EJTAS
ISSN 2786-7447
EUROPEAN JOURNAL OF THEORETICAL AND APPLIED SCIENCES
OPEN ACCESS
PEER REVIEWED

From Margins to Mainstream (M2M): Can Artificial Intelligence (AI) Reshape Governance for Chittagong Hill Tracts Indigenous Communities?

Chakma Vaskar
School of Artificial Intelligence and Computer Science, Nantong University, Nantong, China

Amin Misbahul
School of Artificial Intelligence and Computer Science, Nantong University, Nantong, China

Rouf Abdur
School of Artificial Intelligence and Computer Science, Nantong University, Nantong, China

Suruj Al Mahmud
School of Computer Science and Technology, Southwest Jiaotong University, Nantong, China

Mia Raju
School of Management, Rabindra University, Bangladesh

Rafid Mustavi
School of Mechanical Engineering, Yangzhou University, Yangzhou, China

Suggested Citation

Vaskar, C., Misbahul, A., Abdur, R., Al Mahmud, S., Raju, M., & Mustavi, R. (2025). From Margins to Mainstream (M2M): Can Artificial Intelligence (AI) Reshape Governance for Chittagong Hill Tracts Indigenous Communities? *European Journal of Theoretical and Applied Sciences, 3*(1), 166-178. DOI: 10.59324/ejtas.2025.3(1).16

Abstract:

Indigenous communities in the Chittagong Hill Tracts (CHT) of Bangladesh contend with multifaceted governance challenges, including representation, resource allocation, and access to services. This paper investigates the potential of Artificial Intelligence (AI) to address these issues and foster inclusive governance practices in the region. Grounded in the following research questions: 1) How are Indigenous communities currently governed in the CHT, and what are the primary challenges they face? 2) What are the opportunities and challenges of leveraging AI to enhance governance in the CHT? 3) How do Indigenous communities perceive the role of AI in governance, and what are their expectations and concerns? the study adopts a self-directed research approach, employing interviews, surveys, and online research to gather insights. Through a synthesis of existing literature and empirical findings, the paper identifies key considerations for deploying AI in governance contexts, including ethical implications, community engagement strategies, and capacity-building initiatives. The research underscores the importance of centering Indigenous perspectives and promoting participatory approaches in the design and implementation of AI-driven governance solutions. By shedding light on the intersection of AI and Indigenous governance, this study contributes to the discourse on technology and social justice, offering practical insights for policymakers, researchers, and practitioners seeking to advance inclusive development agendas in marginalized regions.

Keywords: *Chittagong Hill Tracts (CHT), Indigenous Governance, Artificial Intelligence, Technology Adoption, Sustainable Development.*

Introduction

The Chittagong Hill Tracts (CHT) (W. Van Schendel, 2000; A. Mohsin, 2003; B. Chakma, 2010) of Bangladesh, nestled in the southeastern corner of the country, are home to a rich tapestry of Indigenous cultures and traditions (M. G. Paul and J. Uddin, 2024; SPA Bhopal, 2024). This region, encompassing three hill districts (A. K. Pasha, et al) - Rangamati, Bandarban, and Khagrachari - is characterized by its rugged terrain, lush greenery, and diverse ethnic communities (M. R. Shelley, 2000; S. B. Amin, 2021), including the Chakma, Marma, Tripura, Tanchangya, Mro, Bawm, and others (S. Halim, et al). Historically marginalized and subject to conflict over land rights, the Indigenous peoples of the CHT have long struggled for recognition, autonomy, and socio-economic development (M. Ashrafuzzaman, 2014; S. R. Khan, 2014; B. Chakma, 2010; A. Barkat, 2010). Amidst these challenges, the potential of Artificial Intelligence (AI) to reshape governance and improve the lives of Indigenous communities in the CHT emerges as a compelling avenue for exploration (I. F. Tapu and T. K. Fa'agau, 2022; Y.-F. Wang, 2023). By leveraging AI technologies, such as machine learning, data analytics, and natural language processing, there exists an opportunity to address longstanding governance gaps, enhance service delivery, and promote inclusive decision-making processes (M. Kuziemski and G. Misuraca, 2020; O. B. Adeoye, et al, 2024; F. Pedro, et al, 2019). Despite the growing interest in AI-driven governance solutions worldwide, little attention has been paid to its potential applications in the context of marginalized Indigenous communities, particularly in regions like the Chittagong Hill Tracts. This paper seeks to fill this gap by examining the following research problem: How can Artificial Intelligence (AI) reshape governance for Chittagong Hill Tracts' Indigenous communities? The significance of this research lies in its potential to offer insights and recommendations for policymakers, researchers, and practitioners interested in advancing inclusive development agendas in marginalized regions (S. Ahmed, et al, 2023). By investigating the intersection of AI and Indigenous governance, this study not only contributes to theoretical debates surrounding technology and social justice (M. Z. Hasan, 2012) but also provides practical guidance for designing and implementing AI initiatives that center Indigenous perspectives and promote equitable outcomes. This paper is organized as follows: Following this introduction, the subsequent section provides a comprehensive review of existing literature on AI applications in governance and Indigenous communities. The methodology section outlines the research design and approach, including data collection methods and ethical considerations. The findings section presents the results of the study, followed by a discussion of their implications and limitations. Finally, the paper concludes with a summary of key findings, recommendations for future research, and closing remarks.

