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AI-Based Public Service Transformation: An Analysis of Algorithmic Bias Risks and Digital Government Accountability in ASEAN

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ABSTRACT

***Purpose**: The rapid integration of Artificial Intelligence (AI) in public service delivery has brought both opportunities and challenges in the ASEAN region. This study investigates the risks of algorithmic bias and the effectiveness of digital government accountability in five ASEAN countries: Singapore, Indonesia, Malaysia, Thailand, and the Philippines.*

***Subjects and Methods:** Through expert interviews, policy document analysis, and comparative case studies, the research identifies key issues such as biased algorithms in welfare programs and predictive policing, as well as the varying levels of institutional accountability across countries. Singapore's comprehensive AI governance framework, emphasizing transparency and fairness, contrasts with the more fragmented approaches in Indonesia and the Philippines, where AI systems often lack oversight mechanisms.*

***Results:** The study finds that public trust in AI-based public services is strongly influenced by transparency and citizen engagement. It concludes that addressing algorithmic bias and strengthening accountability mechanisms are essential for the responsible deployment of AI in public services.*

***Conclusions:** This research contributes to the existing literature on AI governance, particularly within the ASEAN context, and calls for further exploration of AI governance frameworks and citizen participation in less mature AI environments.*

INTRODUCTION

The rapid evolution of digital technologies has significantly influenced the transformation of public services, particularly within the context of digital government (Lindgren & van, 2018; Margetts, 2008). Governments across the ASEAN region are increasingly adopting Artificial Intelligence (AI) technologies to enhance the efficiency, accessibility, and quality of public services. From automated citizen service portals to predictive analytics in law enforcement, AI-based solutions are being integrated into government systems to optimize decision-making and streamline public sector processes. This transformation is not only changing how governments operate but also how citizens interact with government institutions.

As AI systems become embedded in the very fabric of public service delivery, they offer the promise of more efficient, personalized, and inclusive services (Poudel, 2024; Makhdum, 2024; Latupeirissa et al., 2024). However, as this digital transformation progresses, it also brings forth a new set of challenges that need to be addressed to ensure that the application of AI in public services does not inadvertently perpetuate inequality or harm marginalized groups.

Recent studies have shown that algorithmic decision-making systems, while efficient, are not immune to biases that may arise during their development and implementation. Algorithmic bias, the phenomenon wherein machine learning algorithms produce results that are systematically prejudiced due to flawed data or human influence in the training process, is a growing concern within the public sector (Kordzadeh & Ghasemaghaei, 2022; Packin & Lev-Aretz, 2018). These biases may exacerbate existing inequalities, leading to discriminatory outcomes in public services such as healthcare, social benefits, and policing.

For example, AI systems used in hiring or criminal justice may inadvertently discriminate against certain demographic groups if trained on biased historical data. Therefore, the issue of algorithmic bias in AI-based public services is of paramount importance, particularly in the context of ASEAN countries, where social, cultural, and economic diversity presents both opportunities and challenges for equitable AI implementation (Mahusin et al., 2024; Isono & Prilliadi, 2023).

As the implementation of AI-based solutions in public services expands, the issue of accountability in digital government becomes increasingly critical (Al-Ansi et al., 2024). Digital government accountability refers to the responsibility of public sector institutions to ensure that the deployment of AI technologies aligns with ethical standards, legal frameworks, and societal values. In ASEAN, where governance structures vary significantly across member states, ensuring digital government accountability in AI deployment becomes a complex task.

Governments must not only ensure that AI technologies are deployed ethically but also that they remain transparent and accountable to the citizens they serve. Public trust in AI-driven services is crucial for their long-term success, and the lack of accountability mechanisms may undermine the effectiveness of digital governance initiatives. Without robust accountability frameworks, citizens may lose confidence in AI technologies, hindering their potential to transform public services positively.

The primary research problem addressed in this study is the risk of algorithmic bias and the challenge of ensuring accountability in the implementation of AI technologies in ASEAN public services. While AI has the potential to enhance the efficiency and effectiveness of public sector services, the presence of bias and the lack of accountability mechanisms may undermine the benefits these technologies offer. In the context of ASEAN, where diverse socio-political environments and varying degrees of technological infrastructure exist, the implementation of AI-based solutions in public services poses a unique set of challenges.

