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| RESEARCH ARTICLE

AI, Legal Pluralism, and Property Governance: Comparative Insights on Rulemaking and Enforcement from the U.S., U.K., Ukraine, China, and India

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| ABSTRACT
Artificial intelligence (AI) systems are set to assume a growing number of tasks that have been the traditional domain of human rulemaking and rule-enforcing agencies. However, the world into which AI will be deployed is one of legal pluralism and hybrid property governance. Building on legal pluralist scholarship and on parallel developments in the US, UK, Ukraine, China, and India, this article provides an exploratory analysis of how AI systems may fit with plural property rulemaking and enforcement regimes that encompass both formal law and informal social norms. We also use Elinor Ostrom's Institutional Analysis and Development (IAD) framework to analyze how AI systems may operate in a plural legal environment where local, community-specific, informal "rules-in-use" may depart from stated, formal "rules in books" to produce a system of hybrid property governance. AI has the potential to bring higher levels of efficiency and consistency to such administrative tasks. At the same time, we find that if AI systems are designed to ignore the social and legal pluralism in which they are embedded, they may well erode public trust, legitimacy, and justice in highly socially complex contexts that are too variable or local to be treated as standardized or to have rule-of-law principles uniformly imposed on them. We therefore argue that the operational design details of AI systems and their use in hybrid governance arrangements matter, that rule enforcement algorithms that are context-blind or context-oblivious are likely to have distributive impacts that increase conflict and injustice, and that the context matters because local governance arrangements do. Cases of socially contextualized AI property governance systems, from automated traffic cameras in India to predictive policing in the UK to mortgage fraud detection in the US, illustrate a tension between a desire to automate the standardized enforcement of rules using AI and people's desire for relational social norms. The article presents a framework and some concrete design considerations to help guide the participatory design of AI in plural property governance contexts that surfaces, engages, and accounts for stakeholders, local norms, and legitimacy criteria. In so doing, we aim to contribute to and expand the normative and institutional AI governance literature as well as the literatures on legal pluralism and institutional design.

| KEYWORDS
Artificial intelligence, informal norms, rule enforcement, governance, Ostrom, participatory design, housing cooperatives, smart surveillance, Ukraine, India, China, Europe

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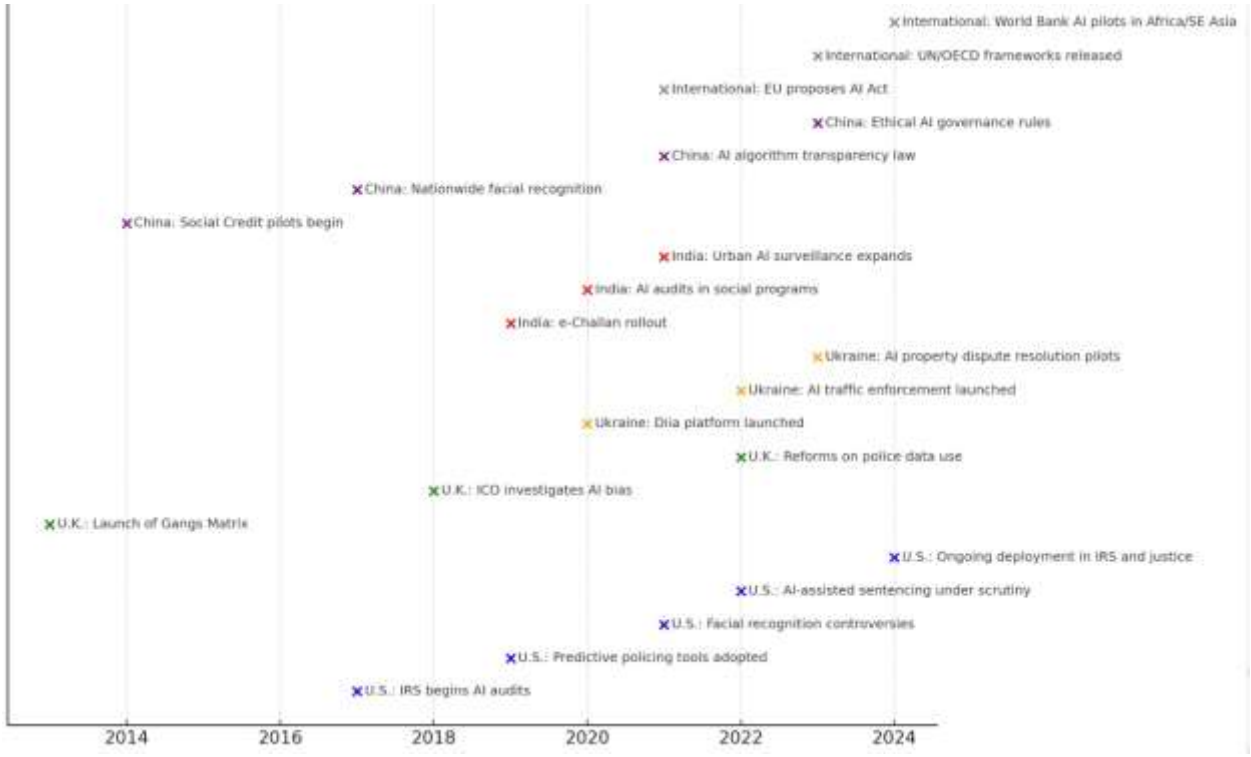
1. Introduction