Literature Review

AI Applications in Governance

The application of Artificial Intelligence (AI) in governance has been gaining traction globally, promising enhanced efficiency, transparency, and citizen engagement. AI technologies, such as machine learning, natural language processing, and data analytics, have been utilized to improve public service delivery, facilitate participatory governance, and streamline administrative processes. Studies have highlighted the potential of AI to predict and address societal issues proactively, optimize resource allocation, and enhance decision-making processes (C. Challoumis, 2024; X. Hao and E. Demir, 2024). In the context of governance, AI has been employed in various ways:

- Service Delivery: AI-driven platforms can analyze large datasets to identify trends and provide personalized services, such as in

healthcare and education (N. Katal, 2024; S. Aminizadeh, et al, 2024).

• Transparency and Accountability: AI tools can monitor government activities and detect anomalies, thereby reducing corruption and increasing accountability (O. APAMPA, 2024).

• Citizen Engagement: AI-powered chatbots and participatory platforms enable more efficient communication between citizens and government authorities, fostering greater civic participation (A. Nechesov and J. Ruponen, 2024).

AI and Indigenous Communities

AI's impact on Indigenous communities is a relatively underexplored area, with limited literature addressing the specific needs and challenges of these populations. However, emerging studies suggest that AI can play a critical role in preserving Indigenous languages, enhancing educational opportunities, and improving healthcare outcomes (J. Li, A. Brar, and N. Roihan, 2021; N. R. Mannuru, et al, 2023). For instance, AI algorithms can be used to create digital archives of Indigenous languages, facilitating language learning and preservation (S. Sharofova, 2023). Despite these potential benefits, there are significant ethical considerations. Issues such as data privacy, cultural sensitivity, and the risk of exacerbating existing inequalities must be carefully addressed. Indigenous communities often have distinct governance structures and cultural practices that may not align with conventional AI applications, necessitating tailored and respectful AI interventions (I. Ouedraogo, 2024).

Current State of Governance in the Chittagong Hill Tracts

The Chittagong Hill Tracts (CHT) in Bangladesh, home to diverse Indigenous communities including the Chakma, Marma, and Tripura, face complex governance challenges. The region has a history of political marginalization, land disputes, and socio-economic underdevelopment. The 1997 CHT Peace Accord (B. Chakma, 2016; M. T. Islam, 2019; R. S. Partha, 2016; A. Mohsin, 2003) aimed to address some of these issues by granting autonomy and establishing local governance bodies, such as the CHT Regional Council and Hill District Councils. However, the implementation of the Accord has been inconsistent, and Indigenous communities continue to face significant governance challenges (A. S. Haque, 2023).

Key issues in CHT governance include:

• Lack of Representation: Indigenous peoples often have limited representation in national and local decision-making processes (R. D. Roy, 2004).

• Resource Allocation: There are disparities in the distribution of resources and access to basic services, such as education, healthcare, and infrastructure (A. Kabir, et al, 2019).

• Land Rights: Land disputes remain a critical issue, with Indigenous communities frequently facing displacement and loss of traditional lands (R. Nabi, 2020).

Gaps in the Literature

While there is a growing body of research on AI in governance and some studies on the impact of technology on Indigenous communities, several gaps remain:

• Context-Specific Studies: There is a lack of research focused on the unique socio-political and cultural contexts of the CHT.

• Community-Centric Approaches: Few studies emphasize the involvement of Indigenous communities in the design and implementation of AI solutions.

• Ethical and Cultural Considerations: More research is needed on how to address ethical concerns and cultural sensitivities when applying AI in Indigenous settings.

Addressing the Gaps

This research aims to fill these gaps by:

1. Conducting a comprehensive analysis of the governance challenges faced by Indigenous communities in the CHT.

2. Exploring the potential applications of AI to address these challenges, with a focus on community-driven solutions.

3. Investigating the perceptions, expectations, and concerns of Indigenous communities regarding AI in governance.

4.Providing recommendations for policymakers, researchers, and practitioners on implementing AI in a manner that is inclusive, respectful, and beneficial to Indigenous communities in the CHT.

Methodology

Research Design

This study employs a mixed methods research design, combining both qualitative and quantitative approaches to comprehensively address the research questions. The qualitative component includes interviews and focus groups with community members, experts, and stakeholders to gain deep insights into the governance challenges and perceptions of AI. The quantitative component involves surveys to collect data from a diverse range of age groups within the indigenous communities.

