Leave No One Behind: AI-Powered Inclusive Development for Viksit Bharat 2047

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Abstract

Viksit Bharat 2047 envisions a socially and economically developed India. However, achieving this goal requires addressing the challenges faced by underprivileged sections too. This paper explores the potential of Artificial Intelligence (AI) as a transformative tool for inclusive development and examines how AI can empower marginalised communities in areas like education, healthcare, livelihood opportunities etc, particularly in rural areas. The article acknowledges the importance of responsible AI development, ensuring inclusivity and mitigating potential biases, particularly in the Indian heterogeneous society. By harnessing the power of AI responsibly, it is possible to build a more equitable and prosperous India, leaving no one behind on the path to Viksit Bharat 2047.

Keywords: Artificial Intelligence, Inclusive Development, Viksit Bharat 2047, Responsible AI, Marginalised communities, AI-powered social inclusion

Introduction

The vision of Viksit Bharat 2047 (Developed India by 2047) encapsulates India's aspiration for a future marked by economic prosperity, social progress and technological advancement. At its core lies the principle of inclusive development, ensuring that all sections of society benefit from this progress (Mundhe: 2024). However, achieving this goal requires addressing deep-rooted inequalities that continue to marginalise certain communities. (Pandya :2024). Despite India's economic progress, significant

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challenges remain in achieving inclusive development. Marginalised communities, including women, rural populations, religious minorities and tribal groups, face numerous hurdles across various sectors such as education, healthcare, financial inclusion, information access etc. For example, in education, though the national literacy rate of 74%, (Census 2011) but with stark rural-urban disparities (67.7% vs. 84.1%) exist. Gender disparity also persists, with a female literacy rate of 65.5%. These disparities limit access to knowledge and upward mobility for marginalised communities.

Traditional development models, often top-down and uniform, frequently fall short in reaching marginalised communities. These models may not address the specific needs and challenges these groups encounter. Moreover, bureaucratic red tape and corruption can hinder the effectiveness of government programs. While India has made steps in certain social indicators, significant disparities persist. For instance, India's ranking of 129 on the 2024 Global Gender Gap Index, trailing nations like Bangladesh, Nepal, Sri Lanka and Bhutan, underscores enduring inequalities in women's education, health and economic participation. Rural populations continue to lag behind urban areas in terms of essential amenities, infrastructure and access to social services which perpetuating an uneven development landscape. Despite these challenges, AI presents a promising avenue for inclusive development in India. This paper delves into the potential of AI as a transformative tool to bridge these divides, empower marginalised populations and contribute to a truly equitable and prosperous India. Given these persistent disparities, innovative solutions are imperative to address the unique challenges faced by marginalised communities. AI, with its transformative potential, offers a new approach to rethinking development strategies and creating more inclusive opportunities across sectors.

The Landscape of Development in India

Over the past few decades, India has undoubtedly made remarkable progress in its economic development. Yet, these advancements have been unevenly distributed, leaving significant sections of society still grappling with entrenched socioeconomic inequalities.

For marginalised communities, such as women, religious minorities and lower castes, the road to equality is often blocked by deeply rooted social and cultural barriers (Hasmath, 2015). Because of these barriers, stark disparities exist in the lives of rural populations and they bear the brunt of these disparities (Asaria et al., 2019). For example, the lack of access to quality education, healthcare and financial services stifles the ability of rural populations to fully integrate into the broader economy and holds back their potential progress. Women, in particular, face a unique set of challenges, with unpaid care work disproportionately falling on their shoulders, curbing both their educational and employment prospects (Kuri, 2009). This intersection of gender and economic inequality perpetuates a vicious cycle of poverty, which not only constrains individual potential but also hampers overall national development. Addressing these persistent issues demands a shift away from traditional methods and towards innovative, holistic strategies that truly prioritise inclusivity. In the following section, we will explore the current strategies in place for promoting inclusive development in India and highlight the gaps that remain, which draw from the review of existing literature.

