

ARTIFICIAL INTELLIGENCE IN DEVELOPING COUNTRIES: A SYSTEMATIC REVIEW OF CROSS-SECTOR APPLICATIONS, IMPLEMENTATION CHALLENGES IN SOUTH ASIAN COUNTRIES.

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Abstract. In South Asia countries like Bangladesh, India, Pakistan, Sri Lanka and Nepal, artificial intelligence (AI) is rapidly changing several sectors. AI has aided solar energy forecasting, disaster prediction, healthcare diagnostics, agriculture precision, HRM, financial compliance in Bangladesh. This discourse identifies various applications of AI/ML in the field of environmental studies, healthcare, education, agriculture, and smart energy systems, with a focus on the Indian context, aiming to augment predictive accuracy and personalization. AI is used in Pakistan, especially in, personalized e-learning, covid-19 detection and prediction, breeding plants, and data-driven business decisions by advanced deep learning models. AI for Good: Sri Lanka showcases Health Misinformation Detection and Digital Drones, Technology for the Public Sector, Chatbots for Education, and presents a strong position on governance and ethical issues Nepal — Nepal is also showing the early signs of AI adoption in healthcare, education, and fintech space. However, amid critical opportunities to boost productivity and decision-making, poor data quality, inadequate infrastructure, ethical considerations, skill gaps, and rural access problems call for tailor-fitting policies, as well as capacity bolstering.

Keywords: Artificial Intelligence (AI), Agriculture, Business, Education, Healthcare, South Asia.

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INTRODUCTION

The technology of Artificial Intelligence (AI) is a worldwide phenomenon for education and has restructured the ways in which knowledge is delivered, delivered, assessed, and received again. Introduction of Artificial intelligence (AI) has been used for more than ten years in formal educational operations, for instance, personalized learning and adaptive tutoring systems, intelligent assessment tools, prediction of student-s performance (Zawacki-Richter et al, 2019). A new body of regional research indicates that — at a rapidly emerging scale — artificial intelligence (AI) could be positioned as the defining technology in the effort to address critical developmental challenges throughout South Asia. Bangladesh: AI applications are being customized for clean energy, disaster management and healthcare. It has been used for solar energy forecast prediction (Islam Miskat et al. 2023), scenario-based prediction of landslide victims (Alam et al. 2023), and for obtaining high diagnostic accuracy for diseases such as kidney diseases and thalassemia (Chowdhury et al. 2025).

AI is widely reported in India, from environmental sustainability involving state-of-the-art air pollution forecasting (Rautela & Goyal, 2024), to improving vocational education and medical diagnostics (Balakrishnan et al., 2018). Literature on AI-driven personalized e-learning systems receives scholarly attention in Pakistan (Murtaza et al., 2022) but broad application of the technology in modern agriculture and public health

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systems remain equally under-researched. Meanwhile, Sri Lankan studies have examined the potential role of AI chatbots in education (Mahroof et al., 2020) and enhancing community participation in public health campaigns (Wijesinghe et al., 2025). For Nepal, literature suggests an early but critical imperative to use AI and explainable methods for investigating customer satisfaction in other sectors such as fintech (Khanal et al., 2023), alongside its promise for contributing to bridging healthcare gaps in low-resource settings (van Teijlingen et al., 2020). All of this regional tapestry illustrates an ambition to leverage AI for sectoral optimization and problem-solving along with a struggle with context-specific impediments to this aspiration at the levels of infrastructure, ethics and implementation capacity.

