Unlocking the Potential of Artificial Intelligence Techniques to Assess the Impact in Developing Nations

Temur Khabibullaev, Visa Inc., Hartwick College, Member, IEEE, Austin, Texas, temurkhabibullaev@ieee.org.
Weian Wang, Computer and Information Sciences Department, Hartwick College, Oneonta, NY, wangw@hartwick.edu.

[1] ***Abstract*—This study discusses the implications of Artificial Intelligence technologies and technological advancements which and how Generative AI, neural network, and deep learning, in different domains of third-world countries. A review of the literature and empirical research would be included that shows that AI technology can have promising transformative effects on agriculture and crop yields, the economy, disaster prediction, along with use cases present in the financial and health services. However, Applying these technologies in developing countries is usually limited by several factors. These include inadequate access to quality data, lack of necessary infrastructure, and most importantly shortage of technical personnel and skilled workers. As such, the challenges identified call for the integration of policy initiatives, and research and development through the relevant mechanisms at the government, organizational and international levels. The current status of the development and development and implementation of AI models is limited to the governance frameworks and the policies that allow sustainable progression of Artificial methods. If 3rd world countries are able to draft these complicated frameworks that comply with the international standards, a number of use cases that are still under research can be deployed in a real-world scenario.**

***Index Terms*— Third-world countries, Generative AI, Neural networks, Deep learning, Agriculture, Disaster prediction, Economic forecasting, Healthcare, Finance, Data accessibility.**

I. INTRODUCTION

In recent years, AI has opened several promising avenues that have the potential of revolutionizing the various aspects of human life. From improving the efficiency of Industrial machines with the industrial revolution 4.0 that is powered by smart IoT devices to enhancing healthcare services using image processing and other machine learning methods, the applications of AI are diversely expanded in different domains.

While the benefits of AI and most of the development is being performed by first world countries, a few underdeveloped countries have also adopted the use of AI and it has significantly improved the economic conditions of the countries. The impact on developing countries is limited by the adequate resources and the technological adoption rate nevertheless several uses have been reported in different countries.

Understanding the importance of AI and ML in developing countries is necessary for several reasons, firstly the socio-economic challenges faced by these countries are a bit different than first world countries as it may include inadequate healthcare facilities or limited access to quality infrastructure or improper financial services. AI has the potential to address these issues by offering tailored solutions as per the unique needs of the country. Secondly, Adoption of AI presents several opportunities for generating revenue and boosting the economies of these countries. By using AI driven solutions businesses can enhance their productivity and governments can make their services transparent facilitating more users simultaneously. The public healthcare field is the most important use case that benefits with the integration of AI in the services sector as it can significantly improve the patient experience and outcomes. Moreover, the integration of AI in finance, particularly in stock markets, opens avenues for efficient trading and risk management.

A. Research Area

The paper would try to aim at exploring the influence of key AI technologies such as Gen AI, neural networks, and deep learning in the context of third world countries. The ability to create new content anonymously with the help of GenAI can open limitless creative doors for people and the businesses to adopt and the overall process of generating content can be simplified in the field of Arts and breaking the language barriers. Similarly with the help of Neural networks, businesses can automate their repetitive tasks, and reduce the overhead costs associated with employing an actual person to perform the dedicated job. Lastly, with the help of machine learning there are countless applications reported in the field of healthcare and finance. The paper would present a set of AI applications and strategies that are currently being deployed in different avenues of developing countries and how it is impacting their socio-economic statuses.

---

[1]Temur Khabibullaev, Visa Inc. Austin Texas, tkhabibu@visa.com.
Color versions of one or more of the figures in this article are available online at http://ieeexplore.ieee.org

II. Problem Statement

The paper aims to address the socio economic challenges that are currently persistent in the widespread AI adoption in third-world countries, such as inadequate healthcare, outdated agriculture, and limited access to financial services. It will explore current AI methods that are deployed in these regions, and what strategies are being proposed to enhance living standards and economic growth.

Despite the current rate of development in the field of AI, third world countries often face socio-economic challenges that can reduce the rate of widespread adoption of AI and how these technologies are effectively utilized. The challenges include inadequate healthcare, outdated agricultural techniques, minimal development of AI in the field of education and research and lack of proper financial services, along with the use of Gen AI and neural networks for improving the customer experience by automating the customer service sector. As a result, many populations in these countries are deprived of the benefits that AI could bring. The paper would present several current methods and use cases that are actively deployed in 3rd world countries and how these methods can be used for improving the overall living standards and economy for a country.