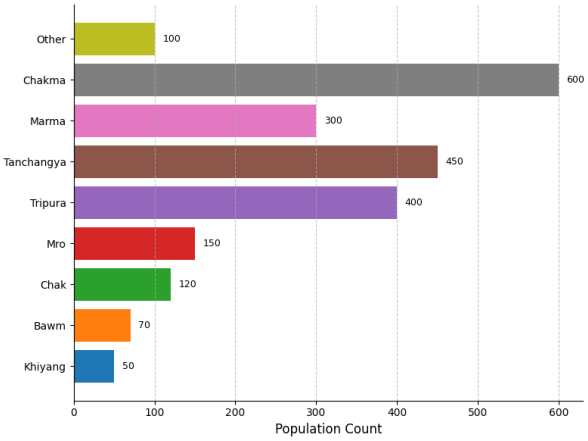

Figure 1. Diverse Range of Indigenous Communities Participated in the Survey

Data Collection

Methods for Gathering Data

• Surveys: Targeting various age ranges within the indigenous communities to capture a broad spectrum of perspectives.

• Interviews: Conducted with community leaders, governance experts, and stakeholders to gather detailed qualitative data.

• Focus Groups: Facilitated discussions with community members to address specific governance challenges and potential AI solutions.

Steps for Data Collection

• Design and pilot survey instruments.

• Administer surveys across different age groups within the indigenous communities.

• Conduct in-depth interviews with key stakeholders.

• Facilitate focus group discussions to gather qualitative insights.

• Compile and analyze data using appropriate statistical and thematic analysis techniques.

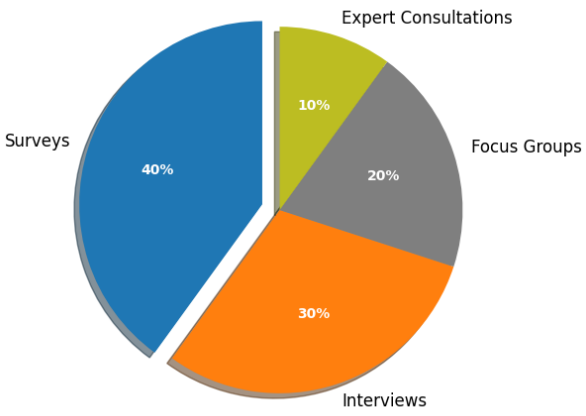

Figure 2. Ways of Gathering Data

AI Framework Development

Steps for Developing and Implementing AI Models

1. Identify Governance Needs: Conduct a needs assessment to identify key governance challenges that can be addressed using AI.

2. Data Collection: Gather relevant data from various sources, including government records, community feedback, and external datasets.

3. Algorithm Selection: Choose suitable AI algorithms based on the specific governance problems identified.

4. Model Development: Develop AI models tailored to the governance needs of the Chittagong Hill Tracts (CHT), ensuring cultural sensitivity and relevance.

5. Pilot Testing: Implement pilot projects to test the AI models in real-world governance scenarios within the CHT.

6. Evaluation: Assess the performance and impact of the AI models, making necessary adjustments based on feedback and outcomes.

7. Deployment: Scale up successful AI models for broader implementation across the CHT.

Ethical Considerations

Ethical considerations are central to this research, particularly concerning data privacy, consent, and cultural sensitivity.

The following measures are implemented:

Data Privacy and Consent

• Strict data protection protocols, including encryption, access controls, and secure storage, are used to safeguard participant data.

• Informed consent is obtained from all participants, with clear explanations of the purpose of data collection and its intended use.

Cultural Sensitivity

• Engage with community leaders and cultural experts to ensure that AI solutions respect local traditions and values.

• Customize AI models and interfaces to align with cultural contexts and languages to gain acceptance and ensure relevance.

Transparency and Accountability

• Maintain transparency in AI development processes and decision-making criteria.

• Establish feedback mechanisms to allow community members to express concerns and provide input, ensuring AI solutions are responsive to their needs.

Inclusivity

• Ensure diverse representation in data collection, including marginalized groups and those with limited digital literacy.

• Design AI solutions to empower communities rather than impose external solutions, promoting ownership and sustainability.

AI Applications in Governance

The application of Artificial Intelligence (AI) in governance holds significant promise for improving the lives of marginalized Indigenous communities in the Chittagong Hill Tracts (CHT) of Bangladesh. By addressing issues related to participatory governance, resource management, transparency, and service delivery, AI can facilitate more inclusive, efficient, and responsive governance systems.

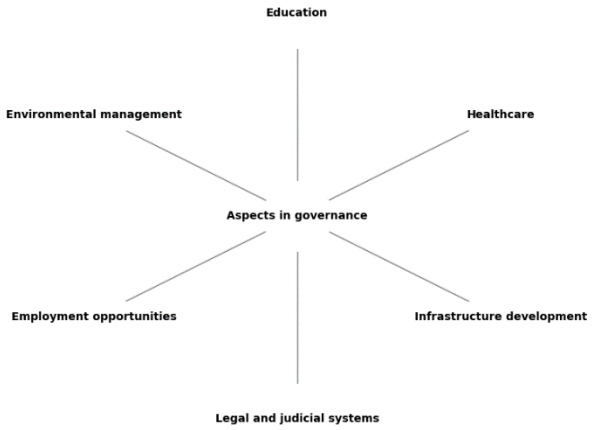

Figure 3. Aspects of Governance Participants Think Need the Most Improvement

Participatory Governance Platforms

AI can enhance participatory governance by developing platforms that allow Indigenous communities to engage in decision making processes more effectively. AI-driven platforms can provide real-time feedback mechanisms, enabling community members to voice their concerns and opinions on various governance

issues. For instance, natural language processing (NLP) can be used to analyze community feedback in multiple languages, ensuring that even those who are not fluent in Bengali or English can participate.