RESEARCH METHOD

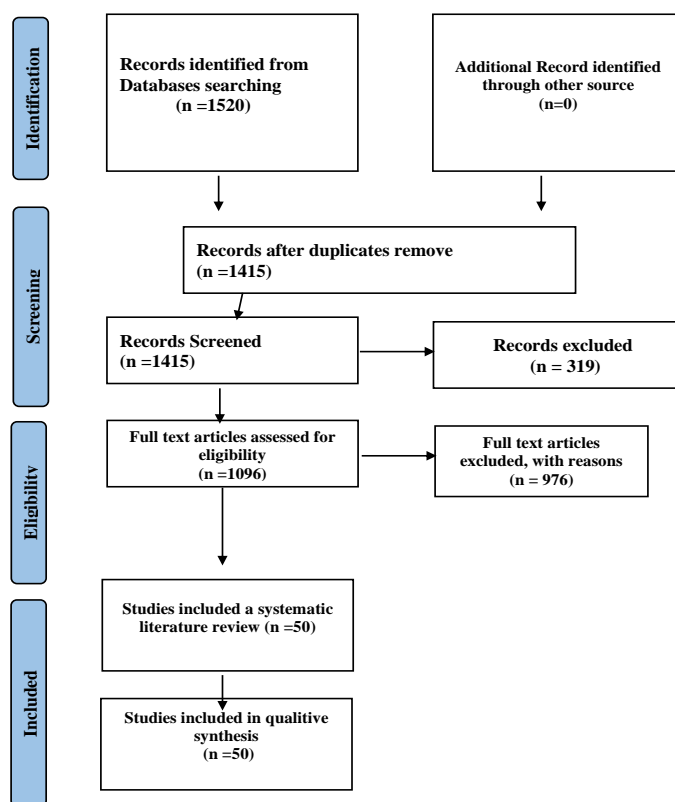


Figure 1. Flow diagram of the selection of the papers.

This is conducted a systematic literature synthesis methodology for analyzing AI research within South Asia in this review. A systematic search conducted through Elsevier, IEEE Access, Springer, PubMed, and MDPI targeted peer-reviewed journal articles and respective conference proceedings published from 2016 to 2025. We made use of search queries that included the combination "artificial intelligence" or "machine learning" with the names of the countries in our study ("Bangladesh," "India," "Pakistan," "Sri Lanka," "Nepal") and key sectors (e.g., "healthcare," "technology," "environment," "agriculture," "education," "business"). An initial pool of publications was screened for relevance, focusing on those that either described typical uses of or actual results based on AI in the regional context. The selected literature was subsequently classified through a thematic analysis style approach (Alam et al., 2023;

Rautela & Goyal, 2024; Murtaza et al., 2022). To achieve this, we extracted and synthesized the key themes, methods, reported outcomes (e.g., accuracy measures), and identified challenges to offer a comparative snapshot of AI adoption, innovation, and implementation gaps across the five nations. Thus, this also facilitated both trends that turned out to be largely similar as well as locally specific findings in the regional AI ecosystem development process.

RESULT

Country	Key Sectors	Representative AI Uses
Bangladesh	Energy, health, agriculture, education, business	Solar forecasting, disease diagnosis, smart farming, generative AI learning
India	Environment, health, education, agriculture, business, technology	Smart grids, air pollution modeling, medical imaging, AI banking
Pakistan	Education, agriculture, health, business	Personalized e-learning, crop detection, COVID-19 analytics
Sri Lanka	Health, education, agriculture, public services	Health misinformation detection, chatbots, e-agriculture platforms
Nepal	Healthcare, education, fintech	Medical screening, AI-assisted teaching, explainable fintech models