A. Aims and Objectives

The purpose of this study is to conduct a literature review and highlight the existing models that are deployed across third-world countries in the field of businesses, government platforms, healthcare and finance, the primary aim of the study can be further broken down into the following objectives below:

- Exploration of the use cases of Generative AI and other technological advances in the third world in addressing socio-economic disputes.
- Analysis of the revenue generation models for such technologies across diverse sectors of developing economies.
- Identification of challenges and opportunities for integration of these technological developments into third countries' socio-economic frameworks.
- Proposal of strategies for achieving inclusive Generative Artificial Intelligence development and deployment in third countries.

B. Projected Outcomes

Upon achieving the mentioned goals, this paper will be able to:

- Offer the audience an overview of how AI technologies have the capacity to help third worlds solve their socio-economic problems.
- Discuss the implications of AI implementation for third-world countries in terms of profit generation and economic prosperity.
- Identify the primary concerns that third-world countries would have to address when considering AI implementation.
- Suggest the steps that policymakers, industry participants, and researchers will need to take to make the development of AI technologies in third-world countries sustainable and efficient.

III. Technologies Explored

A. Generative AI

Generative Artificial Intelligence represents a new and revolutionary type of machine learning that allows computers to autonomously develop content indistinguishable from the work of human origin. Unlike traditional AI models, which are trained to perform specific tasks, such as classification or forecasting, generative models can create new data instances by generalizing existing patterns from the data available. This section discusses the potential of Generative AI in terms of solving socio economic problems and promoting creativity in third-world countries. Generative AI includes a variety of approaches, each with different abilities. However, the one thing they have in common is they can generate images, text, music, and entire virtual worlds, which opens several opportunities for creativity and content generation. Generative AI can offer a range of solutions to the problems faced by third-world countries due to the lack of resources and expertise. Utilizing generative models can help tackle the problems of access to art and culture, language translation, and content creation and contribute to cultural enrichment, better communication, and, as a result, the rate of economic development can be improved.

B. Neural Networks

Neural networks are a group of machine learning algorithms that simulate the behavior and working principles of the human brain. Since it is made up of nodes or neurons interconnected and structured into layers, each layer processes input data while transforming it to produce an output. Neural networks have significantly performed several tasks, including image and speech recognition, natural language processing, and pattern recognition. In situations where the third-world countries have several challenges on resources and infrastructural needs, Neural networks are a holy grail to solve a vast majority of socio-economic challenges. From increased agricultural yields and personalized learning, a number of use cases have been reported that makes use of neural networks for urban infrastructure optimization, neural networks in itself have the potential to drive change and may impact millions of lifes in different fields.

C. Deep Learning

Deep Learning refers to a branch of machine learning involving neural networks that contain multiple abstraction levels. The networks demonstrate complex patterns and representations from robust sources of data, which allows them to perform better in complex scenarios, which may include visual identification, linguistic processing, and use cases linked with game theory. Since the third-world states have limited access to technologies and knowledgebase, Deep Learning can be a powerful facilitator of social and economic change. Application of Deep Machine Learning tools in these settings would make it possible to address major health, financial, and governance issues, among others, thus raising the life-quality of the population.

D. Machine Learning

Machine Learning refers to the usage of techniques that allows a statistical model to learn from data and make predictions or decisions without human intervention. Ranging from regression to classification to clustering to reinforcement learning, ML provides a useful set of tools for tackling problems in different domains. Given that third-world countries face a few issues such as poverty, disease, and lack of infrastructure, machine learning can present several development opportunities in these countries. Using machine learning techniques, developing countries can increase the productivity of agriculture, and improve the overall diagnostic methods and healthcare facilities. To enable economic growth and improve the overall living standards of the public.

IV. Use Cases in developing countries

A. Farming and Agriculture

3rd World countries also use agriculture as one of the main sources of income and food for a significant part of their people. Emerging and developing countries are looking to AI-powered tools to increase productivity levels while enhancing natural resource management and maintaining food security against the changing environmental and socio-economic conditions. Several elements are helping encourage the integration of AI in farming among developing countries. The significant improvement and reach of digital technologies and their connection in terms of increased accessibility to AI tools and platforms, even in remote areas, are the primary use case. Small business owners may use their smartphones and low-cost sensors to monitor soil contamination levels, weather conditions, and crop health levels that are needed for AI-generated data and insights.