Review of Inclusive Development in India: Strategies and Gaps

India's quest for inclusive development has raised a rich body of scholarly literature. Since the dawn of its national planning process, the emphasis has been on equitable growth, achieved through strategies like poverty alleviation, affirmative action and increased spending on social sectors. Amartya Sen (1999) defended the 'capabilities approach,' advocating for individual freedom and resources to pursue a fulfilling life. However, existing research also exposes significant gaps. Christophe Jaffrelot (2016) critiques the persistence of social inequalities and argues for a deeper focus on dismantling caste and gender discrimination. Similarly, Jean Drese and Amartya Sen (2013) highlight stark regional disparities, with rural areas lagging in infrastructure and social services. These gaps necessitate innovative solutions to realise the vision of Viksit Bharat.

Fortunately, research on AI for social good offers promising avenues for inclusive development. Alam (2023) demonstrated the personalised learning platforms powered by AI to cater to diverse learning styles and improve educational outcomes. Božić (2023) further emphasises the potential of AI to bridge the digital divide by providing remote access to quality education. Jiang et al. (2017) showcase the effectiveness of AI in healthcare diagnostics, while Liu et al. (2020) explore its potential for disease prediction. Additionally, Agrawal (2022) and Yasir et al. (2022) argue that AI-powered microfinance solutions can empower unbanked populations and promote financial inclusion.

While the potential of AI is undeniable, concerns regarding responsible development demand careful consideration. Jobin et al. (2019) map the global landscape of AI ethics guidelines, emphasising principles of fairness, transparency and accountability. Algorithm bias, as highlighted by Kasim and Koshiyama (2021), can perpetuate existing inequalities. For instance, AI-powered credit scoring models trained on biased data could unfairly disadvantage marginalised communities. Similarly, a lack of transparency in AI development can raise concerns about privacy and data security (Oseni et al., 2021). Therefore, the literature review underscores that AI has a transformative role in addressing existing inequalities but ensuring responsible AI development and deployment through robust ethical frameworks is crucial to harnessing its potential for social good.

Responsible AI for Social Good

While AI presents immense potential for inclusive development, its ethical and responsible deployment is paramount. Concepts such as fairness, transparency and accountability serve as bedrock principles in AI development to prevent exacerbating existing inequalities (Tigard, 2021). Algorithmic biases, rooted in training data, can inadvertently lead to discriminatory outcomes. To ensure fairness, measures like data anonymisation, bias detection algorithms and vigilant human oversight are essential. Transparency in AI decision-making processes is also crucial for building trust with users. This introduction has laid the groundwork for exploring specific AI applications for inclusive development in Viksit Bharat 2047. The concept of Responsible AI will be further elaborated upon, emphasising its critical role in ensuring equitable and sustainable

AI-powered development. (Sia & Ahmed: 2022). However, responsible AI development is paramount to ensure its ethical and equitable use for social good. So, it is necessary to analyse the challenges associated with responsible AI implementation and propose strategies to navigate them.

AI Applications for Addressing Sectoral Challenges

AI develops intelligent systems capable of learning and performing tasks traditionally requiring human intelligence (Gruetsemacher & Whittlestone, 2019). This transformative potential holds immense promise for tackling development challenges in India, particularly concerning bridging existing inequalities and empowering marginalised communities. For example, in education, AI-powered platforms can personalise learning experiences, catering to diverse learning styles and overcoming limitations of traditional methods. Imagine rural students with limited access to qualified teachers benefitting from AI tutors who adapt lessons to their pace and understanding. (Fitria: 2021). Additionally, AI-powered translation tools can break down language barriers, ensuring educational materials are accessible in various regional languages. In healthcare sector, AI can revolutionise healthcare delivery in Viksit Bharat. Algorithms can analyse medical data to improve diagnostics, predict disease outbreaks and offer remote patient monitoring. This can be particularly beneficial in rural areas with limited access to healthcare facilities. AI-powered chatbots can provide basic health information and answer common medical queries, empowering individuals to take charge of their health. (Puaschunder: 2019)

For financial inclusion, AI-driven credit scoring models can assess creditworthiness beyond traditional parameters, reaching unbanked populations, particularly women and rural entrepreneurs. (Mhlanga: 2023). Microfinance institutions can leverage AI to streamline loan applications and disburse funds efficiently. This can empower marginalised communities to access capital for starting businesses and pursuing income generation opportunities and regarding access to information, AI-powered language translation tools can bridge the information gap, allowing marginalised communities to access crucial information on government services, healthcare and educational resources.