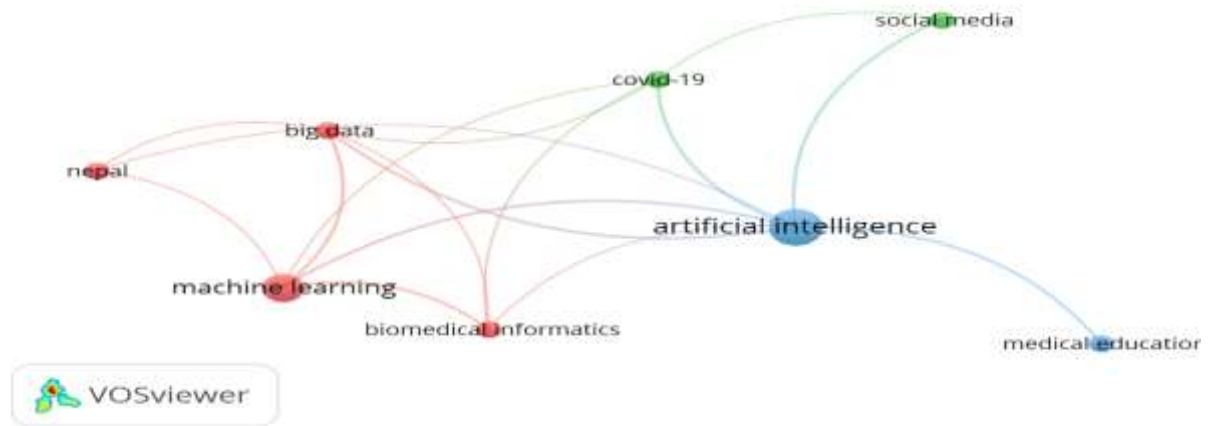


Figure 2. Network Visualization

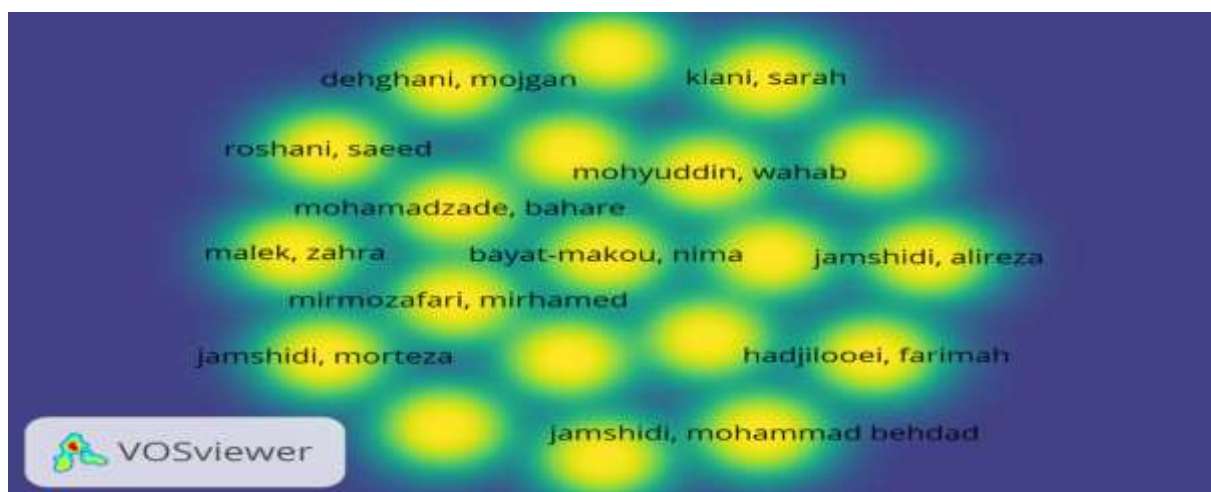


Figure 3. Density Visualization

Bangladesh

Energy & Environment

The integration of Artificial Intelligence (AI) especially machine learning (ML) and artificial neural networks (ANN) into the design, operation, and maintenance of solar energy systems promises to revolutionize conventional approaches, allowing forecasting, optimization, and spectral monitoring to enhance operational efficiency which would provide a solid base for meeting the growing energy demand and sustainable growth in solar energy significant countries such as Bangladesh (Islam Miskat et al., 2023). Though ML-based methods for forecasting solar radiation and power have been widely applied around the world, local models that reflect the extreme variability of weather in Bangladesh are developing to provide enhanced support for renewable energy planning and policy. In addition to energy, AI techniques like ANN, fuzzy logic, hybrid, kernel-based and tree-based models have also been used in environmental hazard analysis, which allows prediction of susceptibility from various sources of data such as rainfall, elevation and land characteristics. On the other hand, although scenario-based AI applications for small-scale casualty estimation are limited, both linear and logistic regressions are used to instantly predict casualties for 1.054×10^{41} combinations of scenarios from seven attributes (e.g., rainfall, area of mass, elevation, and type), making these methods relevant to multi-hazard early warning systems grounded within the United Nations Sendai Framework for Disaster Risk Reduction (Alam et al., 2023).

Business

Polas et al. (2022) argue that AI improves SMEs' agility, strategic value and knowledge management ability, to the extent that they are integrated with human and organizational resources. AI-HRM in Bangladesh activates digital culture and organizational strategy for sustainable organizational performance, with an emphasis on strategy showing stronger effects than culture in volatile context under RBV/DCV frameworks, and mediation gaps remain (Mollah et al., 2024). Furthermore, AI-blockchain hybrids are shown to be better at combating money laundering than manual methods with significant reduction in false positives, while they scale up by addressing scalability, regulatory, and privacy challenges (Rahman & Karim, 2025), thus, support promising fintechs such as bKash and compliance to become a smart nation by 2041 (Rahman & Karim, 2025) by leveraging ML anomaly detection, graph analytics and immutable ledgers.