In research conducted by Dieisson Pivoto an examination of the status and barriers of Smart Farming (SF) adoption in Brazil was undertaken through interviews with specialists. The qualitative findings revealed insights into the current landscape of SF in the country and the challenges hindering its widespread adoption. The experts identified the nascent stage of technological development in the agricultural sector compared to more advanced regions like Europe. Key areas of SF application in Brazil, such as sugarcane cultivation and real-time monitoring, were discussed, along with the role of unmanned aerial vehicles in enhancing decision-making and risk management in agriculture. The interviews also shed light on the existing tools and technologies available in the Brazilian market for SF, including telemetry-based machinery, automation systems, and data collection systems [2]. In their research, Matheus Cordeiro et al. addressed the challenge of managing water usage in agriculture through Smart Farming. They proposed using Deep Learning techniques to predict soil moisture levels, compensating for connectivity issues in the smart farming system. They also made use of Fog Computing to extend computational resources to farm edges. Their study included building prediction models, handling missing data, and evaluating the performance on lightweight computers to demonstrate efficiency in water conservation [1].

Komi Mensah Agboka presented a methodology that included comparison of different predictive models to estimate maize yield under various farming systems in East Africa. The study focuses on agroecological practices like maize-legume intercropping and push-pull technology as potential solutions to mitigate crop losses from pests. By using interpretable models and climatic and edaphic variables as predictors, the research aims to provide insights into the potential yield gains from adopting sustainable farming practices. The findings suggest that the symbolic regression model outperformed other approaches in accurately predicting maize yield, with MLI and PPT systems showing promise in improving crop productivity. The study also emphasizes the importance of scaling up these practices through awareness campaigns and public-private partnerships to ensure food security in the region. Additionally, the research highlights the need for further exploration of alternative AI methods and the integration of biological control options into predictive models to enhance their effectiveness [3]. Similarly, research conducted by Muhammad Zulqarnain Siddiqui focused on implementing modern agricultural management techniques in Pakistan using different hardware-based improvements. The study introduces an AI-based smart agriculture system utilizing sensor technology for real-time field monitoring and decision-making support. It incorporates sensors to collect data on various factors like humidity, temperature, soil moisture, and crop health, which are then analyzed by AI algorithms to optimize resource allocation. The system offers both automated decision-making and manual user control features, allowing farmers to adjust operations based on their knowledge and preferences. Additionally, the research

highlights the use of Raspberry Pi for controlling and monitoring agricultural aspects, such as soil moisture levels and weather conditions, as well as the application of soil pH sensors for measuring soil acidity or alkalinity. Furthermore, the study discusses the use of machine learning models for plant disease diagnosis, utilizing a dataset of leaf images classified into healthy or diseased categories. The research aims to address challenges in Pakistan's agriculture sector by modernizing farming practices and improving crop yield through technology-driven approaches, ultimately enhancing food security and economic stability in the region [4].
Similarly, Muhammad Junaid et al developed a smart cloud-based system for remote monitoring of agriculture farms using IoTs. They utilized AI-based machine learning models like Support Vector Machine to classify real-time and stored data collected from diverse sources. The proposed system achieved improved performance efficiency compared to existing baselines. To diagnose crop diseases in Pakistan, a fuzzy inference system was presented by Muhammad Toseef et al. The system operates on Android mobile devices, communicating with farmers in Urdu, Pakistan's local language. By inputting crop symptoms, the system accurately diagnoses diseases, particularly focusing on cotton and wheat, with a high accuracy rate of up to 99% based on testing with 100 real crop problems [5]. Moiz Uddin Ahmed et al. developed a predictive model for wheat production in the northern areas of Pakistan using machine learning algorithms. They collected five years' worth of data and selected the most relevant attribute subset related to wheat cultivation. Twelve machine learning algorithms were applied and compared, with Sequential Minimal Optimization Regression (SMOreg) emerging as the most accurate predictor, followed by Multilayer Processing (MLP). Their findings demonstrate the predictive capability of machine learning in estimating crop yield, particularly in localized agricultural environments [6].