The ability of the written text of property rules in common law or civil law jurisdictions to capture or reflect the on-the-ground dimensions and details of the local environment and shared understandings is usually limited. This is especially true about the local management of common-pool property at the community level and the norms of governance that might discipline and/or constrain free-riding behavior and conflict over shared property. The degree to which there is a gap between law in the books and property governance in practice is an important characteristic of property systems. It is also a central issue for any analysis of legal pluralism and comparative property institutions.

In this paper, we examine informal social rules, shared understandings, and community norms that exercise authority over property access and use in a variety of plural legal systems and comparative sites in the United States, the United Kingdom, Ukraine, China, and India. Using Elinor Ostrom's Institutional Analysis and Development framework to help organize and conceptualize our findings, we provide a lens through which to view the interactions between local, informal governance structures and institutions and state property law. We explore how rights are being enforced and property maintained in these legal pluralistic contexts.

Table: Milestones in AI-Driven Rules Enforcement (2013–2025)



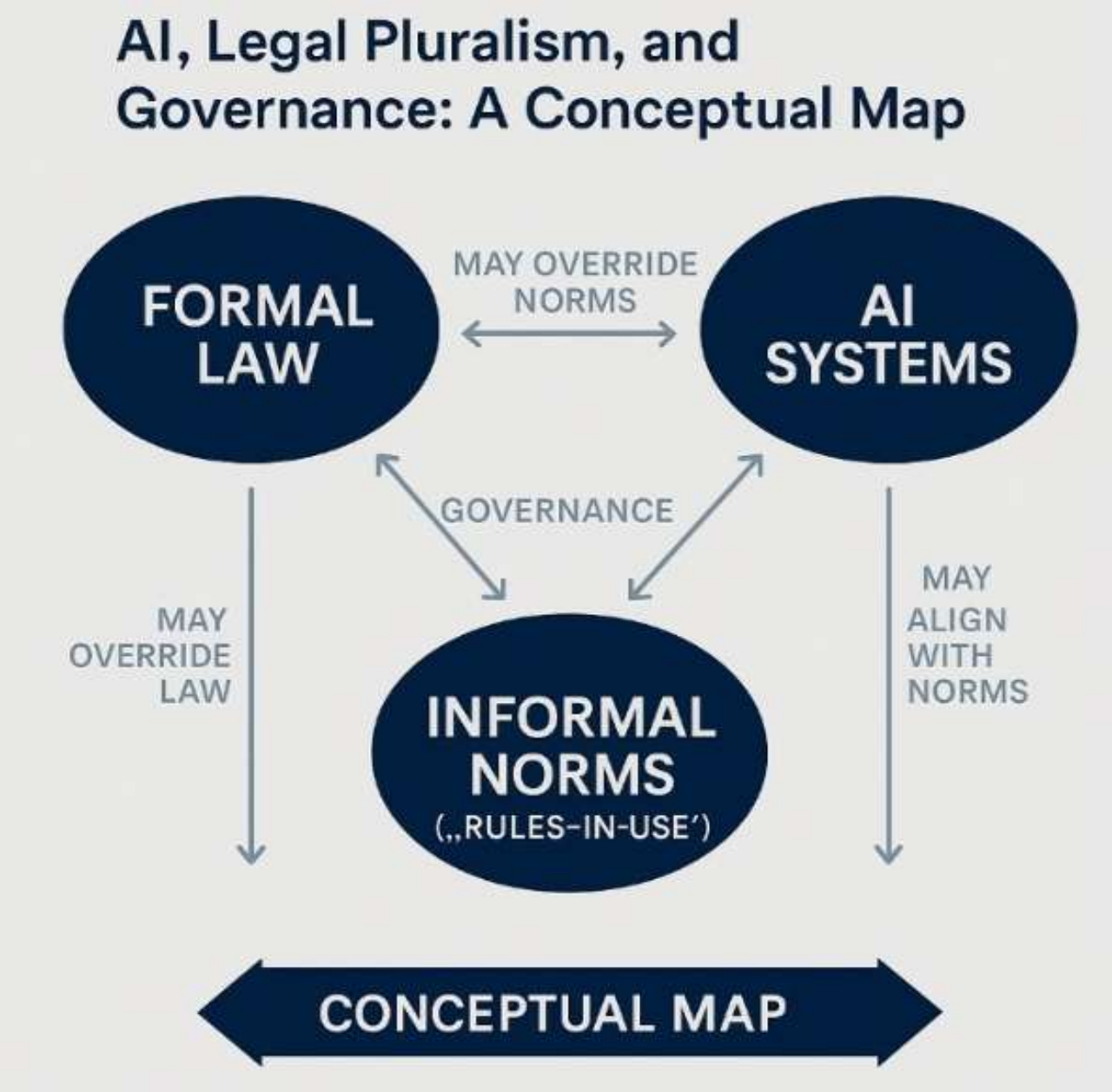
On the one hand, AI is and has the potential to be a viable option for institutional design and architecture to more efficiently enforce property and resource use. Such technological tools are already put to work in relatively modular ways by administration and police agencies to keep track of infractions, whether in the context of fraud detection, monitoring of movement and traffic restrictions, or ensuring tax payment. In most of these cases, the behavior of algorithms is strictly and contingently embedded in unambiguously defined legal and property regimes. In contrast, in a hybrid governance system, the use of AI may be hampered by problems of incomplete or biased data inputs, dissonance with or misrepresentation of local social norms, and vulnerability to cooptation for elite ends and perpetuation of power asymmetries.