Healthcare

AI Innovations Addressing Bangladesh Healthcare Gaps in Screening and Disaster-related Challenges Model-agnostic hybrid AHP-TOPSIS framework (with ML models (XGBoost, CatBoost, RF) and XAI (SHAP/LIME)) for thalassemia prediction of pregnant women using a 1200-sample CBC /demographic dataset with hematologic prioritization (MCH, RDW, Hct) and achieving 99.28% prediction accuracy in high-prevalence settings (Chowdhury et al., 2025) In addition, islands of success in RNN based classification on CT images from Dhaka achieve 99.89% accuracy of kidney disease subtypes, representing a leap from the limits of ML in segmentation to adapted diagnostics using DL (Alavi Gharahbagh et al., 2024). Compared to several other approaches, this new low-cost microwave imaging system containing metamaterial antennas and automated scanning

along with non-ionic (breast tumor detection) and selective gain/directivity system is novel and its early diagnosis with high gain and directionality is effective in wide area (Mahmud et al., 2018). These developments highlight the progress of AI that leads to more affordable and accurate medical treatment.

Agriculture

Bangladesh has constraints in agriculture, such as an inefficient irrigation system that only appropriates 25–30% of the available water, manual pest detection that accounts for a 41% rice yield loss, an excessive rate of inorganic fertilizers application, and a slow rate of mechanization. Smart Farming provides potential solutions with AI-powered forecasting, UAV-based remote sensing and monitoring of crop health, and sensors to measure soil moisture, salinity, temperature, and leaf wetness. Moreover, the national wireless infrastructure, backed by extensive 4G/5G coverage of 158 million subscribers, and low-power wide-area networks like LoRaWAN, can facilitate the deployment of IoT technologies in even the most remote regions (Haque et al., 2021).

Education

ChatGPT-type generative AI have the potential to provide conversational explanations of complex HPV concepts to enable self-directed learning in language limited, low-resourced settings like Bangladesh where HPV-related health educators are scarce. Studies refer to it as a relatively low-cost, accessible technology with the potential for personalized health education, and its post-intervention knowledge scores were superior to other traditional materials: 82.19% vs.43.27% baseline ($t=-34.44$, $p<0.00001$) Self-reported ease of self-learning (83.72-87.21% positive) and useful (90.7% positive) rating for ChatGPT among participants supports our preliminary findings that ChatGPT is scalable on mobile platforms despite reported limitations of self-use (Rahman, Akter, & Sayem, 2025).

Technology

Regression testing strategies enable AI learning-to-rank (LTR) based (pre-trained) model on test case priorities and ranking-to-learn (RTL) which progressively learns rankings through a feedback loop and compares them against metrics such as Mean Reciprocal Rank (MRR) and fault detection cost-effectiveness. Criticizes conventional coverage-based methods (like statement/branch coverage) as insufficient for large systems and mentions early applications of neural networks like RNNs for sequence tracking, graph-based for code dependencies and hybrid LTR systems with outcomes of 20-30% improvement of fault localization vs. baselines (Alam et al., 2025).

India

Environment

As cities become home to an estimated 68% of the world population by 2050, the reliance on centralized grids puts a strain on supply. AI optimized distributed energy resources (DERs), energy management systems (EMS), and advanced storage integrated into smart microgrids provide efficiencies of up to 25% and resilience, as evidenced by San Diego, Barcelona and New York's Brooklyn Microgrid. Indeed, in spite of the heavy cost and cybersecurity issues, public-private partnerships drive adoption in Germany and India, and one can expect AI-quantum developments to offer further

advances in the future (Almihat & Munda, 2025). In a similar way, AI/ML has revolutionized air pollution forecasting in India. Traditional models such as MLR and ARMA did not cope well with the linear assumption of traditional models, while ANN, SVM, RF, and deep learning-based approaches such as CNN, RNN and LSTM used to capture the complex fundamentals of the pollutant dynamics than other models together with their assistance plot. Recent models like LSTM and ST-DNN have become more accurate ($RMSE = 7.27 \mu\text{g}/\text{m}^3$), thus improving environmental management (Rautela & Goyal, 2024).

Education

In India, broad ICT applications such as digital platforms and blended learning have been adopted to tackle trainer shortages and enhancing access to vocational training, though there has been limited direct targeting on AI. Nonetheless, this basis is in line with nascent literature which sees AI as an essential development for the scaling of Technical and Vocational Education and Training (TVET). More recent research highlights the AI-based solutions, like adaptive learning, ML-powered intelligent tutoring, immersive simulations, and generative AI for personalized skills assessment, and workforce preparation opportunities. However, these innovations improve the quality of training by providing real-time feedback and help close equity gaps in rural and informal sectors. While infrastructure gaps, data privacy issues, and high costs are reminiscent of previous ICT challenges, the presence of policy support and teacher training can enable those short-comings to stimulate AI to transform by 2030 (Balakrishnan et al., 2018). In Jharkhand, exploratory analysis found that large language models have been adopted by only 0.7% of students, but high predictive power (90% recall or more) with explainable AI in northern India indicates that issues of trust and implementation far supersede basic technological capability (Matos et al., 2025).