Chatbots can provide personalised responses to queries in local languages, ensuring information is readily available and accessible. Additionally, AI's ability to automate repetitive tasks could free up human resources for more complex activities, potentially leading to increased productivity and job creation across various sectors (Banerjee et al., 2023). These examples show that how AI is already making a difference and, more importantly, how it can be scaled up to reach broader sections of society.

AI for Inclusive Development in Action: Three Cases

The promise of AI for inclusive development isn't just theoretical. Real-world examples showcase its potential to bridge gaps and empower marginalised communities. Here, we explore three such cases.

Case 1: EkStep - Bridging the Rural Education Gap: Millions of children in rural India face limited access to quality education due to teacher shortages and resource constraints. EkStep, an Indian EdTech company, tackles this challenge by leveraging AI to personalise learning experiences. Their adaptive learning platform employs AI algorithms to assess individual strengths and weaknesses, tailoring educational content and activities accordingly. Catering to diverse learning styles and functioning in low-bandwidth environments, the platform is accessible in remote areas. It has reached over 50 million children across India, providing personalised learning regardless of location or background. Studies (Manthra, 2018) reveal significant improvements in learning outcomes, particularly in rural areas, demonstrating the transformative power of AI in education.

Case 2: Wadhwani AI - Early Detection of Tuberculosis: Early detection of tuberculosis (TB) is crucial for treatment and control. However, limited access to healthcare facilities and specialists hinders early diagnosis in remote areas. The Wadhwani Institute for Artificial Intelligence (WIAI) has developed an AI-powered system for analysing chest X-rays. This system utilises deep learning algorithms to detect TB with high accuracy, even exceeding human radiologists in some cases (Narasimhan et al., 2020). WIAI's AI tool is being deployed in pilot projects across India, offering rapid and accurate TB screening in resource-constrained settings. This can significantly

improve case detection rates and lead to earlier treatment for marginalised communities, contributing to better health outcomes (Bajpai & Wadhwa 2021).

Case 3: mDiabetes - Mobile Health for Diabetes Management: mDiabetes is an innovative mobile health initiative addressing the growing diabetes epidemic in India, particularly among underserved populations. Launched in collaboration with various organisations, it aims to provide accessible and personalised diabetes management solutions through mobile platforms. The initiative primarily operates in rural and semi-urban areas with limited access to healthcare facilities and specialised medical support. Notably, their flagship program with Nokia between 2011 and 2013 engaged over 1 million individuals, establishing it as the largest text and voice message-based diabetes prevention program globally (Pfammatter A et al., 2016). This pioneering effort targeted diverse socio-economic backgrounds, delivering bi-weekly diabetes awareness and prevention messages over six months.

These case studies illustrate the power of AI in addressing challenges faced by marginalised communities in India. By personalising education and improving healthcare access, AI aligns with the goals of Viksit Bharat 2047. As responsible AI development continues, these successes offer a glimpse into the transformative potential of this technology for social good. While these cases showcase AI's transformative potential, understanding the obstacles to AI adoption is crucial for scaling these solutions and ensuring they benefit all sections of society.

Challenges of AI Implementation

While AI holds immense potential for fostering inclusive development in India it also possesses significant challenges which requires careful attention. The first challenge is infrastructure hurdles and digital literacy gaps. Limited access to reliable internet connectivity and computing power in rural areas can significantly hinder the deployment and effectiveness of AI solutions (Hagendorff, 2020). A substantial portion of the Indian population, particularly in rural regions, lacks basic digital literacy skills,

impeding their ability to utilise and benefit from AI-powered tools (Patel, 2024). Second major challenge is the ethical considerations and responsible implementation. Here, data privacy concerns, potential biases in AI algorithms and the need for human oversight necessitate robust ethical frameworks and responsible implementation strategies (Jobin et al., 2019). These concerns around ethical deployment are particularly crucial to avoid exacerbating existing inequalities and undermining trust in AI systems. Another concern is the collaboration and innovation for social good. Overcoming these challenges requires collaboration between the government and private sector. Public-private partnerships can leverage private sector expertise and resources to develop and deploy AI solutions with wider reach and improved infrastructure. Moreover, government-led initiatives focusing on digital literacy training and awareness programs can equip marginalised communities with the skills necessary to utilise AI tools effectively. Furthermore, promoting innovation in AI for social good, alongside incentivising and supporting research and development in AI specifically aimed at addressing social challenges, can foster the creation of innovative solutions tailored to India's unique context.