In this paper, we take steps toward further understanding and investigating the potential for such a future and its contours for when AI and property governance operate in the presence of legal pluralism. We raise the question of AI adoption in property systems and argue for participatory, site-specific implementation where formal and informal institutions both contribute to the delineation of rights.

2. Theoretical Framework

Building on Elinor Ostrom's Institutional Analysis and Development (IAD) framework, as well as the nascent field of AI ethics and governance. Ostrom was prescient in pointing out that formal institutions do not wholly determine institutional behavior; instead, people develop "rules-in-use" through their social interactions. We adapt this observation to the domain of AI, arguing that enforcement technologies should be assessed in terms of their social legitimacy and appropriateness rather than solely their technical precision.

2.1 A Conceptual Map Diagram: AI, Legal Pluralism, and Governance



3. Methodology

Most of the research was done by way of a descriptive and explanatory comparative qualitative case study. The aim is to discern how AI relates to (interfaces with) and between (spans across) multiple property governance institutions. Six cases were chosen in different legal traditions and degrees of AI penetration to shed as much light on governance across jurisdictions as possible. Data was collected from sources including statute law and legal doctrine, scientific literature, and observational data based on fieldwork. Several institutional components were selected from each case based on Elinor Ostrom's Institutional Analysis and Development (IAD) framework in an effort to allow for both comparative understanding of action arenas and rules-in-use as well as potential resultant of governance. Cases also consider, where possible, how AI systems are in practice beginning to affect the enforcement of rules, clarity of access and exclusion, as well as perceived legitimacy in these systems. Intended as primarily exploratory, AI-informed cases also sketch a potential future or potential space for innovation, to the degree that they are actively being considered. At a more practical level, these cases may serve to point to areas for further study in designing digital tools to avoid undue disruption to more complex institutional configurations than themselves, particularly in legally plural contexts.