Example: In Brazil, AI-powered chatbots have been used to engage citizens in participatory budgeting processes (M. E. Cortes-Cediela, et al, 2023; M. A. & G. Ruiz, 2023), allowing residents to propose and vote on local projects. A similar approach can be adopted in the CHT to involve Indigenous peoples in local governance decisions, thereby enhancing transparency and accountability.

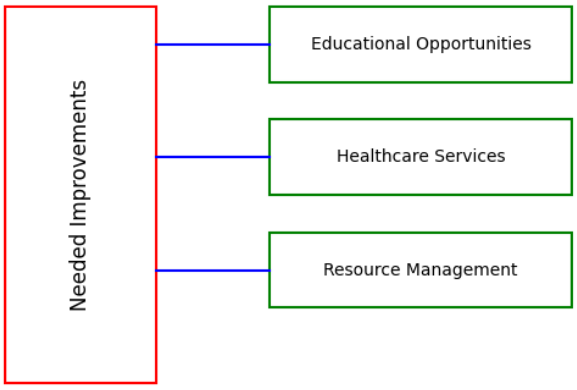

Figure 4. How AI Contribute to Improving Governance in Different Communities

Resource Management

Effective resource management is crucial for the sustainable development of the CHT region. AI can assist in managing natural resources by providing predictive analytics and decision support systems. These technologies can help monitor environmental conditions, forecast agricultural yields, and manage land use more efficiently.

Example: AI models that analyze satellite imagery and environmental data can predict deforestation and land degradation trends, allowing for timely intervention and sustainable land management practices. In India, AI has been used to monitor crop health and optimize irrigation, leading to better resource utilization and increased agricultural productivity (S. Titirmare; T. Talaviya, et al, 2020).

Transparency and Accountability

AI technologies can significantly enhance transparency and accountability in governance by automating data collection, analysis, and reporting processes. Blockchain technology, combined with AI, can create immutable records of transactions and decisions, reducing opportunities for corruption and ensuring that public resources are used effectively.

Example: Estonia has implemented blockchain-based systems to secure government records and ensure transparent transactions (S. Semenzin, et al, 2022; D. Aktas, 2024). A similar system can be implemented in the CHT to track the allocation and use of development funds, ensuring that resources reach the intended beneficiaries.

Service Delivery

AI can improve the delivery of essential services such as healthcare, education, and social welfare by automating processes and providing personalized services. For instance, AI powered telemedicine platforms can bridge the gap in healthcare access by connecting remote Indigenous communities with medical professionals. Machine learning algorithms can analyze patient data to provide accurate diagnoses and treatment recommendations.

Example: In Rwanda, AI-driven telemedicine initiatives have improved healthcare access in remote areas by allowing patients to consult with doctors via mobile platforms (D. Nnaji, 2024; I. Ouedraogo, 2024; S. Ibeneme, et al, 2021). Implementing similar AI-based telehealth services in the CHT can address the region's healthcare challenges, especially in areas with limited access to medical facilities.

Educational Support

AI can play a crucial role in enhancing educational opportunities for Indigenous children and adults in the CHT. Adaptive learning systems, powered by AI, can provide personalized educational content tailored to the needs and learning styles of individual students.

These systems can offer multilingual support, helping preserve Indigenous languages while improving literacy and educational outcomes.

Example: AI-driven platforms like Duolingo have successfully used adaptive learning techniques to teach new languages to users worldwide (Q. Wang, 2024; R. Imamguluyev; R. K. Yekollu, et al, 2024). Similar platforms can be developed to teach Indigenous languages and other subjects to students in the CHT, supporting both cultural preservation and educational advancement.

Measures for Implementing Local Pilot Projects in the Chittagong Hill Tracts

Given the current lack of AI-driven pilot projects in the Chittagong Hill Tracts, several measures can be taken to initiate such projects:

Catagory	Votes
Automated translation services for indigenous languages	360
AI-driven data analysis for resource management	220
AI-powered health diagnostics and telemedicine	500
Smart agriculture technology	430
Disaster prediction and management systems	440
E-governance platforms for better public service delivery	240
AI-based education tools	500

Table 1. AI Applications do People Think Could Directly Benefit Community's Governance

Establishing Digital Infrastructure

The foundation of any AI-driven governance initiative is robust digital infrastructure. The CHT region requires significant investment in internet connectivity, mobile network coverage, and access to digital devices. Establishing this infrastructure is crucial for enabling AI applications and ensuring that community members can access digital services.

Implementation

• Expand broadband internet access and mobile network coverage to remote and underserved areas.

• Distribute affordable smartphones and other digital devices to community members, with a focus on marginalized groups.

• Set up digital hubs or community centers equipped with computers and internet access to serve as focal points for AI-related activities.

Data Collection and Management

Accurate and comprehensive data is essential for developing effective AI models. Data collection efforts should focus on gathering relevant information on governance issues, resource management, healthcare, education, and other critical areas.