The most important challenge is infrastructure readiness and resource constraints. The lack of advanced computing resources, such as supercomputers essential for running complex AI algorithms and processing large datasets, hampers India's ability to leverage AI effectively. As of 2023, India ranks 74th globally in terms of supercomputing capacity, significantly trailing countries like the United States and China (Top500, 2023). Furthermore, according to the World Bank's World Development Indicators (2022), India's research and development expenditure as a percentage of GDP stands at only 0.7%. This figure is significantly lower than that of major economies and falls well below the global average of 1.8% and significantly lower than that of leading nations; for instance, Israel (5.43 %), US (3.45%), Germany (3.14%), China (2.40 %), France (2.35 %), Singapore (1.85 %) and UK (1.70 %). This underinvestment in critical infrastructure and R&D not only limits the development of homegrown AI solutions but also hampers the country's ability to compete in the global AI landscape, necessitating urgent policy interventions to enhance technology infrastructure and funding for AI research. By addressing the challenges and capitalising on the

opportunities, India can utilise the power of AI to bridge the gaps hindering inclusive development.

Despite the challenges, numerous opportunities exist to promote inclusivity with AI. Developing AI solutions with minimal bandwidth requirements and offline functionality can ensure inclusivity and reach remote populations with limited internet connectivity. Additionally, integrating AI tools with local language capabilities can bridge the digital divide and empower marginalised communities to access information and services in their native languages. Besides, incorporating community feedback throughout the development and deployment process can ensure AI solutions address the specific needs and contexts of marginalised populations, fostering trust and ownership (Feuerriegel et al., 2020).

Roadmap for Implementing AI for inclusive development in India

As AI advances, it presents a unique opportunity to address the challenges faced by marginalised communities in India. Here is a roadmap which outlines actionable recommendations for major sectors, ensuring AI's benefits are equitably distributed and sustainable.

1. Education: AI is reshaping the educational landscape in India, personalising learning, providing immersive experiences, and automating administrative tasks. AI-powered language learning platforms offer tailored instruction and speech recognition, while AR and VR technologies create virtual field trips and simulations, bringing the world to students' fingertips. Additionally, AI-led tools like DeepGrade are addressing the pressing issue of teacher shortages by automating grading, allowing educators to focus on more meaningful interactions with students. Other emerging applications include task automation, smart content creation, round-the-clock support, and adaptive assessments.

2. Agriculture: AI can revolutionise agriculture in India, optimizing resource management, predicting crop yields, and detecting diseases and pests. Precision farming systems, utilising data from sensors and drones, are enhancing planting, fertilisation, and harvesting practices. AI algorithms can also predict crop yields by analysing weather patterns, soil moisture, and fertiliser usage. Additionally, AI-powered tools analyse crop images to detect and diagnose diseases and pests, minimizing crop losses. A notable example is the use of AI-powered drones by Indian farmers to monitor crop health, identify pests, and optimize pesticide application, leading to increased yields and reduced environmental impact.

3. Healthcare: AI can transform healthcare in India, facilitating remote consultations, predicting health risks, and aiding in disease diagnosis. Telemedicine and remote patient monitoring are becoming increasingly prevalent, while AI is accelerating drug discovery and enabling proactive interventions for chronic conditions. Notably, AI algorithms are analysing medical images to enhance the accuracy and efficiency of disease detection and diagnosis. For instance, startups like Qure.ai are utilising AI to analyse X-rays and CT scans, aiding in the early diagnosis of diseases like tuberculosis and lung cancer, particularly in rural areas with limited access to specialized medical care.