4. Case Studies

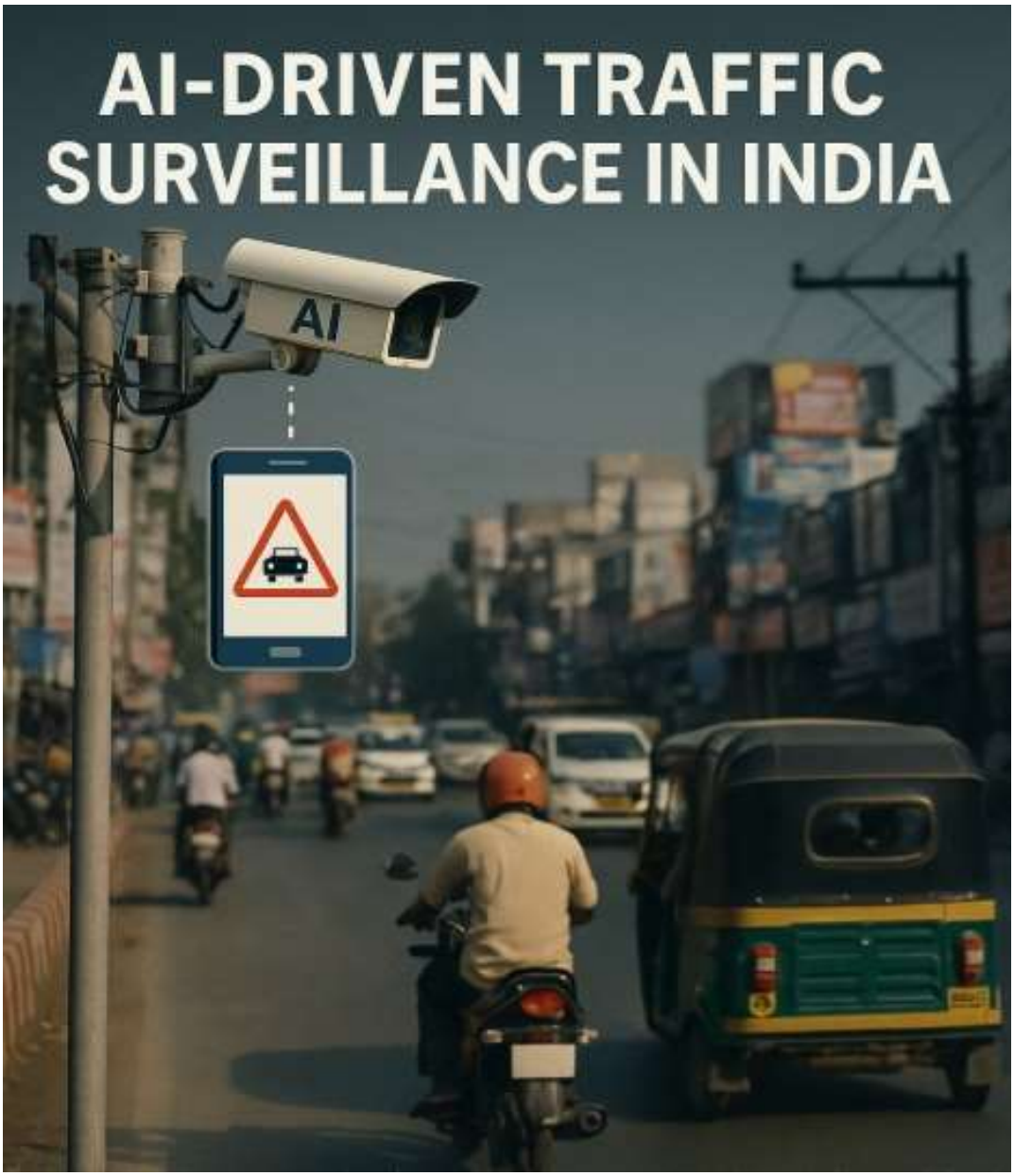
4.1 Ukraine: Housing Cooperatives and AI Enforcement

Ukraine, after the fall of the Soviet Union, reformed the management of multi-unit residential buildings to be built upon the idea of joint ownership and the housing cooperative as the legal framework for the multi-unit property. Ukraine's legal code with regard to housing cooperatives has a relatively loose definition for joint ownership, and is relatively silent on the organizational minutiae of how the unit is to be managed daily: maintenance, collection of fees and payment of bills, and resident disputes. Informal sources of governance – unwritten norms, collective decision-making, and deference to long-term community members – fill in these gaps.