Ensuring the quality and integrity of data is paramount. Implementation:

• Conduct extensive surveys and community consultations to gather data on local governance challenges and needs. • Utilize satellite imagery and geospatial data for monitoring land use, environmental conditions, and resource management.

• Implement data management systems that ensure data is clean, anonymized, and securely stored, with strict protocols for data privacy and access.

Developing AI Solutions Tailored to Local Needs

AI applications must be designed to address the specific governance challenges faced by the Indigenous communities in the CHT. This involves creating AI models that are culturally sensitive and relevant to the local context.

Implementation

• Collaborate with local stakeholders, including community leaders, NGOs, and government officials, to identify priority areas for AI intervention.

• Develop AI models for participatory governance platforms that enable community

members to engage in decisionmaking processes.

• Create AI-driven resource management systems to optimize the use of natural resources and monitor environmental sustainability.

• Design AI-powered healthcare and educational platforms that provide personalized and accessible services to remote communities.

Building Capacity and Promoting Digital Literacy

For AI-driven governance to be successful, it is essential to build the capacity of local communities and promote digital literacy. This will empower community members to effectively use AI applications and participate in digital governance processes.

Implementation

• Conduct training programs and workshops to enhance digital literacy and technical skills among community members, with a focus on women and youth.

• Provide ongoing support and resources to local officials and community leaders to help them understand and utilize AI technologies.

• Develop educational campaigns to raise awareness about the benefits and potential of AI in governance, addressing any concerns or misconceptions.

Ensuring Ethical and Inclusive AI Implementation

Ethical considerations are critical when implementing AI in governance, particularly in terms of data privacy, consent, and cultural sensitivity. Ensuring that AI applications are inclusive and respect local traditions and values is essential for gaining community trust and acceptance.

Implementation

• Establish ethical guidelines and frameworks for AI development and deployment, with input from local communities and cultural experts.

• Obtain informed consent from all participants in data collection and AI initiatives, clearly explaining the purpose and use of their data.

• Customize AI interfaces and functionalities to align with local languages, cultural practices, and community needs. • Create feedback mechanisms to allow community members to express their concerns and provide input on AI applications, ensuring continuous improvement and responsiveness.

Analysis and Discussion

Comparison of Pre- and Post-AI Implementation Scenarios

The introduction of AI into governance for the indigenous communities in the Chittagong Hill Tracts (CHT) could transform the existing administrative processes. Currently, governance in the CHT faces challenges such as inefficiency, lack of transparency, and limited citizen participation. By integrating AI solutions, these issues can be addressed through streamlined processes, improved service delivery, and enhanced citizen engagement. For instance, AI could automate administrative tasks, thus reducing bureaucratic delays, and provide data-driven insights to optimize resource allocation and policymaking.

Challenges and Risks

Technological Infrastructure and Digital Literacy

Implementing AI solutions in the CHT faces several challenges, primarily due to inadequate technological infrastructure and low levels of digital literacy among the indigenous population. Ensuring that the necessary digital infrastructure is in place and providing comprehensive digital literacy programs are essential steps to overcome these barriers.

Risks of Misuse and Data Security

AI implementation also poses risks, including the potential misuse of technology and concerns over data security. Without proper regulations and safeguards, AI could be exploited for malicious purposes, such as surveillance or manipulation. Additionally, protecting the privacy and data of the indigenous communities is crucial to maintain their trust and ensure ethical use of AI.

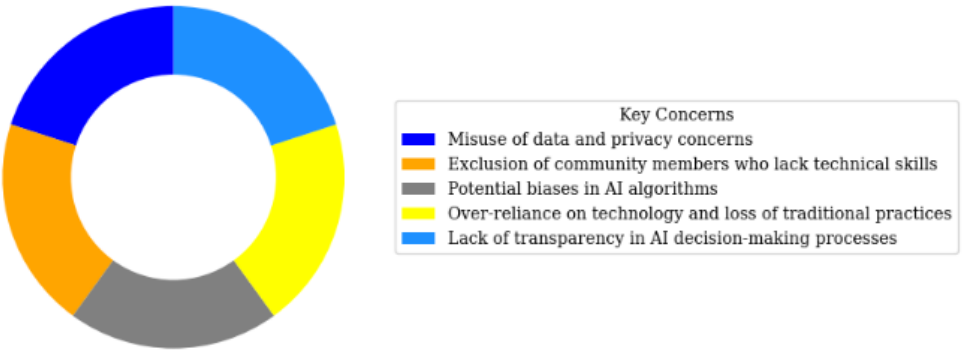

Figure 5. Primary Concerns Regarding the Integration of AI in Community's Governance

Ethical Considerations

Implementing AI solutions in governance also raises several ethical concerns. Data privacy is a major issue, as highlighted by the respondents. Ensuring that personal data is collected, stored, and used responsibly is crucial to gaining community trust. Informed consent and transparency in data handling practices are essential to address these concerns.

Cultural Sensitivity

Cultural sensitivity is another critical consideration. AI solutions must be designed and implemented in a manner that respects and preserves the cultural heritage and practices of the indigenous communities. Engaging with community leaders and members throughout the development and deployment phases can help mitigate cultural risks and ensure that AI technologies are beneficial and respectful of their traditions and values.