These challenges need to be addressed through comprehensive frameworks that ensure AI technologies are developed and deployed in ways that are fair, transparent, and accountable. In the search for solutions to these issues, previous research offers several insights. Scholars have proposed that reducing algorithmic bias requires diverse and representative data, as well as transparent AI development processes that involve multiple stakeholders, including ethicists, data scientists, and the communities affected by these technologies.

Another potential solution lies in the establishment of independent regulatory bodies that can oversee the deployment of AI in public services, ensuring that the technologies meet ethical and legal standards. Additionally, literature highlights the importance of fostering digital literacy among citizens to increase their understanding of AI technologies and empower them to hold government institutions accountable for their use. By adopting these approaches, governments can work towards mitigating the risks associated with AI-based decision-making and enhancing the accountability of digital governance.

However, while there is a growing body of literature on algorithmic bias and digital government accountability, research specific to the ASEAN region remains sparse. Much of the existing scholarship has focused on Western contexts, where regulatory frameworks and societal structures differ significantly from those in ASEAN countries. The diversity of the ASEAN region, both in terms of its political systems and technological infrastructure, necessitates a region-specific approach to addressing the risks associated with AI-based public service transformation.

This gap in the literature calls for more localized research that considers the unique challenges and opportunities in ASEAN member states.

This study aims to fill this gap by analyzing the risks of algorithmic bias and exploring the mechanisms for ensuring digital government accountability in the context of AI implementation in ASEAN public services. The novelty of this research lies in its focus on the ASEAN context, where AI deployment in public services is still in the early stages compared to other regions, providing an opportunity to develop frameworks that are both regionally relevant and adaptable. By investigating the current state of AI-based public services in ASEAN countries, this research seeks to provide practical recommendations for addressing the risks of algorithmic bias and strengthening accountability in digital government systems.

The scope of this study is to examine case studies from several ASEAN nations, drawing comparisons between countries with varying levels of AI adoption and regulatory maturity. Through this exploration, the study aims to contribute to the broader conversation on digital government and AI ethics by providing insights that can help policymakers and practitioners navigate the complex landscape of AI implementation in public services. It also seeks to offer a comprehensive framework that can be adapted to different ASEAN contexts, ensuring that AI technologies are deployed in ways that promote fairness, transparency, and accountability in the delivery of public services.

METHODOLOGY

This study employs a qualitative research design grounded in the principles of interpretivism to explore how ASEAN governments are managing the risks of algorithmic bias and accountability in AI-based public service transformation. The qualitative approach is chosen because it allows for a deeper understanding of the contextual, institutional, and socio-political factors that shape AI adoption and governance practices across diverse ASEAN member states. As AI is a socio-technical phenomenon influenced by political structures, cultural values, and regulatory frameworks, qualitative inquiry enables the researcher to capture the nuances that quantitative approaches might overlook (Creswell & Poth, 2018; Flick, 2022). The study integrates document analysis, expert interviews, and comparative case study techniques to triangulate data sources and strengthen analytical validity.

Research Design

The research design follows a multi-case comparative framework (Yin, 2018), allowing for cross-country analysis of AI governance in public service delivery within the ASEAN region. This design is particularly suitable for examining how different institutional and regulatory contexts influence the risks of algorithmic bias and the implementation of digital accountability mechanisms. The selected cases include Singapore, Indonesia, Malaysia, Thailand, and the Philippines, representing a spectrum of AI adoption maturity and governance structures within ASEAN. Singapore exemplifies an advanced digital governance ecosystem, while countries like Indonesia and the Philippines are in the formative stages of AI policy development. By analyzing these varied cases, the study seeks to identify both shared regional challenges and country-specific practices. The research process consists of three sequential stages: (1) mapping the current AI governance and public service transformation landscape, (2) identifying key challenges and manifestations of algorithmic bias in public service systems, and (3) evaluating digital government accountability mechanisms. Each stage is guided by a structured analytical framework informed by both theoretical and empirical literature on AI ethics, public administration, and digital governance (Bryson, Crosby, & Bloomberg, 2014; Eubanks, 2018; OECD, 2021).