Healthcare

Artificial intelligence generated content (AIGC) in public health employs common large language models (LLM) such as ChatGPT to facilitate chatbots, medication guidance, and summaries of multi-dimensional crises, which offer expanded public access to information but introduce potential bias, hallucinations and loss of trust in findings (Li et al., 2025). Due to problems of equity, detection using random forests and TF-IDF is also subject to fact checking and hybrid oversight. The rapid advance of AI in healthcare education, from Turing's original test (Cohen et al., 2023) to convolutional neural networks (CNNs) and large language models (LLMs), allows for better diagnostic abilities, but also greater opportunity for ethical lapses (Jackson et al., 2024) – surveys show a 72% reduction of errors based on testing from medical students, but with 91% of students lacking any training in AI ethics, and advocates for integrated curricula such as WMA/AMA (Jackson et al., 2024) In spite of an interpretability conundrum, CNNs and smart phone imaging also advance the field of diabetic retinopathy screening by AI (Lim et al., 2020).

Agriculture

The application of AI to biological sciences reaches back to Turing 1950 test and Deep Blue victory in 1997, and, recent ML/DL applications in medicine, agriculture and biotechnology. For instance, in medicine, it predicts Alzheimer (93.95%) drugs for

making (87–96%), FDA-approved IDx-DR diagnostics, precision medicine, and drug discovery platforms such as Open Targets. As population rise up to 2050, agriculture areas utilize drones, cnn (99% disease detection) and Crop Yield prediction to avoid more chemicals. Industrial production of ANN-GA models raises enzyme yields 72 times, still they have bias and privacy issues (Bhardwaj, Kishore, & Pandey, 2022). Comparative genomics for target genes in crop improvement using genome editing for food security using CRISPR/Cas prime editing (31% rice efficiency), artificial intelligence-based phenotyping and speed breeding for food security (Razzaq et al., 2021)

Business

Both sectors in India are already starting to see a huge implementation of AI and ML in SHRM (Strategic Human Resource Management) and banking. Logistic regression, decision trees (best performance), SVM, RF, and XGBoost for bank credit risk prediction is able to achieve accuracy above 95% (Kumar et al., 2023) and (for crisis defaults) also hybrid approaches are recommended. AI and generative AI facilitates rapid literature review, data analysis and predictive recruitment in SHRM; however, opacity, bias and privacy implications are an issue (Gowri et al., 2025). The abstract highlights significant contributions, stating that the final results of several analyses are presented, providing empirical evidence of the use of AI domicile serves to promote efficiency for predicting, classifying and making decisions; and that the extent of such statements is contextually situated within Indian research contexts.

Technology

Starting approximately in 2018 there was a growing use of artificial intelligence and machine learning methods, both in the software for development and as a service, to solve data-rich analytical problems within India. In these studies, algorithm-driven models were used to enhance prediction, classification, and decision-making performance. AI techniques were applied to improve the processing of complex datasets in a more efficient manner than traditional methods. Empirical results using system performance and analytical reliability. In conclusion, the current literature indicates a gradual but meaningful incorporation of AI-based methodologies within the Indian research landscape (Kumar et al (2023)).

Pakistan

Education

Educational technology research includes various aspects of educational data mining (EDM), big data, and subjective e-learning. K-means clustering helps students with adaptive teaming (de Moraes; Prakash) where Algarni focuses on risk prediction and analysis of graduation outcomes. Big data supports dynamic learning environments and predictive analytics (Drigas, Manohar, Tulasi, Daniel). Gaeta's Intelligent Web Teacher, Yarandi's ontology-based orientation approach, and Maselena and Wu's proposed frameworks increase student satisfaction through AI-based scaffolding (Kausar et al., 2018). Although research in the TVET sector was initially limited, Hassan et al. (2021) presented a global systematic literature review (SLR) of ICT use based on 134 papers. Various AI techniques, including knowledge tracing clustering, learning medium orientation, and recommender systems, have significantly advanced subjective learning despite the isolation of research (Murtaza et al., 2022).