Parallel to these reforms, Ukraine has been digitizing aspects of governance, most notably its e-governance platform Diia (Дія, "State in a Smartphone"), first released in 2020. Diia rapidly enabled Ukrainian citizens to perform several government transactions online, ranging from reporting property damage to digital IDs, and seems to have high scaling potential to streamline bureaucratic administration in Ukraine.

Diia is an example of Ukraine's public investment in public digital systems, but a written case study about an AI-powered means of enforcing housing cooperative fees, or an analysis about how such a system interacts with informal fee exemptions, is not publicly known. Discussion of any potential AI-powered fee enforcement rollout in the absence of this evidence would be highly speculative. Digital governance is a factor, but there is no known credible reporting of AI tools conflicting with informal norms with regard to Ukrainian housing.

4.2 India: AI-Driven Traffic Surveillance in India



India's cities are investing in AI-enabled traffic enforcement solutions. Their goal: to automate violation detection. Their challenge: adaptation to local driving cultures and ground realities of governance, both affecting trust and efficacy.

Here are three cases from across the country:

Ahmedabad: E-Challans & Context Insensitivity
A study of Ahmedabad's e-challan system found the algorithmic enforcement ignored contextual factors like occasional, justified, brief stops or customary halts at certain places, resulting in the bulk issuance of challans without local knowledge, context, or nuance.

Nagpur: Advanced Tech, Weak Follow-Through
Nagpur's Rs 197 crore Intelligent Integrated Traffic Management System uses high-resolution cameras, ANPR, and AI for violation detection. However, of over 3 million challans between 2021-2025, just 9.6 % reached court. This poor enforcement, despite technical capture of violations, is due to a lack of legal integration, manpower, and accountability, some warned, could make it a "costly but toothless technological showcase".

Mangaluru: Trials in Progress
Mangaluru is trying out around 200 AI-powered cameras. While violation alerts are sent to violators' phones, fines are being withheld till it's official integration with NIC and legal system backend — the trial being expected to transition to full enforcement on July 1, 2025.

These examples show that though AI systems are fast and effective in automatically generating fines, traffic rules themselves are not being enforced uniformly, this time, taking into account the local driving cultures. This is the reason for the backlash, which shows a challenge with one-size-fits-all rulebook enforcement in socio-culturally diverse societies. The three cases also reveal that AI tools developed in highly codified and consistent environments have significant limits when used in societies with deep cultural diversity and legal pluralism.

For more effective use of AI in traffic governance and more broadly, the design of tools for AI governance needs more localization, context-sensitivity, and enforcement processes with buy-in from the ground.

Highlights
Context Blindness: Standard rules and non-recognition of local behaviors are issues in AI enforcement in Ahmedabad, Nagpur, and Mangaluru. Case observations reflect that machine fairness algorithms face limited real-world impact when used out of context.

Violation Detection vs. Enforcement: Even when violations are identified and digitally captured, the lack of enforcement and integration with legal frameworks due to manpower and resource gaps is a challenge. The enforcement gap of Nagpur's system limits the perceived legitimacy of the system.

Trust and Efficacy: The lack of nuance in considering contexts and poor follow-up enforcement can lead to loss of trust and credibility, reducing compliance. Hence, the importance of developing tools for AI governance with local buy-in and with inbuilt mechanisms for context-sensitivity in mind.

Traffic AI systems are fast and effective in generating fines, but not in enforcing traffic rules, which require cultural understanding of the local driving communities.

4.3 China: Social Credit and Context-Blind Enforcement

China's Social Credit System (SCS) is a collection of provincial- and municipal-level public and private credit-rating pilots designed to nudge compliance through automated surveillance and scoring of behavioral data. China's SCS plans to "increase public trust and fight corruption", but numerous analyses have highlighted accidental and undesirable effects of the system's rigid design.