B. Disaster Prediction

In research conducted by Bo Yu et al, the authors proposed a contour-based landslide detection model for analyzing the relationship between landslides and climate change in Nepal. Utilizing Landsat images and a deep learning framework, they developed a two-part model to detect potential landslides and precisely identify exact landslide locations. By leveraging the Google Earth Engine platform, they synthesized annual Landsat images into one, facilitating national-scale analysis. Their approach achieved a satisfactory performance with 65% recall and 55.35% precision, outperforming previously published works. The model's effectiveness and practical applicability were demonstrated through its ability to accurately detect landslides on a national scale [7]. Similar research was conducted by Sunil Saha et al in which the research aimed to enhance landslide vulnerability mapping in Bhutan's Chukha Dzongkhags using different neural network approaches. Both physical and social conditioning factors were considered, totaling 31 factors, and were selected based on collinearity tests and information gain ratio. A total of 350 landslides were recorded and used to train and validate nine LVM models. The CNN-based combined vulnerability map yielded the highest performance, with an area under curve of 0.921, indicating its potential for supporting landslide prediction and management. The study emphasized the importance of integrating physical and social factors for accurate vulnerability mapping and highlighted the superior performance of CNN over DLNN and ANN models in this context [8].
Rainfall forecasting is also a significant area that can benefit from using AI models. A study conducted by Zimbabwe Open University presented a model to predict the climate variability in Zimbabwe using the BAT Algorithm optimized Artificial Neural Network. They collected meteorological data from 1985 to 2013 from the Zimbabwe Meteorological Service Department, focusing on temperature, pressure, humidity, and rainfall. Pre-processing of the data involved stationarizing and cleaning the inputs and outputs to improve the neural network's performance. The BAT-ANN model was then trained and tested using historical time series data, with the forecast outputs suggesting a cyclic pattern of precipitation over a 25-year period. The study concluded that the eastern, north-eastern, and south-eastern districts of Zimbabwe may experience flash floods in the years after 2025. The objectives of the study were met, including modeling a climate forecasting neural network, and applying the Bat Algorithm for optimization. Suggestions for further research include exploring other neural network architectures and variants of the Bat algorithm to improve forecasting accuracy. Additionally, considering additional weather parameters like wind speed and direction could enhance predictive performance [9].
To assess the susceptibility of floods in Dhaka, research was conducted by A. S. Islam in which an artificial neural network model was developed to predict river stages at Dhaka City using data from boundary nodes of Bangladesh. Five water level stations on the Ganges, Brahmaputra, and Meghna rivers served as input nodes, with Dhaka's Buriganga river station as the output node. The model was trained on data from 1998 to 2004 and validated with data from 2005 to 2007, achieving high accuracy in predicting river stages up to ten days in advance. Feed-forward backpropagation was included in the three-layer neural network, with 20 nodes in the hidden layer, a learning rate of 0.1, and 1000 iterations. The study found maximum R2 values of 0.968 for a 5-day lead time during training and 0.7 during validation, indicating strong predictive

capability [12]. The idea for using ANNs for predicting flood susceptibility is not new as a similar study was conducted by Rhyme Rubayet. The research that was conducted aimed to investigate flood susceptibility in Bangladesh's Sylhet division, focusing on eight influential factors as inputs to the model. A dataset of 1280 samples based on flood and non-flood characteristics was divided for training and testing, with 75% used for training and 25% for testing. For the model an artificial neural network model was developed and validated using mean squared normalized loss performance function and receiver operating characteristic curve techniques. From the analysis it was revealed that a significant portion of the study area, 40.98% and 37.43%, falls within very high and highly susceptible zones, respectively. The model's overall prediction rate was approximately 89%, with a 98% success rate, demonstrating its effectiveness in flood risk assessment [13].

To predict earthquakes, several studies have been conducted using various machine learning methods. In a study conducted by Roxane Mallouhy earthquake prediction using various machine learning algorithms, aiming to distinguish between negative and positive major earthquake events was explored. It focuses on short-term predictions rather than long-term forecasts, utilizing a dataset from a seismic center in Northern California spanning from 1967 to 2003. The study employs eight machine learning algorithms, including Naive Bayes, K-nearest neighbors, and Random Forest, to classify earthquake events accurately. Evaluation metrics such as true positives, true negatives, false positives, and false negatives are considered, along with mean absolute error and root mean squared error. Results indicate varying levels of accuracy among the algorithms, with K-nearest neighbors achieving the highest accuracy of 75.53% with three neighbors. Future work entails applying the findings to real intervention data and incorporating feature selection methods for further refinement. The study could be used to predict the outcomes of earthquakes in developing countries[10]. A similar study was conducted by Cumhur Cosgun in which seismic performance of existing reinforced concrete buildings in Turkey, a country prone to earthquakes was analyzed. Utilizing machine learning techniques such as Random Forest, Support Vector Machines, Decision Trees, and Artificial Neural Networks, the research predicts the buildings' performance against seismic events. Through a five-stage methodology, including data collection, preparation, and analysis, the study evaluates the effectiveness of each ML technique. Results indicate Random Forest as the most accurate predictor, achieving a 100% accuracy rate. In regions where there's high risk of earthquakes, ML models can be used to accurately predict seismic performance, offering valuable insights for risk mitigation [11].