Data Sources and Collection

Data were collected from multiple sources to ensure a comprehensive and triangulated understanding of the research problem. Primary data were obtained through semi-structured interviews with policymakers, technology officers, and civil society representatives involved in digital governance initiatives in ASEAN countries. The interviews aimed to capture stakeholders' perceptions regarding algorithmic bias, risk management, and institutional accountability in AI

deployment. Participants were selected using purposive sampling, emphasizing individuals directly involved in AI governance, digital transformation units, or regulatory oversight roles (Patton, 2015). Approximately 25 experts were interviewed across the five case countries between April and September 2024. Secondary data were derived from government policy documents, white papers, regulatory guidelines, and published reports from international organizations such as the ASEAN Secretariat, the World Bank, the OECD, and UNESCO. Peer-reviewed journal articles, conference proceedings, and think-tank analyses on AI governance in Southeast Asia were also reviewed to provide theoretical grounding and contextual depth.

Analytical Framework

To guide the analysis, this study adopts an integrated framework combining the Algorithmic Accountability Theory (Wieringa, 2020) and the Digital Governance Maturity Model (UNDP, 2022). The framework examines the interaction between three key dimensions: (1) technical fairness how data quality, model transparency, and algorithmic design affect bias; (2) institutional accountability how governments structure oversight and ethical review mechanisms; and (3) public engagement how citizens participate in monitoring and evaluating AI-based services. The framework enables systematic comparison across cases while maintaining sensitivity to contextual variations in political systems and digital capacities. It also supports the identification of causal mechanisms linking governance structures to algorithmic outcomes, such as how weak institutional checks may amplify bias or how participatory mechanisms enhance accountability.

Data Analysis

Data analysis followed a multi-step process involving coding, categorization, and thematic interpretation. Interview transcripts and documents were imported into NVivo 14 for qualitative analysis. Using inductive and deductive coding, the data were first open-coded to identify emerging concepts related to bias, ethics, transparency, and accountability (Saldaña, 2021). Next, axial coding was employed to group codes into broader thematic categories such as “AI ethics and fairness,” “policy gaps,” “technical safeguards,” and “citizen trust.” Finally, selective coding linked these themes to the theoretical constructs within the analytical framework. The analysis proceeded iteratively, with constant comparison across cases to identify convergent and divergent patterns. For example, Singapore’s Model AI Governance Framework demonstrated strong institutional accountability mechanisms, whereas Indonesia and the Philippines faced implementation gaps due to limited technical expertise and fragmented regulatory structures. The comparison highlighted how institutional maturity, rather than technology alone, determines the success of AI governance. To ensure analytical rigor, the study applied several validation techniques. First, data triangulation was achieved by comparing insights from interviews, policy documents, and existing literature. Second, member checking was conducted with selected interview participants to confirm the accuracy of interpretations. Third, peer debriefing sessions with academic experts on AI ethics and governance were held to challenge potential researcher biases and strengthen validity (Lincoln & Guba, 1985).

RESULTS AND DISCUSSION

This section presents the detailed results of the study, analyzing the role of AI in public service transformation across five ASEAN countries. The study aimed to understand the risks of algorithmic bias and evaluate the effectiveness of digital government accountability mechanisms in the region. The findings are based on expert interviews, analysis of policy documents, and case studies across Singapore, Indonesia, Malaysia, Thailand, and the Philippines. The results are categorized into three key themes: (1) risks and manifestations of algorithmic bias in AI-based public services, (2) institutional accountability mechanisms, and (3) citizen engagement and public trust in AI applications. These themes were examined through the lens of the existing literature on AI ethics, governance, and accountability.

Algorithmic Bias in Public Service Systems

One of the central findings of this study is that algorithmic bias remains a significant challenge in the adoption and deployment of AI technologies in public services across ASEAN countries. Algorithmic bias refers to the systematic and unfair outcomes that occur when AI models reflect

or amplify human biases, leading to discriminatory results. AI-based systems, especially in sectors like social welfare, criminal justice, and healthcare, are not immune to these risks. This study found that the deployment of AI systems in public service delivery has often resulted in unintended consequences, primarily due to biased data, flawed algorithmic design, and insufficient transparency in AI models.

In Malaysia, for example, AI applications in public welfare programs have raised concerns regarding the underrepresentation of certain demographics, particularly rural communities. The AI models used to predict eligibility for welfare benefits were trained on datasets that over-represented urban populations, leading to an unfair distribution of resources.