Agriculture

Fruit detection for agricultural robots is divided into three groups; image processing which is limited by the design of operational features and human intervention; machine learning which is based on manual features with high computation cost even after some features are selected few; and deep learning like CNN segmentation (Bargoti & Underwood) and (Bargoti & Underwood for apple and mangoes with augmentation, which are more accurate challenges Like real-time performance and overfitting from orchard. Building on the inspiration of face detection using MTCNN, Zhang et al. (2019) propose F-MTCNN adaptation. On the other hand, incorporation of AI in plant breeding helps molecular characterization of germplasm by analyzing complex datasets through various omics approaches to make highly accurate predictions and selections for the target traits [8]. These include de novo gene editors that have been designed using large language models and that can complement CRISPR–Cas9 for genome engineering. This demonstrates AI potential to improve precision, efficiency, and also the modern era of crop breeding (Farooq et al., 2024).

Healthcare

Applications of AI/DL have already been seen in the COVID-19 pandemic such as high-risk group analysis, outbreak prediction, and diagnosis, in which GANs were used for viral visualization, ELM for cardiac drug prediction, LSTM for heart failure classification, RNN variants (GRU/CW-RNN) for epidemiological forecasting, and CNNs for imaging to distinguish between COVID-19 pneumonia, with the objective of faster RT-PCR/CT methods as a result of big data being integrated without human contact (Jamshidi et al., 2020). We captured public sentiment on contact tracing apps through AI-enabled sentiment analysis (using hybrid lexicon–deep learning models) that revealed generally pro-app sentiment, but high concerns about privacy which can help in the tailoring of health communication strategies to be more responsive (Cresswell et al., 2021).

Business

Using methods such as fuzzy sets, soft sets, and fuzzy soft graphs to represent uncertainty (e.g., vague customer preferences, vague/degrees of risk, and vagueness in multi-criteria decision-making), and using topological indices to minimize quantities in supply chains and customer networks under uncertainty (Azeem et al. (2024)). Assisted by AI, productivity in business research is driven by the automation of literature searches, data analysis and synthesis through the use of machine learning and NLP, along with new opportunities for quality-led by big data pattern recognition and bias mitigation, though issues of algorithmic bias, privacy, and trust still remain. Based on Decision-Making and Information Processing theories, applications of research span marketing, finance, and HRM, and the TAM model identifies key barriers to adoption (Agarwal et al., 2025). AI functions like a double-edged sword through its capacity for growth and disruption at the macroeconomic level, it can simultaneously enhance GDP and productivity, while posing a legitimate risk of job loss — as observed at the global level — and an unprecedented rate of innovation — mostly in Asia-Pacific — but with respective policy readiness (Haseeb et al., 2019).

Environment

Soil moisture drives land-atmosphere coupling to influence precipitation, but models show both positive soil moisture-precipitation feedbacks in some regions and lack of feedbacks in other regions. Overcoming model biases and correlation limitations using satellite and climate model output data (CCM), we validate strongest effects in semi-arid zones. (Wang et al., 2018)

Sri Lanka**Healthcare**

Artificial intelligence has been employed for a long time to investigate the evolution of health misinformation on various social media, especially since the COVID-19 pandemic. Researchers can analyse behavior at scale by using AI-based bot detection systems based on machine learning algorithms that identify accounts as either automated or as human users. Network analysis and community detection methods further identify coordinated messaging, co-occurrence patterns for hashtags and misinformation clusters. Bots identified by AI are known to disproportionately amplify polarized, political, and misleading health narratives according to prior studies. Such AI-based analytical methods yield valuable insights for the late detection, characterization, and mitigation of misinformation in digital public health communication. (Suarez-Lledo et al., 2025). Governance and capacity-building with AI can help amplify health messaging and coordination, but further investigation is needed on sustained engagement and long-term effects of AI. (Wijesinghe et al., 2025)

Education

AI-driven chatbots such as the “Edubot” of Sri Lanka, have a huge potential in institutions with limited resources, engaging students with interactive tutorials and automated self-assessment with an impressive accuracy of over 70%, therefore increasing both accessibility and efficiency (Mahroof et al., 2020). AIED: increasing focus on delivery and performance, led by Computer Science and some STEM scholars; profiling, prediction, intelligent tutoring, and adaptive personalization without educator participation, pedagogical theory, nor ethical critique of increasing privacy and surveillance. Zawacki-Richter et al. The need for transdisciplinary approaches, longitudinal strategies and a more stable ethical-pedagogical framework for genuine progress (2019) Similarly, parallel studies show that by focusing on CPU-centric operating systems, existing designs do not provide adequate support for AI/ML workloads that depend on GPUs and TPUs, leading to progress with designs like LithOS, Salus, and THEMIS on improve accelerator-aware scheduling. However, continuous issues with fairness, scalability, portability and explainability highlight the need for adaptive, AI-first OS to be designed (Vishalinee et al., 2025).

