewed articles, highlighting AI's impact on early warning systems, hazard forecasting, resource distribution, and real-time decision-making across the various stages of disaster management. The authors organized the literature into four main themes: AI-based crisis response, early warning and risk evaluation, continuous professional development, and ethical issues. They argued that the effective integration of AI in DRM requires not only technological progress but also the development of AI literacy and ethical understanding among stakeholders. The review identified significant challenges, including data reliability, the interpretability of AI models, algorithmic bias, and unequal infrastructure. It emphasized the need for inclusive, interdisciplinary educational initiatives and governance frameworks to promote transparent and fair AI applications. The study also addressed the use of AI for analyzing social media sentiment during crises and underscored the necessity of addressing public perception and misinformation. Ultimately, the authors concluded that sustained education and ethical innovation are critical to fully realizing AI's potential in enhancing disaster resilience and response efforts.

Tan et al. (2021) conducted a systematic review to evaluate the application of AI models in natural disaster management (NDM), aiming to detect methodological trends and assess the efficacy of AI

across various disaster scenarios. Drawing from 278 peer-reviewed studies sourced from Elsevier Science, Springer LINK, and Web of Science, the review provided a comprehensive analysis of how AI has been utilized across the different phases of disaster management—mitigation, preparedness, response, and recovery. The study catalogued the application of diverse AI methods, including neural networks, support vector machines, decision trees, and ensemble models, identifying their respective strengths in handling nonlinear, high-volume data with superior accuracy and efficiency. It was observed that most research focused on response and preparedness stages, with particular attention to flood prediction, landslide susceptibility, earthquake detection, and wildfire spread modeling. The authors highlighted that while AI models demonstrated strong potential in enhancing disaster prediction and situational awareness, several gaps persisted—especially in the integration of multi-hazard models, validation of algorithms in real-world conditions, and the inclusion of social and infrastructural dimensions. The review also noted uneven geographic representation, with limited studies from developing regions. The paper concluded with recommendations for advancing AI research in NDM, including improving model generalizability, fostering interdisciplinary collaboration, and enhancing transparency and interpretability of AI tools to support decision-making. This review not only synthesized current modeling practices but also set a roadmap for future innovation and implementation of AI in disaster contexts.

Munawar et al. (2022) conducted a comprehensive review exploring the potential of disruptive technologies in enhancing DRM within urban contexts, particularly emphasizing their application in the development of smart and resilient cities. The authors examined a spectrum of technologies including AI, Internet of Things (IoT), big data analytics, image processing, cloud computing, and mobile applications, identifying both their current usage and the challenges hindering broader implementation. By conducting a systematic search and evaluation of the literature, the study critically examined 120 peer-reviewed articles. It introduced a conceptual framework that combines big data and artificial intelligence to enhance real-time disaster prediction, monitoring, and response. The review included case studies illustrating practical implementations, such as AI-powered flood forecasting systems, IoT-based early warning infrastructures, UAVs for post-disaster damage evaluation, and mobile applications designed for emergency communication. The authors emphasized the transformative impact of these technologies across all phases of disaster risk management—mitigation, preparedness, response, and recovery. However, they also acknowledged several challenges, including concerns over data privacy, gaps in policy, and infrastructural deficiencies, especially in low-resource or developing regions. They advocated for a policy shift that incorporates digital solutions into

national disaster strategies and emphasized the need for global standards and collaborative efforts among governments, academia, and industry. Ultimately, the study argued that strategic deployment and scaling of disruptive technologies could significantly enhance urban resilience, aligning with global goals such as the Sendai Framework and the Sustainable Development Goals. Research confirms that successful deployment of these technologies requires addressing three universal challenges: (1) workforce training gaps, (2) ethical governance frameworks, and (3) human-technology collaboration protocols-challenges consistently identified across both disaster management and healthcare AI implementations (Tomraee et al., 2022). These challenges are magnified in contexts with structural inequalities, where deficits in technological infrastructure and institutional preparedness—even in nominally well-resourced systems—create disproportionate barriers to effective implementation, mirroring patterns seen in crisis-response scenarios (Mohammadi & Kharazmi, 2021).

Moitra et al. (2022) examined the intersection of AI and DRM from a practitioner-focused perspective, offering critical insights into the social consequences and ethical implications of AI integration in this domain. The study centered on a convening of technical experts and practitioners in DRM to deliberate on the negative impacts of AI applications and to explore mitigation strategies and persistent challenges. While AI is increasingly heralded for its potential to enhance data collection, analysis, and decision-making in DRM—making these processes faster, more cost-effective, and more accurate—the authors highlighted a growing body of evidence demonstrating that these technologies can also introduce harm, particularly when deployed without sufficient ethical oversight. Through a series of discussions and collaborative reflections, the study uncovered significant concerns related to bias, opacity, and the detachment of AI developers from the communities affected by disasters. Moreover, the authors observed that critical and ethical AI scholarship has paid relatively little attention to the DRM context, thereby neglecting a vital area where social stakes are high and decisions can have life-or-death consequences. The paper concluded by advocating for more inclusive and reflective design processes that involve domain practitioners throughout the development lifecycle of AI systems, with the aim of fostering responsible innovation and minimizing unintended harm in disaster response and preparedness activities.