Participant-Government Welfare Officer:

> *"When we used the AI system to determine eligibility for aid, we realized that most of the training data came from urban areas. As a result, residents from rural areas were often not identified as eligible recipients, even though their needs were much greater. The system wasn't entirely wrong, but the data simply didn't reflect the social reality of rural areas."*

The government's reliance on historical data to inform decision-making, without considering the evolving social dynamics in rural areas, perpetuated existing inequities. This was highlighted by interview participants who noted that AI-based systems might inadvertently marginalize rural citizens if the data used to train the algorithms does not accurately represent them (Tian, 2024). A similar issue was observed in the Philippines, where predictive policing algorithms, used to forecast potential criminal activity, showed significant biases.

Participant-Law Enforcement Analyst:

> *"Crime predictions from AI systems often show the same areas usually poor areas. However, not all of them are actually high-risk. This reflects past arrest patterns rather than actual conditions. We feel this system reinforces the stigma against poor communities."*

The data used to train these systems were largely drawn from previous law enforcement records, which were already skewed towards certain ethnic or socioeconomic groups. As a result, AI systems used for law enforcement disproportionately targeted marginalized communities, particularly those from lower-income areas. The study found that these systems, while designed to improve public safety, could inadvertently reinforce negative stereotypes and contribute to racial profiling (Lum & Isaac, 2016). Several experts interviewed in the Philippines noted the difficulty in rectifying these biases, as the data used were seen as a reflection of pre-existing societal biases, creating a cycle of inequality.

In contrast, Singapore has made notable strides in addressing algorithmic bias, especially through its "Model AI Governance Framework" which outlines specific guidelines for mitigating bias in AI models. The framework emphasizes the importance of ensuring that AI systems are fair, transparent, and accountable. In Singapore, AI models undergo rigorous audits to ensure that they do not inadvertently disadvantage specific groups or communities.

Participant-AI Ethics Specialist:

> *"Every AI model used by a public institution is required to undergo an internal audit. We examine datasets, the distribution of demographic variables, and potential algorithmic bias. However, technology is evolving rapidly, and audits often lag behind implementation."*

Despite these efforts, experts noted that the pace of technological advancement poses a challenge for regulatory bodies to monitor AI systems in real-time. The speed at which new AI applications are introduced means that many are deployed before comprehensive audits can be conducted. This raises concerns about the adequacy of existing safeguards to prevent the potential amplification of biases (Ng, 2021).

Overall, the results indicate that while there are varying levels of awareness and regulatory effort to address algorithmic bias, ASEAN countries are facing challenges in effectively mitigating this risk. Singapore has developed robust frameworks, but other countries, like Malaysia and the Philippines, continue to struggle with ensuring that AI systems are fair and unbiased. These findings suggest that addressing algorithmic bias requires a comprehensive approach, including diverse data collection, regular audits, and transparency in the development of AI systems.

Digital Government Accountability Mechanisms

A second key finding of the study revolves around the mechanisms of digital government accountability. As AI systems become more integrated into public service delivery, ensuring that these systems are used ethically and responsibly becomes increasingly important. The study identified significant variations in how ASEAN countries manage digital government accountability in the context of AI deployment.

Singapore, as a leader in digital governance, has established a robust accountability framework for AI systems. The country's "Model AI Governance Framework" provides a clear set of guidelines for public agencies to follow when implementing AI systems. This framework includes provisions for transparency, which require government agencies to disclose the types of AI systems they use and how these systems make decisions.

Participant-Government Technology Agency Official:

> *"The AI Governance Framework here is very helpful. Any AI system intended for use in the public sector must be transparently explained what models are used, what data is used, and how decisions are made. The public can demand explanations, and that's part of accountability. But we also recognize that audits can't always keep up with the pace of innovation."*

It also mandates that AI models undergo third-party audits to ensure they are fair and unbiased. This emphasis on accountability and transparency has been instrumental in building public trust in AI-based public services in Singapore. Several experts from Singapore noted that while the framework is not yet perfect, it sets a strong foundation for future AI governance, ensuring that AI deployments are aligned with ethical standards and legal norms (Tan et al., 2020).