C. Economic Forecasting

AI and machine learning techniques are also used for economic forecasting thanks to their ability to evaluate large volumes of historical data and detect patterns and trends, it helps policymakers and economists to improve their forecasting of economic indicators such as GDP growth, inflation, and temporary and structural employment, allowing them to produce more appropriate decisions and develop better policies. The information on the economy that developing countries may derive from AI and machine learning allows them to comprehend their economic setting and assist them in determining where to put assets and how they can derive sustainable development. In research conducted by Raad Mozib Lalon et al, an analysis was performed to forecast Bangladesh's annual GDP growth using an Autoregressive Integrated Moving Average Model, based on historical data spanning from 1961 to 2019. The paper provided the predicted growth values of GDP using ARIMA up to the year 2039. Utilizing the Box-Jenkins approach, the study constructs and assesses various ARIMA models, employing diagnostic tests such as AIC, BIC, ACF, PACF, and Unit Root Test to determine the most suitable model. Results indicate that the ARIMA model effectively predicts Bangladesh's GDP growth for the upcoming years, with significant coefficients identified through maximum likelihood estimation. The research underscores the significance of economic forecasting in policy making and suggests a potential GDP growth range of 2.5% to 4% for the fiscal year 2019-2020, influenced by the COVID-19 pandemic [14]. Another research conducted by Md. Mahfuj Hasan Shohug et al. utilized ARIMA model to estimate Bangladesh's GDP Growth Rate the researchers implement the SARIMAX model, achieving a high prediction accuracy of 87.51% for Bangladesh's GDP, and develop a web application, GDP Indicator, enabling users to access future GDP growth rate predictions and monitor the country's economy [15]. Down below is the plot that was developed by Mozib Lalon et al showing the forecasts of GDP growth in Bangladesh.

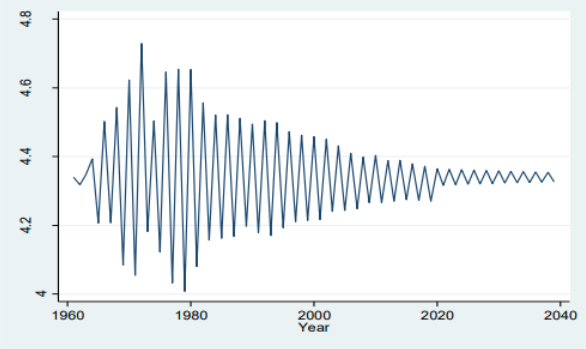

Fig 1: Projected Growth plot of Bangladesh EconomyUsing ARIMA[14]

In research conducted by Anthony Simpasa el, the primary focus was on improving forecast accuracy for economic and financial variables in developing economies, which often face challenges like sudden stops and high volatility. The study compares the performance of artificial neural networks and non-parametric regression models with traditional structural econometric and time series models in forecasting GDP growth in selected African frontier economies. Data from IMF EcOS and country publications is used, covering quarterly observations from 1970 to 2016 for Kenya, Nigeria, and South Africa. The results indicate that artificial neural networks and non-parametric regression models outperform traditional models, particularly when incorporating relevant input variables like commodity prices, trade, inflation, and interest rates. These findings suggest significant potential for practitioners to enhance forecast accuracy in developing economies using advanced computational intelligence techniques. The research employs R for implementation, utilizing packages such as "neuralnet" for neural network models and adapting methods as necessary for analysis [16].
Abraham Kipkosgei Lagat et al. conducted a research study focusing on the application of support vector regression (SVR) and neural network models in modeling and forecasting economic growth for the East African Community countries: Kenya, Uganda, United Republic of Tanzania, Rwanda, and Burundi. Using data from the World Bank and IMF databases covering the period 1990 to 2014, they trained the models on data from 1990-2002 and evaluated their prediction performance on external datasets. The study found that specific-country models performed better than the combined model, with the neural network model generally outperforming SVR. They recommend the use of both machine learning techniques in economic growth modeling and suggest comparing their performance with traditional econometric models using datasets with more extended periods. The research utilized official annual economic data from the World Bank and IMF websites and applied techniques like principal component analysis (PCA) for variable selection and scaling transformation to avoid feature domination. The comparative performance of the models, assessed based on mean square errors, indicated similar performance overall, with the neural network model showing superiority in specific-country models and combined model scenarios. The results obtained from this research were the GDP growth rates of different member countries part of the survey, below is the visual representation of the summary of the projections attained by different models used [17].