4.3.1 Punishing Social Norms

SCS pilots are well-documented to have at times sanctioned local social norms that were broadly tolerated and accepted by communities and other social actors, for example, minor public space violations that did not match pre-programmed rules for automated enforcement. This has led to increased public anxiety over the fairness, transparency, and contextual insensitivity of the system.

4.3.2 Contributing to Low Trust

The Mercator Institute on new risky technologies has also published research which has found that many of these pilots' emphasis on objective rule compliance regardless of local social norms has, in many cases, contributed to low public trust in these institutions and the risk of entrenching existing social divides. Academic research has made clear how one-size-fits-all enforcement can disproportionately impact the most marginalised members of society, and has also made the case for the need for procedural fairness protections in automated decision-making.

4.3.3 Key Takeaways

China's SCS example of poorly managed AI governance tools in a complex social setting shows the risk of backlash and generalized distrust in automation when a tool has no care for or interest in local history, culture, or values. The case suggests the need for relationality considerations in AI design to ground systems with both values and local normative expectations, and built-in and explicit transparency features.

SCS uses automation to enforce rules with behavioral data. The system is quick but may fine-tune local behavior. This lack of context can lower trust and shows a risk of using AI without local awareness.

4.4 United States: AI in Federal Agencies– The Risk of Blind Automation

AI has also been used in federal agencies in the United States for tasks such as fraud detection, benefits eligibility determinations, or tax audit selection. The Administrative Conference of the United States (ACUS) states that 45% of US federal agencies had piloted AI or machine learning by 2020 and notes that algorithmic decision-making systems are already widely

used in enforcement or benefits determinations. Agencies tend to use such systems to the extent that they are motivated to try to match the consistency and accuracy of the letter of the rules, in contrast to more informal, equity-minded discretion. The Stanford–NYU report, Government by Algorithm, documents many such examples, in which systems such as SSA flagging tools or IRS audit criteria have crowded out discretion that had for long allowed public servants to turn the other cheek to claimants with sympathetic stories. Analogous bias concerns arise, as Black et al. (2022) show for IRS audit models, where algorithmic selection criteria fail to meet basic standards of "vertical equity"—that is, where criteria are not adjusted for differences in conditions at higher or lower income levels, and do not fit the intended targets well. Critics have also similarly noted that elimination of human discretion is seen as leading to unfair results. Theoretical and empirical work on these and other potential avenues for AI tools, if blindly applied to social contexts, to reinforce or amplify biases against marginalized groups, is a concern. Sanctions, such as large fines, disqualifications, and fraud allegations triggered by a priori algorithmic selection, may be perceived as turning a blind eye to mitigating evidence or local knowledge. The result is a tradeoff between, on the one hand, the increased administrative capacity and reduced discretion that automated systems make possible and, on the other hand, the potential for equity, legitimacy, and trust to deteriorate in ways that risk weakening the very goals that agencies seek to achieve. Proposed remedies include explicitly accounting for vertical equity in system design, using transparent selection criteria, or allowing for human discretion where appropriate, as in ACUS recommendations. AI tools hold the promise of more efficient adjudication in federal agencies—but risk bias and blind automation without context-aware design, transparency, and calibrated fairness.

4.5 UK: AI for Public Surveillance and Predictive Policing

The UK has adopted several AI systems for public-sector surveillance and policing. Some systems have produced a series of high-profile cases exemplifying some of the harm that context-blind systems have been able to cause in public trust and social fairness.

1. London’s citywide AI-assisted CCTV system

Multiple boroughs in London (e.g., Hammersmith & Fulham) have deployed or expanded an AI-enabled CCTV system for behavior detection and analysis to identify loitering, shouting, and broken glass. The fundamental concern with these types of systems has been that their use would infringe on citizens' privacy and lead to unjustified overreach in the absence of necessary checks and balances in the form of appropriate regulation. Civil rights organizations have urged the establishment of clearer boundaries on AI functions in public spaces.

2. The "Gangs Matrix" predictive policing system
The "Gangs Matrix" of the Metropolitan Police is an algorithmic system to track those who have been identified as likely at risk to be involved in gang activity (predominantly young Black men). As of June 2022, 34,538 people were listed in the Gangs Matrix system; a report from Amnesty International, based on research into a sample of 421 young people, found that 35% of those they were able to make contact with were not in a gang. The system has been heavily criticized for racial bias and data opaqueness, bringing into question the use of black-box AI systems in police decision-making.