Thekdi et al. (2022) proposed a novel conceptual framework to evaluate the synergies and limitations between AI and disaster risk analysis. Acknowledging that AI methods have transformed fields like healthcare and infrastructure, the authors argued that the integration of AI into DRM remains underdeveloped and conceptually fragmented. They identified a need to reconcile AI's data-centric approaches with

foundational principles of risk science—such as uncertainty management, system thinking, and ethical oversight. Using a combination of literature review, keyword analysis, and a topic modeling method (Latent Dirichlet Allocation), the study mapped the landscape of AI applications in DRM and identified key thematic areas such as flood modeling, data management, system simulation, and human impact analysis. The authors then engaged 40 experts in AI and risk science through a survey to assess the effectiveness of integrating AI into DRM along multiple dimensions, including automation, transparency, ethical accountability, and domain knowledge incorporation. Results showed optimism regarding AI's potential for automating labor-intensive tasks and leveraging big data, but also highlighted significant deficiencies in addressing uncertainty, ensuring explainability, and managing legal, ethical, and social implications. The study culminated in a framework designed to guide the development, evaluation, and regulation of AI tools in DRM, advocating for a balanced, interdisciplinary approach that embeds risk principles into AI design and implementation. The authors concluded that without such integration, AI's role in DRM could remain superficial or even counterproductive, and called for greater collaboration between the AI and risk analysis communities.

Velev and Zlateva (2023) provided a comprehensive analysis of the challenges associated with the application of AI in DRM. The study acknowledged the growing potential of AI in supporting DRM activities—from early prediction to real-time response and post-disaster recovery—but emphasized the complexity of integrating AI effectively and ethically. The authors identified several major challenges, including the necessity for high-quality, diverse, and secure data; computational infrastructure limitations; integration difficulties with existing emergency systems; and issues around transparency, accountability, and bias in AI decision-making processes. Furthermore, the paper highlighted the technological tools essential to DRM, such as IoT, edge computing, remote sensing, social media analytics, and cloud computing, each contributing valuable real-time and large-scale data for AI processing. Specific AI techniques discussed included machine learning, deep learning, natural language processing, and optimization algorithms, which enable risk assessment, damage evaluation, early warning systems, and decision support. Despite its advantages, the paper stressed the critical importance of maintaining human oversight and ethical standards, advocating for robust data governance, interdisciplinary collaboration, public awareness, and regulatory compliance. The authors concluded that while AI offers transformative capabilities for DRM, its successful deployment depends on addressing its technical, ethical, and operational constraints through continued research, development, and policy integration.

Ghaffarian, Taghikhah, and Maier (2023) conducted a systematic

literature review to examine the integration of explainable artificial intelligence (XAI) into DRM, addressing the challenges of interpretability and transparency in AI-driven decision-making. Drawing from 195 initial publications, the authors selected 68 studies for in-depth analysis to identify prevailing trends, methods, case studies, and challenges associated with XAI-DRM applications. The review found a notable increase in XAI-DRM research post-2021, with a strong focus on flood, landslide, wildfire, and earthquake risk modeling. The most common AI techniques included random forests, gradient boosting, and convolutional neural networks, typically used for predictive tasks such as hazard susceptibility mapping and damage assessment. Post-hoc model-agnostic methods like SHAP and LIME dominated the explainability landscape, offering insights into feature importance and model behavior. However, the authors emphasized the scarcity of ante-hoc or inherently interpretable models and hybrid approaches. The study also noted a significant reliance on remote sensing data and identified a lack of applications addressing multi-hazard scenarios, socio-economic vulnerabilities, and the recovery phase of DRM. Key recommendations included advancing hybrid XAI frameworks, promoting multi-hazard analysis, embedding explainability in early warning systems and digital twins, and enhancing stakeholder engagement through transparent AI tools. The authors concluded that while XAI holds substantial promise for enhancing trust and accountability in AI-assisted DRM, its adoption remains limited and uneven, necessitating further interdisciplinary research and policy integration.