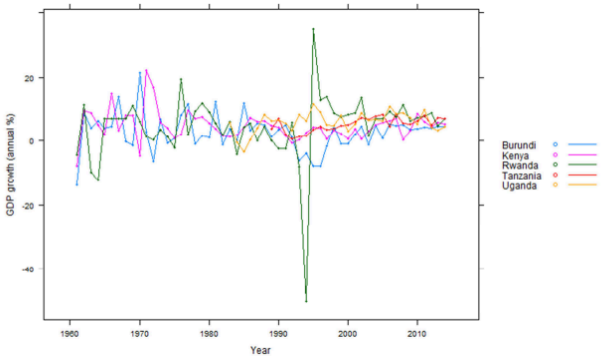

Fig 2: Summary of Growth rates of GDP of East African Countries[17].

D. Real World Use cases in the Field of Healthcare

The application of artificial intelligence and machine learning in healthcare systems in developing countries presents a unique opportunity in significantly improving patient outcomes and tackling resource scarcity. AI and ML present new possibilities for developing countries in improving diagnostic accuracy, since treatment plans can be tailored as per the needs of the users and administrative functions can also be improved significantly. Although the approach is faced with several barriers, including limited access to relevant data and infrastructure, the evidence suggests that the use of AI and ML could bridge the gap in healthcare services delivery and serve as the path towards providing the underserved with equal and timely healthcare services.
This research by Dhamodharavadhani Sikar et al. aims to identify the most effective COVID-19 mortality model for India by employing regression techniques and predicting future mortality rates. Statistical Neural Networks such as Radial Basis Function Neural Network and Generalized Regression Neural Network are utilized to develop the COVID-19 Mortality Rate Prediction model. For the analysis two datasets, one comprising COVID-19 death cases as time series data and the other containing both confirmed and death cases, are used. Hyperparameter optimization is used for fine-tuning the models for minimal errors. The study finds that the GPR model outperforms SNNs in terms of RMSE and R2 values. By hybridizing the GPR model with SNNs and using NAR-NN time series forecasting, the research achieves improved predictive accuracy in forecasting COVID-19 death cases, providing a valuable tool for assessing infection severity and aiding decision-making to reduce mortality rates in India [18]. Another research can be included for predicting the mortality among newborns in Pakistan by Dr. Smartson et al, in which an ANN was used, the model suggests a slight decline in infant mortality rate in Pakistan over the next decade, based on analysis of annual data spanning from 1960 to 2020 and out-of-sample projections up to 2030. The stability of the model, as indicated by residual analysis and forecast evaluation criteria, shows its reliability in forecasting

infant mortality trends. It showcases how advanced analytical techniques like artificial neural networks in addressing critical public health issues such as infant mortality, providing valuable insights for policymakers to formulate maternal and child health interventions in Pakistan [19]. In another research conducted by Dr Smartson ANN was the research builds upon previous studies by applying the ANN approach to analyze COVID-19 cases in Bhutan from the research it was indicated that COVID-19 cases in Bhutan are likely to remain significantly low over the forecasted period, emphasizing the effectiveness of control and preventive measures implemented by the government. The study utilizes the ANN approach, known for its flexibility and nonlinear modeling capabilities, to analyze COVID-19 cases in Bhutan based on daily data from January 2020 to March 2021 [20].

Neural networks can also be used to determine the satisfaction of health information systems that are present in hospitals and how these systems are adopted in real-world situations. In research conducted by Surya Neeragatti et al, a new theoretical framework was developed to assess the factors influencing hospital workers' satisfaction with Healthcare Information Systems in India, based on the Unified Theory of Acceptance and Use of Technology. Structural Equation Modeling was used to analyze primary data collected from 265 hospital workers, revealing that effort expectancy emerged as the most significant factor influencing satisfaction with HIS. The research model that was used in their research is given below [21].