Recommendations

Combating Corruption and Enhancing Transparency

To address the pervasive issues of corruption and lack of transparency in governance, the implementation of AI-driven solutions is crucial. Developing an AI-based governance platform can automate and monitor various administrative processes, reducing human intervention and, consequently, opportunities for corruption. Such a platform can include features like digital audits, blockchain-based transaction records, and transparent procurement systems. By ensuring that all transactions and decisions are recorded and accessible, AI can significantly increase accountability. Regular audits and real-time monitoring by AI systems can detect and flag any irregularities, ensuring that corruption is promptly identified and addressed. Moreover, involving community members in oversight processes through digital platforms can further enhance transparency and trust in governance.

Education and Training Programs

Improving digital literacy and providing education on AI technologies are essential for the Indigenous communities in the Chittagong Hill Tracts. Comprehensive education and training programs should be developed to equip community members with the necessary skills to use AI tools effectively. These programs can include workshops, online courses, and community seminars focusing on the basics of AI, its applications, and its benefits. Special emphasis should be placed on training youth and women to ensure inclusive development. Additionally, integrating AI education into the local school curriculum can foster a new generation of tech-savvy individuals who can leverage AI for community development.

Collaborating with local NGOs and educational institutions can facilitate the effective rollout of these training programs.

Healthcare Improvements

AI can revolutionize healthcare delivery in the Chittagong Hill Tracts by providing remote diagnostics, personalized treatment plans, and efficient health management systems. Implementing AI-driven telemedicine services can bridge the gap in healthcare access for remote and underserved areas. AI algorithms can analyze patient data to provide accurate diagnoses and recommend appropriate treatments, reducing the dependency on physically available healthcare professionals. Additionally, AI can be used to monitor public health trends and predict outbreaks, enabling timely interventions. Training local healthcare workers to use AI tools can enhance their ability to provide quality care. Partnerships with healthcare organizations and tech companies can facilitate the deployment of AI technologies, ensuring that they are tailored to the specific needs of the community.

Smart Agriculture Technology

Introducing smart agriculture technology powered by AI can significantly enhance agricultural productivity and sustainability for the Indigenous communities. AI-driven solutions can provide real-time insights into soil health, weather conditions, and crop management, enabling farmers to make informed decisions. Precision farming techniques, guided by AI, can optimize resource use, such as water and fertilizers, and increase crop yields. Drones and sensors equipped with AI can monitor crop health and detect pest infestations early, reducing crop losses. Additionally, AI can facilitate access to market information, helping farmers to get better prices for their produce. Training programs on the use of these technologies, along with subsidies and financial support, can ensure that even small-scale farmers benefit from these advancements. Collaborating with agricultural research institutions can further enhance the effectiveness of AI solutions in agriculture.

By addressing these key areas—corruption and transparency, education and training, healthcare, and agriculture—AI can play a transformative role in improving the lifestyle of Indigenous people living in the Chittagong Hill Tracts. These recommendations, if implemented effectively, can empower communities, enhance their quality of life, and promote sustainable development.

Conclusion

The research on leveraging Artificial Intelligence (AI) for enhancing governance in the Chittagong Hill Tracts (CHT) reveals significant potential for transforming the lives of marginalized Indigenous communities. Key findings from the survey and analysis indicate that the current governance system in the CHT faces substantial challenges, including corruption, lack of transparency, limited access to essential services, and inadequate representation in decision-making processes. These issues have contributed to widespread dissatisfaction and hindered sustainable development in the region.

The implementation of AI offers promising solutions to these challenges. AI-driven platforms can automate and monitor administrative processes, significantly reducing opportunities for corruption and increasing transparency. The use of AI in governance can ensure that all transactions and decisions are recorded and accessible, fostering accountability and trust. Furthermore, AI's ability to provide real-time monitoring and flag irregularities can enhance the effectiveness of anti-corruption measures.

Education and training programs focused on digital literacy and AI technologies are essential for empowering the Indigenous communities. By equipping community members with the necessary skills to use AI tools effectively, these programs can foster inclusive development and ensure that the benefits of AI are widely distributed. Training the youth and women in particular can lead to a more inclusive and sustainable community development.

In the healthcare sector, AI can bridge the gap in access to quality services. AI-driven telemedicine and remote diagnostics can provide timely and personalized healthcare to remote and underserved areas, reducing dependency on physically available healthcare professionals. AI's ability to monitor public health trends and predict outbreaks can enable timely interventions and improve overall health outcomes.

The introduction of smart agriculture technology powered by AI can enhance agricultural productivity and sustainability. AI-driven solutions can provide real-time insights into soil health, weather conditions, and crop management, enabling farmers to make informed decisions and optimize resource use. Precision farming techniques and AI-guided pest detection can increase crop yields and reduce losses, contributing to food security and economic stability for the Indigenous communities.

In summary, the potential of AI to empower marginalized Indigenous communities and improve governance in the CHT is immense. By addressing the key challenges in governance, healthcare, education, and agriculture, AI can play a transformative role in enhancing the quality of life for the Indigenous people. The successful implementation of AI-driven solutions requires a collaborative effort involving community members, local leaders, NGOs, and government authorities. With the right strategies and investments, AI can become a powerful tool for promoting sustainable development and empowering the Indigenous communities in the Chittagong Hill Tracts.