Technology

Although the Technology Acceptance Model (TAM) has been a leading framework for technology acceptance research, the role of the (TAM) in contributing to AI chatbot usage in the context of government continues to be under-researched particularly in developing countries. By leveraging trust, design, and social influence, extensions fill the unmet needs of the citizens in accessing the public services of Sri Lanka (Rathnayake et al., 2025) ODI cricket predictions in sports analytics transitioned from statistical margin

models to ML-based classification using Naïve Bayes, SVM, and Random Forest. However, it still suffers from the problems of imbalance (team specific) and loss of accuracy in the real-time scenario and this highlights the need of dynamic approach (Pathak & Wadhwa 2016).

Agriculture

In developing nations, agricultural hurdles, where farming is a source of livelihood, are solved through tech-based solutions. Maize in Sri Lanka is under threat from insect pests, disease, fire and poor soil fertility; the Ceylon E-Agro app connects farmers with AI-based Agri Agents and IoT to provide solutions in real-time, connect with buyers, and predict prices → 45% more productivity (Imalka et al., 2022). Currently, soil nutrient testing is mostly costly and slow; however, IoT soil sensors and ML regression are contributing to greening agriculture and the analysis of soil nutrients in a cost-effective and efficient manner [35]. While the studies show the potential of Gaussian Process Regression (GPR) on small datasets, such as in (Senevirathne et al., 2022) GPR remains missing in existing IoT work flows which would allow its integration in lightweight IoT frameworks.

Nepal

Healthcare

Subedi et al., Nepal's study on avian influenza literature identifies important risk factors. Confirming that distance from roads, proximity to H9 infected farms and contact with wild birds were the most important risk factors for H9 in Chitwan and adjoining districts (2022) and that wearing protective clothing was an important biosecurity component. These findings corroborate international evidence from Pakistan and Japan, as well as previous studies in Nepal beyond the Kathmandu Valley. While the usage of AI in medical education in Nepal is still minimal, yet progressive, it is parallelly increasing in similar domains infused within infectious disease research. Found that while awareness among medical students was moderate, structure of awareness training was minimal, and they suggested that awareness training needs to develop into curriculum (Rezazadeh et al., 2023). Wider health care applications reflect the transformative capacity of AI across diagnostics, surveillance and planning, while tools to manage diabetic retinopathy and neonatal asphyxia provide solutions for low-resource contextual settings (van Teijlingen et al. 2020). Cole et al. However, the high accuracy of AI screening for retinopathy of prematurity using simple low-cost devices, with the potential for delivery via telemedicine and portable imaging, further demonstrates the promise of AI (Chaitanya et al. 2022). But infrastructure, system integration, and fair access to rural areas remains obstacles. Combined, these studies highlight the need for local contextual knowledge, ethical implementation, and purposeful partnerships to leverage AI for better health in Nepal.

Business

Despite extensive literature on customer satisfaction in fintech and services identifying critical determinants such as service quality, ease of use, security, and corporate social responsibility, limited machine learning (ML) and explainable AI (XAI) application has been found in Nepal. Even fewer provide methods of interpretation and prioritization such as PCA, SVM, or SHAP/LIME, and the Theory of Planned Behavior

(TPB), which is highly relevant, is infrequently used. To address some of these gaps Khanal et al., (2023) In this pioneer study, apply PCA to determine top drivers of satisfaction which in turn machine learning (ML) model with explainable Artificial Intelligence (XAI) is used to explain their impact inside a Nepalese fintech firm.

Education

AI could change the face of education through personalization, automation and enhanced interaction, and while intelligent tutoring systems are associated with better outcomes, they come with high teacher training costs. The ethical issues, such as the impact on traditional teaching jobs, are still very much there. Although literature is rich in developed context, Bohara & Rana (2024) point out a gap in developing countries like Nepal where effective implementation may only be achieved when such contextual problems and the level of proficiency are detangled and investigated to achieve equitable adoption. Complementing this, Pant et al. (2023) AI research in Nepal is fledgling, and scarce, ICT integration despite gaps in training, lack of practice, and fear of job insecurity is fostered by teacher motivation. These results highlight the critical importance of regional, ethical, and inclusive AI strategies in the education system of Nepal.