3. Predicting custody risk with the HART algorithm
Durham Constabulary has used an AI algorithm called the Harm Assessment Risk Tool (HART) to predict reoffending risk and to make decisions around custody. An academic paper has been published providing an analysis of this system and making a case that it could unintentionally magnify biases around socioeconomic status (as one of its predictors is postcode). To address the perceived fairness of this tool, police excluded the postcode from the model.

4. "AI for Justice" on assessing the opaqueness of contextual understanding
In an empirical study of the algorithms used by the UK criminal justice system, Miri Zilka, Holli Sargeant, and Adrian Weller (2022) conclude that "minimal transparency and clarity of governance structures have affected the potential for these systems to be evaluated appropriately". In their words, they "encourage stakeholder engagement and awareness of AI in policing, comprehensive and accurate documentation of algorithms' purposes and uses, and independent and ongoing oversight".

AI systems for enforcement, surveillance, and predictive policing have often failed to consider the local traditions and fairness in social contexts, creating public trust problems in the UK.

The problem of the risk of systemic bias due to unfair data (postcode, demographic, etc.) continues to loom large in "objective" algorithmic models.

The problem of opaqueness and the lack of accountability mechanisms have also limited the ability for stakeholders to hold these systems and their developers to account, and the need for transparency, participation of stakeholders, and AI ethics and governance remains.

The context blindness of AI systems is an international problem, and the above-described cases of AI use in the UK and EU illustrate that, while technology matters, a participatory and context-aware approach matters for effective governance.

5. Analysis
A unifying theme of these case studies from China, Ukraine, India, the UK, and the USA is that AI enforcement systems often fail when they are superimposed on plural, complex, noncodified social systems from the top down. The pressures of automation for efficiency, consistency, and scale collide with the needs of social reality for equity, legitimacy, and adaptability. Time and again, we find that AI enforcement risks triggering resistance, non-compliance, and institutional distrust unless it includes participatory design, explainable reasoning, and an appreciation of informal social norms.

Table: Comparative Matrix of AI + Property Governance in 5 Countries

Country	Domain	AI Application	Tension with Informal Norms	Outcome
Ukraine	Housing Co-ops	Digital platforms	Lack of fee exemption rules	Speculative risk
India	Traffic enforcement	E-challan, ITS	Ignores driving culture	Public distrust
China	Social credit	Behavior scoring	Penalizes social norms	Low transparency
U.S.	Federal agencies	Fraud/audit detection	Reduces discretion	Bias concerns
U.K.	Predictive policing	Surveillance & HART	Postcode/demographic bias	Equity concerns

The most important lesson from our case studies is the move away from technical fixes, towards more contextualized approaches to governing. This involves rooting AI development in situated knowledges, participatory processes, and local community values.

6. Toward Context-Aware AI: A Participatory Framework

We sketch a four-point framework for AI systems in the hybrid governance of collective affairs:

- **Data Diversification**: Incorporating ethnographic/qualitative sources.
- **Norm Recognition Modules**: Train AI on local customs and behavioral expectations.
- **Stakeholder Integration**: Engage users in training and system design.
- **Legitimacy Metrics**: Evaluate fairness and user trust, not just accuracy.

7. Policy and Research Implications

AI governance tools must be fit for informal rule spaces. Participatory co-design will foster legitimacy and non-maleficence. Policymakers can prioritize investment in capacity-building and context-aware AI systems, especially in property and resource governance.

8. Conclusion

AI also has a role to play in helping enable more effective property governance. Automated decision-making needs to be introduced with care in property governance systems that may have multiple, deep layers of customary governance, as well as plural legal orders. In situations where there are many sources of property law that are public, private, and/or overlap or are in conflict with each other, automating a single set of rules for making decisions risks creating an absence of trust, fairness, and legitimacy. On the other hand, AI applications can potentially help support good property governance where no human decision-maker could be familiar with the full range and complexity of existing practices. However, to be successful, these tools need to be applied in a way that is context-sensitive so they are able to enable, rather than displace, existing governance systems. Embedding AI decision-making in context-sensitive design processes and local knowledge, shaped by local stakeholders, can help AI become a force for good in property governance.

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Footnotes

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