In contrast, Indonesia and the Philippines face more significant challenges in establishing strong institutional accountability mechanisms. Indonesia's AI governance landscape is still nascent, with no centralized authority responsible for overseeing AI applications in the public sector. As a result, there is a lack of standardized processes for ensuring accountability across different government agencies. While some government bodies have implemented AI systems, there are few checks in place to monitor their impact on citizens or to ensure that the systems are ethically sound. Experts from Indonesia highlighted the absence of a national AI strategy as a key barrier to ensuring effective accountability.

Participant-Official from the Ministry of Communication and Informatics:

> *"Currently, there is no central authority specifically regulating the use of AI in the public sector. Each institution operates by its own standards. This weakens accountability, as there is no mechanism to check whether the system is ethical or not."*

Similarly, in the Philippines, accountability mechanisms are weak due to a lack of a cohesive regulatory framework for AI. The country's decentralized approach to governance means that AI systems are implemented in an ad-hoc manner across different regions and agencies. This lack of a unified strategy for AI oversight makes it difficult to ensure that AI deployments adhere to ethical standards or are subject to rigorous accountability checks.

Participant-Technology Policy Advocate:

> *"We see many AI implementations being carried out without public consultation or ethical evaluation. The absence of national regulations leaves local institutions free to determine what they consider safe, This risks violating citizens' rights."*

Several stakeholders from the Philippines expressed concern that without a clear national policy on AI, public service systems might operate without sufficient oversight, risking ethical lapses and the misuse of AI technology.

Thailand's experience lies somewhere in between. While the country has begun to implement AI systems in sectors such as healthcare and transportation, institutional accountability remains an area of concern. Experts emphasized that while there are initiatives to develop AI governance frameworks, these efforts have yet to be fully institutionalized. The National Artificial Intelligence Strategy (2018-2037) outlines ambitious goals for AI development, but it lacks clear provisions for ensuring that these technologies are implemented responsibly (Teng & Po, 2021). Thailand's AI governance framework is still evolving, and the country faces challenges in aligning its AI policies with global best practices on digital accountability.

Participant-Civil Society Digital Rights Activist:

> *"We see a willingness to move toward accountability, but the policies are still too general. There are no technical rules explaining what should be audited, how audits are conducted, or who is responsible for violations."*

The results indicate that the level of institutional accountability in AI deployment varies significantly across ASEAN countries. While Singapore has established comprehensive accountability mechanisms, countries like Indonesia and the Philippines face considerable barriers to ensuring that AI systems are ethically governed. The lack of a cohesive national strategy for AI in many ASEAN countries highlights the need for stronger regulatory frameworks and institutional coordination to ensure that AI technologies are used responsibly in public services.

Citizen Engagement and Public Trust

The third major finding concerns the importance of citizen engagement and public trust in the success of AI-based public services. Public trust is essential for the widespread acceptance and effective use of AI technologies in governance. The study found that the level of citizen engagement and the degree of transparency in AI decision-making processes directly affect public trust in these technologies. In Singapore, high levels of citizen trust in AI are attributed to the government's proactive efforts to involve the public in AI governance. The Singaporean government conducts regular public consultations to educate citizens about AI technologies and their implications.

Participant-Government Policy Officer (Digital Governance):

> *"Public trust in AI in Singapore is built through a regular consultation process. Every new AI-related policy is usually preceded by a public forum. Citizens are given the opportunity to ask questions, provide input, and understand how the system works."*

Furthermore, the transparency of AI decision-making processes, coupled with active citizen involvement, has helped foster a sense of trust and confidence in AI-based public services. The government's commitment to transparency and accountability ensures that AI systems are not perceived as "black boxes" but as transparent and accountable tools that serve the public good (Tan et al., 2020).

Participant-Local Government Official:

> *"We do focus on service efficiency, but there's not much room for citizen involvement in AI policy formulation. As a result, the public sees this technology as something distant and difficult to understand."*

However, in the Philippines and Indonesia, public trust in AI is relatively low. In both countries, there is limited citizen engagement in the development of AI policies or the oversight of AI systems. Experts from Indonesia and the Philippines noted that many citizens are unaware of how AI systems are used in public services, leading to a sense of distrust and skepticism.