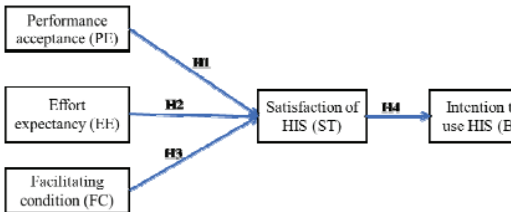

Fig 3: Research model employed to identify the satisfaction of healthcare workers [21]

E. Uses In Finance

In research conducted by Favourate Y Mpofu the role of fintech and Fourth Industrial Revolution has been presented, and how these tools are promoting digital financial inclusion and how it can achieve the 2030 United Nations Sustainable Development Goals in developing countries. Through an analysis of existing literature and empirical evidence, the study investigates both the transformative and disruptive effects of fintech and 4IR technologies on financial inclusion and sustainable development. The findings reveal that enhanced financial inclusion and access to affordable funding is possible along with negative consequences which include bias perpetuation and increased risks [22]. In another research conducted by Bahadur Singh, the use of Gen AI in the banking sector of India was explored, its potential for enhancing customer engagement and operational efficiency was highlighted. Through a systematic review of existing literature and empirical evidence, the study uncovers both the benefits and challenges associated with GenAI adoption in the financial services sector. The importance of strategic reskilling initiatives to equip banking professionals with the requisite expertise to leverage GenAI effectively was explored in his research [23].

V. Barriers faced by 3rd World Countries in Promotion and Usage of AI

Developing countries face several challenges that prevent them from integrating artificial intelligence technologies. Primarily, they lack access to high-quality, adequate, and relevant datasets. Many AI projects are based on the algorithm training process with data and the subsequent generation of accurate predictions. However, the scope and quality of available data are often low in developing countries. Consequently, the likely outcomes of many AI initiatives are the inability to generate the expected benefits due to the poor quality of input data.

Another significant challenge is poor technological infrastructure. A lack of adequate internet connection and inefficient hardware having limited compute resources makes it difficult to use AI solutions. Without sufficient technological infrastructure, organizations, and countries in developing nations are struggling to design and adopt artificial intelligence.

In addition, the shortage of professionals that have the necessary expertise in the field of AI and its cognate areas is another major obstacle that prevents widespread adoption. In general, many developing countries have a shortage of personnel competent in data science, machine learning, and the design of algorithms. Since it is impossible to develop and apply AI without it, it slows down progress aimed at fully realizing the transformative potential of artificial intelligence for civilization. To date, overcoming this barrier is the responsibility of the governments of the relevant countries and organizations, the international community. They need to create conditions, which include legal and educational policies, to increase competence in the application of AI. The table below shows how the current incompetencies are being addressed using the research explained in the prior section.

Barrier	Strategy	Research Citation
Infrastructure Limitations	Utilize sensor technology and AI algorithms for remote monitoring and analysis in agriculture	Siddiqui, M. Z. et al. [4]
Affordability and Accessibility	Develop low-cost solutions using smartphone-based AI tools for small-scale farmers	Agboka, K. M. et al. [3]; Ahmed, M. U. et al. [6]
Lack of Localized Solutions	Develop specific-country models for economic forecasting to cater to unique contexts	Lagat, A. K. et al. [17]
Capacity Building	Invest in reskilling initiatives for banking professionals to leverage Gen AI effectively	Simpasa, A. et al. [16]
Data Scarcity	Utilize available data for AI applications in critical health issues like COVID-19 mortality prediction	Sikar, D. et al. [18]; Smartson, D. et al. [19][20]
Limited Collaborative Partnerships	Foster public-private partnerships and international collaboration for AI advancement	Pivoto, D. et al. [2]; Junaid, M. et al. [6]

VI. Conclusions

In conclusion, the research has captured the transformative potential of artificial intelligence in third-world countries and several sectors such as agriculture, disaster management, economic prediction, healthcare, and finance have been explored. From the analysis, promising outcomes can be seen for using Generative AI, neural networks, and deep learning, on improving the different domains in these countries. Despite the numerous benefits, the widespread acceptance of AI in developing countries is limited to several factors. These factors include limited access to-quality data, inadequate infrastructure development, and insufficient exposure to the policymakers. To ensure that these barriers are limited, governments must work with businesses and foreign and intercontinental agencies to enhance this concept in the countries and make reforms that permit scientific development in these regions.