Acknowledgement

We extend our heartfelt thanks to the indigenous communities of the Chittagong Hill Tracts for their invaluable insights and cooperation. We also appreciate the support the encouragement from our families and friends.

Conflict of Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Adeoye, O. B., Addy, W. A., Ajayi-Nifise, A. O., Odeyemi, O., Okoye, C. C., & Ofodile, O. C. (2024). Leveraging AI and data analytics for enhancing financial inclusion in developing economies. *Finance & Accounting Research Journal*, 6(3), 288–303. https://www.fepbl.com/index.php/farj/article/view/856

Ahmed, S., Shamsuzzoha, A., & Rahman, M. Z. (2023). Developing inclusive tourism in Chittagong Hill Tracts (CHT): A case study on Sajek Valley, Bangladesh. *Asian Review of Social Sciences*, 12(2), 1–9.

Aktas, M. (2024). Blockchain application in government. In *Exploring Blockchain Applications: Management Perspectives* (pp. 150–170).

Amin, S. B. (2021). A brief history and overview of tourism in Bangladesh. In *The Economy of Tourism in Bangladesh: Prospects, Constraints, and Policies* (pp. 39–82). Springer. https://doi.org/10.1007/978-3-030-67634-2_3

Aminizadeh, S., Heidari, A., Dehghan, M., Toumaj, S., Rezaei, M., Navimipour, N. J., Stroppa, F., & Unal, M. (2024). Opportunities and challenges of artificial intelligence and distributed systems to improve the quality of healthcare service. *Artificial Intelligence in Medicine*, 149, 102779. https://doi.org/10.1016/j.artmed.2023.102779

Apampa, O. (2024). Government analytics: Leveraging digital technologies, machine learning and artificial intelligence for probity and accountability in public service.

Ashrafuzzaman, M. (2014). The tragedy of the Chittagong Hill Tracts in Bangladesh: Land rights of indigenous people.

Barkat, S., Halim, A., Osman, I., Hossain, M., & Ahsan, M. (2010). *Status and dynamics of land rights,*

land use and population in Chittagong Hill Tracts of Bangladesh. Human Development Research Centre.

Chakma, B. (2010). The post-colonial state and minorities: Ethnocide in the Chittagong Hill Tracts, Bangladesh. *Commonwealth & Comparative Politics, 48*(3), 281–300. https://doi.org/10.1080/14662041003735627

Chakma, B. (2016). The CHT and the peace process. In M. S. Mahmud (Ed.), *Routledge handbook of contemporary Bangladesh* (pp. 306–315). Routledge.

Challoumis, Z. (2024). Building a sustainable economy: How AI can optimize resource allocation. In *XVI International Scientific Conference* (pp. 190–224).

Cortes-Cediela, M. E., Pardo-Bosch, A., Velasco-Montero, C., & Piattini, M. (2023). Trends and challenges of e-government chatbots: Exploratory research in their application to open government data and citizen participation content. *Government Information Quarterly, 40*(4), 101877. https://doi.org/10.1016/j.giq.2023.101877

Halim, S., Roy, D., Chakma, S., & Tanchangya, S. B. (2007). *Regional Indigenous Peoples' Programme*.

Hao, X., & Demir, E. (2024). Artificial intelligence in supply chain decision-making: An environmental, social, and governance triggering and technological inhibiting protocol. *Journal of Modelling in Management*, 19(2), 605–629. https://doi.org/10.1108/JM2-12-2021-0311

Haque, S. (2023). Land rights of the ethnic minorities in Chittagong Hill Tracts. *International Journal of Human Rights and Constitutional Studies, 10*(4), 399–432. https://doi.org/10.1504/IJHRCS.2023.100567

Hasan, M. Z. (2012). *Social equity and integrity through ICT: A critical discourse analysis of ICT policies in Bangladesh*.

Ibeneme, S., Okeibunor, J., Muneene, D., Husain, I., Bento, P., Gaju, C., Housseynou, B., Chibi, M., Karamagi, H., & Makubalo, L. (2021). Data revolution, health status transformation and the role of artificial intelligence for health and pandemic preparedness in the African context. In *BMC Proceedings* (Vol. 15, pp. 1–12). Springer. https://doi.org/10.1186/s12919-021-00213-y

Islam, M. T. (2019). *Peace agreement and conflict transformation: A study of the 1997 Chittagong Hill Tracts Accord of Bangladesh* (PhD thesis). University of Bradford.

Kabir, R., Datta, S., Raza, S. H., & Maitrot, M. R. L. (2019). Health shocks, care-seeking behaviour and coping strategies of extreme poor households in Bangladesh's Chittagong Hill Tracts. *BMC Public Health, 19*(1), 1–12. https://doi.org/10.1186/s12889-019-7759-9

Katal, N. (2024). AI-driven healthcare services and infrastructure in smart cities. In *Smart Cities* (pp. 150–170). CRC Press.