Bari et al. (2023) conducted a critical appraisal to assess the feasibility and potential of AI in enhancing disaster risk and emergency health management, particularly through the lens of environmental health. Drawing on literature sourced from PubMed, Google Scholar, and Scopus, the study emphasized the pressing need for timely and accurate health risk evaluations during natural disasters, which are essential for safeguarding population health in crisis scenarios. The authors posited that AI technologies—ranging from predictive analytics to intelligent decision-support systems—could significantly improve the responsiveness and precision of healthcare delivery during emergencies. These tools offer the capacity to process vast datasets from multiple sources (e.g., environmental sensors, satellite imagery, epidemiological records) to anticipate and monitor disaster-related health threats, such as disease outbreaks or infrastructure strain. The paper highlighted AI's emerging role as a transformative force in the Fourth Industrial Revolution, suggesting that its integration into disaster and emergency health systems could be a decisive step toward resilient and adaptive public health infrastructure. Although largely conceptual, the appraisal urged policymakers and health authorities to embrace AI innovations to mitigate the health consequences of

disasters. The authors concluded that while challenges remain—such as ethical concerns, data governance, and infrastructural limitations—the strategic deployment of AI has the potential to revolutionize emergency health management in disaster-prone contexts.

Dai et al. (2024) conducted a scoping review to explore the application of AI in urban ecosystem-based disaster risk reduction (Eco-DRR), aiming to clarify the conceptual synergies between AI technologies, ecosystem services, and natural hazard mitigation. Employing the PRISMA-ScR framework, the authors systematically analyzed 76 peer-reviewed studies across 24 countries, focusing on the integration of AI in Eco-DRR strategies such as green infrastructure, ecosystem service evaluation, and dynamic monitoring. The review identified four primary Eco-DRR procedures—ecosystem service assessment, disaster risk assessment, plan decision-making, and monitoring and evaluation—mapped against AI objectives of learning, discovery, and reasoning. Floods and extreme heat emerged as the most commonly addressed hazards, with AI used primarily for decision optimization and risk profiling. Parcel- and city-scale studies were most frequent, indicating a growing urban focus. The review highlighted AI's capacity to process complex spatial-temporal data, enhance decision-making, and optimize planning under conditions of uncertainty. Importantly, the study introduced a theoretical framework linking natural disaster types, Eco-DRR objectives, and appropriate AI methodologies. Key challenges identified included vague Eco-DRR objectives, data heterogeneity, and underutilization of AI in dynamic and participatory planning. The authors concluded that while the field is in its early stages, there is significant potential for AI to support adaptive, ecosystem-integrated urban resilience strategies, especially when paired with traditional models and real-time sensor data.

Adonis (2025) conducted a systematic review to assess the integration of AI in disaster risk management (DRM), with particular attention to its application in developing regions. The review evaluated the use of AI technologies throughout the disaster management cycle—preparedness, response, recovery, and mitigation—focusing on underrepresented areas such as South and Southeast Asia, Latin America, the Caribbean, East and South Africa, and Ghana. Following PRISMA guidelines, the study screened 150 records and synthesized findings from 35 peer-reviewed articles and reports. It explored various AI applications, including predictive modeling, natural language processing, geospatial analysis, and AI-driven decision support systems. The results underscored AI's potential to improve risk assessment, streamline resource allocation, strengthen early warning mechanisms, and support post-disaster reconstruction efforts. However, the review also identified critical barriers, such as technological and infrastructural constraints, concerns about data privacy, algorithmic bias, opacity in AI processes, and ethical challenges—particularly those

involving inclusivity and the representation of marginalized communities. The study concluded by highlighting the importance of cross-sector collaboration, increased digital literacy, and the development of ethical AI frameworks tailored to local contexts and humanitarian values. Recommendations included promoting AI applications in multi-hazard settings, advancing explainable AI, and integrating local knowledge systems to improve both technological equity and DRM efficacy in resource-constrained regions.

Eren and Duman (2025) examined the integration of AI into disaster management, proposing a comprehensive model that explores AI applications across all phases of disaster response. Framed by the increasing complexity and scale of both natural and human-made disasters, the study emphasized the transformative role of digital technologies, including AI, in enhancing societal resilience and disaster preparedness. Using secondary data sources, the authors developed a model that aligns AI functionalities with key disaster management tasks such as data collection, early warning, communication, simulation, search and rescue, and damage assessment. They underscored how AI technologies—ranging from machine learning and natural language processing to robotics and UAVs—can improve situational awareness, facilitate rapid and informed decision-making, and enable efficient resource allocation. The study illustrated AI applications through global case studies, including flood prediction with Google's Flood Hub, wildfire modeling with CSIRO's Spark system, and post-earthquake damage detection using xView2. In Türkiye, examples included AI-supported facial recognition tools for reuniting displaced individuals and autonomous UAVs for real-time disaster mapping. However, the authors cautioned that AI implementation remains challenged by data quality issues, technological disparities, and the need for high computational infrastructure. They recommended addressing data privacy concerns, enhancing AI's adaptability in low-resource settings, and investing in AI-driven training for both public and emergency personnel. The paper concluded by affirming AI's significant potential in reducing the human and economic toll of disasters when thoughtfully integrated into policy and practice.