DISCUSSION

The Insights indicates that across the South Asian-5 (Afghanistan, Bangladesh, India, Nepal and Pakistan), all are engaged in artificial intelligence (AI), but at different levels of depth and substance. Such differences are primarily a reflection of national priorities, availability of resources and maturity of the research. The most mature and diverse AI ecosystem can be found in India, evidenced by work spanning from basic research in ecology (Rautela & Goyal, 2024) to scalable solutions in academia and in business, suggesting both institutional and industry backing.

In contrast, AI use in Bangladesh is geared more towards addressing pressing real-life issues, such as enhancing disaster tolerance (Alam et al., 2023), and breakthroughs in healthcare diagnostics content (Choudhury et al., 2025) where high-accuracy models are being deployed to mitigate infrastructural constraints. In Pakistan, Sri Lanka and Nepal, research is relatively nascent and application-specific. While these studies have been concentrated around pilot studies or theoretical frameworks in the context of education (Murtaza et al., 2022; Mahroof et al., 2020), and fintech (Khanal et al., 2023).

A key shared factor is the so-called “implementation gap.” Although a number of studies highlight high levels of technical performance (for instance, 99% diagnostic accuracy), challenges are high as well, including absence of digital infrastructure, a shortage of local AI expertise, issues over data privacy and algorithmic bias, and absence of policy support (van Teijlingen et al., 2020; Polas et al., 2022). These points suggest that the region is at a tipping point, where technologically evidenced based breakthroughs are outpacing sustainable implementation. In the coming years, AI is bound to face challenges that would need to go beyond algorithmic innovations, requiring wise investments in human capital, sound governance and fair access, which would make AI more than just an academic venture, and more like a development that we can all enjoy and benefit from each day.

Limitation and future direction

The review is limited by its reliance on secondary data, thereby restricting it to the scope, quality and methodology of studies to date. Existing literature is mostly sector-specific in scope, tends to use the controlled datasets or pilot studies as a support for their conclusions, and is limited in terms of cross-country and cross-sector generalizability (Islam Miskat et al., 2023; Rautela & Goyal, 2024). Remarkably, few studies were published before 2020, which speaks to the novelty of AI applications in South Asia and limits long-term perspectives on trends in adoption, implementation barriers, and sustained effects.

We can do this by using empirical, longitudinal, and mixed-method designs to assess how AI systems function across real-world contexts at high levels (Pant et al., 2025; van Teijlingen et al., 2020). Integrating explainable AI (XAI), ethical and governance frameworks in policy, and cross-country comparisons, essential to scalable, equitable, and contextually sensitive AI adoption (Rahman & Karim, 2025; Zawacki-Richter et al., 2019).

CONCLUSION

This systematic review establishes that artificial intelligence (AI) is maturing as a disruptive force in South Asia but also as a patchily deployed and implementable force with applications across several sectors including health, education, agriculture, energy, business and governance. The facts suggest that India outperforms others in the depth of research and sectoral diversity, buoyed up by relatively stronger institutional capacity and industry engagement (Rautela and Goyal, 2024; Kumar et al., 2023). The last application in disaster risk reduction and diagnostics by South–South cooperation, Bangladesh, demonstrates how AI can be strategically applied to tackle immediate development challenges, in this case balancing the need for high accuracy models and low infrastructure capacity (Alam et al. 2023; Chowdhury et al. 2025).

AI research within Pakistan, Sri Lanka, and Nepal tends to be more fragmentation- and pilot-oriented, with some leading contributions in education, public health, fintech, and agricultural innovation and limited large-scale deployment (Murtaza et al., 2022; Mahroof et al., 2020; Khanal et al., 2023). A common implementation gap could be observed across all 5 countries: technical performance seems to be moving ahead of governance frameworks, ethical safeguards, labor force readiness, and digital infrastructure (Polas et al., 2022; van Teijlingen et al., 2020). The sustainable adoption remains limited due to the data quality, explainability, privacy, and equitable rural access issues (Zawacki-Richter et al., 2019). In sum, the key implications point towards the realization of the socio-economic potential of AI in South Asia being predicated on a combination of concerted policy support along with associated investment in local human capital and context-specific, ethically consequential implementation strategies to finally translate research success into equitable developmental dividends.

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