Participant-ICT Policy Advocate:

> *"Public engagement in AI policy is almost non-existent. Many citizens don't even know that certain systems are AI-based. This lack of information makes people suspicious and reluctant to trust."*

Additionally, the lack of transparency in AI decision-making processes has exacerbated public concerns about the fairness and ethics of these systems. Public engagement in the AI policy process is minimal, and there are few platforms for citizens to voice their concerns or hold government institutions accountable for the use of AI.

Participant-Government Digital Transformation Officer:

> *"Awareness of the importance of public participation in AI governance is indeed growing, but we don't yet have a mature formal mechanism for it. Many policies are still made top-down."*

Thailand's situation is somewhat mixed. While there is growing awareness of the need for public engagement in AI governance, the country has not yet developed formal mechanisms for citizen participation. Experts emphasized the importance of building trust through transparency and citizen education, but they also acknowledged that these efforts are still in the early stages. The study found that public trust in AI-based public services in Thailand is still fragile, and the government must do more to engage citizens and ensure transparency in AI decision-making processes (Teng & Po, 2021). Overall, the study found that public trust in AI-based public services is strongly influenced by the level of transparency and citizen engagement in AI governance. Countries like Singapore, which prioritize transparency and public participation, enjoy higher levels of trust in AI systems. In contrast, countries like Indonesia and the Philippines, where citizen engagement is limited, face challenges in building trust in AI technologies.

Discussion

The findings of this study confirm that the primary challenge in implementing AI in the ASEAN public sector lies not solely in technological capacity, but rather in the structural and ethical dimensions of digital governance (Ali et al., 2018). Emerging algorithmic bias demonstrates that AI is never neutral, as it reflects the social, political, and historical conditions of the data it uses. This reinforces the view in critical literature that technology has the potential to deepen inequality if implemented without adequate social corrections. Therefore, the issue of algorithmic bias must be understood as a political-administrative issue, not simply a technical programming issue.

The differences in levels of digital accountability between countries also reflect the gap in institutional maturity in managing AI risks. Countries with clear and coordinated regulatory frameworks demonstrate a better ability to internalize ethical principles into bureaucratic practices. Conversely, weak coordination and policy fragmentation indicate that digital transformation in many ASEAN countries remains sectoral and has not been integrated into a coherent governance vision. This situation risks creating a gray area of accountability, where responsibility for the impacts of AI becomes unclear and difficult to account for legally and administratively.

From a social perspective, findings regarding low public trust in some countries indicate that the legitimacy of AI in public services depends heavily on the quality of the relationship between the state and citizens. Trust cannot be built solely through increased service efficiency, but also through information transparency, clear complaint mechanisms, and spaces for meaningful participation. When citizens do not understand how decisions are made or lack channels for correcting them, AI tends to be perceived as an instrument of control, rather than a tool for service delivery. This reinforces the argument that digital transformation without democratization has the potential to undermine government legitimacy.

Overall, this study's findings demonstrate that the success of AI-based public service transformation is crucially determined by the synergy between technical capacity, institutional strength, and the quality of citizen participation. AI cannot be positioned as a quick fix for governance issues, but rather as an instrument that requires a mature ethical, legal, and social framework. Without the integration of these three dimensions, the implementation of AI has the potential to create new risks

in the form of inequality, policy delegitimization, and the erosion of public trust. Therefore, the future of AI in ASEAN public services depends heavily on policy direction that places accountability and social justice as the primary foundations of government digitalization.

CONCLUSION

This study explores the risks of algorithmic bias and the challenges of digital government accountability in the transformation of public services through AI across five ASEAN countries. The findings highlight significant variations in how algorithmic bias and accountability are addressed in AI systems, with Singapore standing out for its robust governance framework. In contrast, countries like Indonesia and the Philippines struggle with issues such as fragmented regulations and limited citizen engagement in AI governance. The study identifies algorithmic bias as a critical concern, especially in welfare programs and law enforcement, where biased data and flawed algorithms can reinforce existing social inequalities. The research also emphasizes the importance of transparency, citizen trust, and institutional accountability in AI governance. It concludes that while AI can enhance public service efficiency, its success depends on effective governance frameworks, transparency, and the active participation of citizens. The study contributes to the growing body of knowledge on digital governance, particularly in the ASEAN context, and underscores the need for more comprehensive AI policies and regulatory bodies in the region. Future research could explore the practical implementation of AI governance frameworks in emerging ASEAN nations, further examining the role of public engagement in mitigating algorithmic biases.

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