4. Discussion and Conclusion

This study set out to critically examine the dual role of AI in contemporary society, focusing on its entanglement with surveillance capitalism and its potential in DRM. The findings reveal a stark contrast between these two trajectories. On one hand, AI has been weaponized by BigTech corporations and data brokers to deepen systems of surveillance and commodification. As Zuboff (2019), and Crain (2016) have argued, the extraction and monetization of personal data through AI-driven platforms are not isolated phenomena but are core to the economic architecture of surveillance capitalism. This data regime

thrives on asymmetries of power and information, where users are rendered increasingly transparent to corporations while the workings of algorithms and data markets remain opaque. The rise of social media and personalized recommendation systems has only intensified this trend, allowing corporations to harvest behavioral, emotional, and locational data on an unprecedented scale, often without meaningful consent (Stjernfelt & Lauritzen, 2020; Bapte & Katkhede, 2024). These developments present profound challenges for democracy, privacy, and civic autonomy.

In contrast, a growing body of research highlights the potential for AI to serve vital public interest goals (Shahghasemi, 2025), particularly in the context of disaster risk management. Scholars across disciplines have demonstrated how AI can be deployed to enhance early warning systems, streamline emergency response, and optimize post-disaster recovery efforts (Abid et al., 2021; Ogie et al., 2018; Sun et al., 2020). Techniques such as machine learning, geospatial intelligence, and natural language processing have enabled the analysis of vast, complex datasets in real time, supporting decision-making under uncertainty and improving outcomes for vulnerable populations. These tools have proven especially valuable in low-resource settings and in response to climate-induced disasters, where traditional response mechanisms are often inadequate (Adonis, 2025; Dai et al., 2024). However, even in these constructive applications, concerns remain about algorithmic bias, lack of transparency, and the potential for data misuse, particularly when private corporations are involved in the development or deployment of AI tools. These risks underscore a systemic imperative: just as AI demands technical safeguards, digital environments require societal ones—particularly media literacy to cultivate critical engagement with algorithmic systems and resist the exploitative patterns endemic to surveillance capitalism (Arsalani et al., 2022).

To reconcile these challenges and offer a sustainable solution, this article presents the Public AI for Resilience (PAIR) framework. The framework is designed to preserve the life-saving potential of AI in disaster risk management (DRM) while protecting such technologies from the exploitative tendencies of the commercial data economy. PAIR rests on four interrelated pillars. The first emphasizes the need for data sovereignty and ethical governance, advocating for disaster-related data to be treated as a public good rather than a market commodity. This approach necessitates moving beyond fragmented policy regimes that lead to regulatory ambiguity and enforcement shortcomings—a concern highlighted by cross-sectoral governance comparisons, which reveal how inconsistent frameworks have contributed to enduring systemic risks (Taheri et al., 2022). This governance must acknowledge technology's dual nature—while IT systems can mitigate risks through data-driven innovation (Soroori Sarabi et al., 2023), their unregulated adoption often replicates the very

vulnerabilities they aim to solve, as seen in surveillance capitalism's erosion of privacy under the guise of optimization. Strong legal protections are required to prevent unauthorized data sharing and to ensure that communities retain control over how their data is used. Such protections must cultivate institutional trust—a sociological construct requiring robust oversight, separation of powers, and civil society engagement to create environments where legal safeguards are both enforceable and trusted (Kodabakhshi et al., 2021). Secondly, AI infrastructure for DRM should be democratized. This means prioritizing open-source development, public ownership, and participatory design processes that incorporate local knowledge and ethical reflection. Thirdly, explainability and accountability must be central to all AI applications in this space. Tools should be auditable and interpretable, especially in high-stakes contexts, to avoid the epistemic injustices that opaque models often perpetuate (Ghaffarian et al., 2023). Finally, cross-sectoral integration is essential. Governments, civil society organizations, academic institutions, and multilateral agencies must collaborate to develop and govern AI tools, ensuring they serve collective, not corporate, interests.

Conflict of interest

The authors declared no conflicts of interest.

Ethical considerations

The authors have completely considered ethical issues, including informed consent, plagiarism, data fabrication, misconduct, and/or falsification, double publication and/or redundancy, submission, etc. This article was not authored by artificial intelligence.

Data availability

The dataset generated and analyzed during the current study is available from the author on reasonable request.

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