Khan, S. R. (2003). Indigenous peoples in Bangladesh: Land rights and land issues in the context of Chittagong Hill Tracts (CHT).

Kuziemski, M., & Misuraca, G. (2020). AI governance in the public sector: Three tales from the frontiers of automated decision-making in democratic settings. *Telecommunications Policy, 44*(6), 101976. https://doi.org/10.1016/j.telpol.2020.101976

Li, J., Brar, A., & Roihan, N. (2021). The use of digital technology to enhance language and literacy skills for indigenous people: A systematic literature review. *Computers and Education Open, 2*, 100035. https://doi.org/10.1016/j.caeo.2021.100035

Mannuru, N. R., Shahriar, S., Teel, Z. A., Wang, T., Lund, B. D., Tijani, S., Pohboon, C. O., Agbaji, D., Alhassan, J., Galley, J., et al. (2023). Artificial intelligence in developing countries: The impact of generative artificial intelligence (AI) technologies for development. *Information Development*. https://doi.org/10.1177/02666669231200628

Mohsin, A. (2003). *The Chittagong Hill Tracts, Bangladesh: On the difficult road to peace*. Lynne Rienner Publishers.

Nabi, R. (2020). *Examining the selective best practices of indigenous land claims to remedy existing prolonged CHT land dispute crisis* (Doctoral dissertation, University of Kansas).

Nechesov, A., & Ruponen, J. (2024). Empowering government efficiency through civic intelligence: Merging artificial intelligence and blockchain for smart citizen proposals. *Technologies, 12*(12), 271. https://doi.org/10.3390/technologies12120271

Nnaji, D. (2024). Impact and challenges of artificial intelligence integration in the African health sector: A review.

Ouedraogo, D. (2024). *Mobile technology and artificial intelligence for improving health literacy among underserved communities* (PhD thesis). Université de Bordeaux; Université Nazi Boni.

Partha, R. S. (2016). The consequences of Chittagong Hill Tracts (CHT) peace accord at the village level: Case study of Khagrachari Hill District in Bangladesh. *Journal of International Development and Cooperation*, 22(1), 1–14.

Pasha, K., Mozumder, S., & Chakma, K. (n.d.). The impact of jhum cultivation on hilly area (Rangamati, Khagrachari). *Management, 1*(1), 97–107.

Paul, M. G., & Uddin, J. (2024). Advocating dharma and ahimsa: Mitigating human rights violations and vulnerabilities among indigenous communities in the Chittagong Hill Tracts (CHT). *Educational Administration: Theory and Practice, 30*(5), 6990–7000.

Pedro, M., Subosa, A., Rivas, A., & Valverde, P. (2019). Artificial intelligence in education: Challenges and opportunities for sustainable development.

Roy, R. D. (2004). Challenges for juridical pluralism and customary laws of indigenous peoples: The case of the Chittagong Hill Tracts, Bangladesh. *Arizona Journal of International and Comparative Law*, 21, 113–183.

Ruiz, M. A. G. (2024). Towards a better protection of human rights through the use of AI and related technologies in budgeting and auditing of public expenditure. *Deusto Journal of Human Rights, 14*, 173–201.

Semenzin, S., Rozas, D., & Hassan, S. (2022). Blockchain-based application at a governmental level: Disruption or illusion? The case of Estonia. *Policy and Society*, 41(3), 386–401. https://doi.org/10.1093/polsoc/puac016

Sharofova, S. (2023). The impact of AI on endangered languages: Can technology save or kill? *Texas Journal of Philology, Culture and History*, 25, 52–59.

Shelley, M. R. (2000). Socioeconomic status and development of Chittagong Hill Tracts (CHT) of Bangladesh: An overview. In *Growth, Poverty Alleviation, and Sustainable Resource Management in the Mountain Areas of South Asia* (pp. 107–136).

Suman, S. (2024). *Tourism planning & development in tribal areas* (Doctoral dissertation, SPA Bhopal).

Talaviya, T., Shah, D., Patel, N., Yagnik, H., & Shah, M. (2020). Implementation of artificial intelligence in agriculture for optimisation of irrigation and application of pesticides and herbicides. *Artificial Intelligence in Agriculture*, 4, 58–73. https://doi.org/10.1016/j.aiia.2020.04.002

Tapu, I. F., & Fa'agau, T. K. (2022). A new age indigenous instrument: Artificial intelligence & its potential for (de)colonialized data. *Harvard Civil Rights-Civil Liberties Law Review, 57*, 715.

Titirmare, S., Margal, P. B., Gupta, S., & Kumar, D. (2024). AI-powered predictive analytics for crop yield optimization. In *Agriculture 4.0* (pp. 89–110). CRC Press. https://doi.org/10.1201/9781003129712-5

Van Schendel, W., Mey, W., & Dewan, A. K. (2000). *The Chittagong Hill Tracts: Living in a borderland*. White Lotus Bangkok.

Wang, Q. (2024). AI-driven autonomous interactive English learning language tutoring system. *Journal of Computational Methods in Science and Engineering*.

Wang, Y.-F. (2023). *Artificial Intelligence System Codesign with Native American Communities for Tribal Emergency Management* (Doctoral dissertation, University of Nebraska at Omaha).