4. Public Safety: AI can play a pivotal role in enhancing public safety in India. AI-powered models can analyse data to predict potential crime hotspots, aiding in proactive prevention efforts. For instance, the Delhi Police have deployed AI-powered surveillance systems to analyse CCTV footage, identify potential suspects, and assist in crime investigations. Additionally, AI-enabled technologies are providing accessibility services for people with disabilities, improving their quality of life. For example, Indian startups like Aira Labs have developed AI-powered smart glasses that can provide real-time visual and auditory information to visually impaired individuals, enabling them to navigate

their surroundings independently. Furthermore, AI-powered cybersecurity systems are crucial in detecting and responding to cyber threats, protecting critical infrastructure and sensitive information from hackers.

5. Public Services: AI can reform public services in India, optimising transportation, monitoring the environment, and empowering women. AI-driven systems are enhancing traffic management, reducing congestion, and improving air quality. For instance, Indian cities like Bengaluru are leveraging AI-powered traffic management systems to optimise signal timings, reducing traffic congestion and improving commute times. Additionally, AI is being utilised for climate change assessment, wildlife conservation, and air quality monitoring. Indian organisations like Skymet Weather Services employ AI to analyse vast datasets and provide accurate weather forecasts, aiding in disaster preparedness and climate change mitigation. Furthermore, AI-enabled platforms are supporting women's entrepreneurship, employment opportunities, and education. Initiatives like the National Association of Software and Services Companies (NASSCOM) in India are leveraging AI to connect women with mentorship, training, and funding opportunities, empowering them to pursue entrepreneurial ventures.

6. Financial Inclusion: AI plays a pivotal role in driving financial inclusion in India, enhancing literacy, empowering women, detecting fraud, and powering microfinance platforms. AI-powered models are improving financial literacy, equipping women with the knowledge and skills to access financial services. Notably, Indian fintech companies like BharatPe are leveraging AI to develop digital payment platforms that provide financial services to underserved populations, including women in rural areas. Additionally, AI is detecting fraudulent activities, optimising microfinance processes, and reducing the risk of financial losses. Many companies, such as MoneyTap, offer AI-based microfinance solutions in India, expanding access to credit for underserved populations. These initiatives are contributing

to a more inclusive and equitable financial landscape in India.

7. Disaster Response: AI plays a crucial role in revolutionising disaster response in India. Drones equipped with AI can rapidly assess damage after natural disasters, providing invaluable information for aid efforts. For instance, during the 2018 Kerala floods, drones were deployed to survey the affected areas, identify areas of severe damage, and assess the extent of flooding. NLP-powered communication tools can facilitate crisis communication and information dissemination, ensuring timely and accurate information reaches affected communities. Additionally, VR simulations provide immersive training experiences for disaster preparedness, enabling individuals to learn and practice disaster response skills in a safe and controlled environment. Furthermore, AI-driven predictive analysis can forecast natural disasters like floods, enabling early warnings and mitigation efforts. Indian organisations like the Indian Institute of Tropical Meteorology (IITM) utilize AI to analyse vast datasets and predict the onset and intensity of monsoon rains, aiding in flood preparedness and early warning systems.

Conclusion

This paper has examined the potential of AI to catalyse inclusive development in India, aligning with the vision of Viksit Bharat 2047. Key areas where AI can empower marginalised communities include education, healthcare and economic opportunities. However, navigating this path requires addressing challenges such as infrastructure limitations, digital literacy gaps and ethical considerations surrounding data privacy and algorithmic bias. Overcoming these hurdles necessitates a multifaceted approach. Public-private partnerships, coupled with capacity-building initiatives and fostering innovation in AI for social good, can pave the way for responsible and equitable implementation.

The potential of AI for inclusive development in India is undeniable. AI-powered solutions can personalise learning experiences, improve healthcare access in remote areas and

empower marginalised communities economically. However, achieving this vision necessitates a relentless pursuit of Responsible AI. Robust ethical frameworks, coupled with transparent development practices and ongoing monitoring of AI solutions, are crucial to ensure AI serves as a force for good, leaving no one behind. Multi-stakeholder dialogues involving government, civil society and the private sector are essential for creating a conducive environment for responsible AI development aligned with Viksit Bharat's inclusive development goals. By harnessing the potential of AI responsibly, India can bridge the gap towards a more equitable and prosperous future for all its citizens.

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