VII. References

[1]. M. Cordeiro *et al.*, “Towards Smart Farming: Fog-enabled intelligent irrigation system using deep neural networks,” *Future Generation Computer Systems*, vol. 129, pp. 115–124, Apr. 2022, doi: 10.1016/j.future.2021.11.013.

[2]. D. Pivoto, P. D. Waquil, É. Talamini, C. P. S. Finocchio, V. F. D. Corte, and G. De Vargas Mores, “Scientific development of smart farming technologies and their application in Brazil,” *Information Processing in Agriculture*, vol. 5, no. 1, pp. 21–32, Mar. 2018, doi: 10.1016/j.inpa.2017.12.002.

[3]. K. Agboka, H. E. Z. Tonnang, E. M. Abdel‐Rahman, J. Odindi, O. Mutanga, and S. Niassy, “Data-Driven Artificial Intelligence (AI) Algorithms for Modelling Potential Maize Yield under Maize–Legume Farming Systems in East Africa,” *Agronomy*, vol. 12, no. 12, p. 3085, Dec. 2022, doi: 10.3390/agronomy12123085.

[4]. “Implementation of Technology for Modern Management of Agriculture Field Impacting the Socio-Economic Condition of Pakistan,” *Journal of Computing & Biomedical Informatics*, vol. 05, no. 02, 2023, doi: 10.56979/502/2023.

[5]. M. Toseef and M. J. Khan, “An intelligent mobile application for diagnosis of crop diseases in Pakistan using fuzzy inference system,” *Computers and Electronics in Agriculture*, vol. 153, pp. 1–11, Oct. 2018, doi: 10.1016/j.compag.2018.07.034.

[6]. M. U. Ahmed and İ. Hussain, “Prediction of Wheat Production Using Machine Learning Algorithms in northern areas of Pakistan,” *Telecommunications Policy*, vol. 46, no. 6, p. 102370, Jul. 2022, doi: 10.1016/j.telpol.2022.102370.

[7]. B. Yu, F. Chen, and C. Xu, "Landslide detection based on contour-based deep learning framework in case of national scale of Nepal in 2015," *Computers & Geosciences*, vol. 135, p. 104388, Feb. 2020, doi: 10.1016/j.cageo.2019.104388.

[8]. S. Saha *et al.*, "Measuring landslide vulnerability status of Chukha, Bhutan using deep learning algorithms," *Scientific Reports*, vol. 11, no. 1, Aug. 2021, doi: 10.1038/s41598-021-95978-5.

[9]. "CLIMATE VARIABILITY FORECASTING USING BAT ALGORITHM OPTIMISED ARTIFICIAL NEURAL NETWORK," *Zimbabwe Journal of Science & Technology*, vol. 10, no. 01, Art. no. https://www.researchgate.net/publication/330635768_CLIMATE_VARIABILITY_FORECASTING_USING_BAT_ALGORITHM_OPTIMISED_ARTIFICIAL_NEURAL_NETWORK.

[10]. "Major earthquake event prediction using various machine learning algorithms," *Hal Open Science*, vol. 01, no. 01, Art. no. https://hal.science/hal-02952670/file/1c834234-d05d-43da-999a-4afcae96e501-author.pdf, Sep. 2020.

[11]. C. Coşgun, "Machine learning for the prediction of evaluation of existing reinforced concrete structures performance against earthquakes," *Structures*, vol. 50, pp. 1994–2003, Apr. 2023, doi: 10.1016/j.istruc.2023.02.127.

[12]. A. S. Islam, "Improving flood forecasting in Bangladesh using an artificial neural network," *Journal of Hydroinformatics*, vol. 12, no. 3, pp. 351–364, Nov. 2009, doi: 10.2166/hydro.2009.085.

[13]. R. R. Rudra and S. K. Sarkar, "Artificial neural network for flood susceptibility mapping in Bangladesh," *Heliyon*, vol. 9, no. 6, p. e16459, Jun. 2023, doi: 10.1016/j.heliyon.2023.e16459.

[14]. R. M. Lalon and N. Jahan, "Predicting Economic Performance of Bangladesh using Autoregressive Integrated Moving Average (ARIMA) model.," *Journal of Applied Finance & Banking*, pp. 129–148, Jan. 2021, doi: 10.47260/jafb/1125.

[15]. Md. M. H. Shohug, A. K. Bitto, M. A. Rubi, Md. H. I. Bijoy, and A. Rahaman, "A Data-Driven Approach to Forecasting Bangladesh Next-Generation Economy," in *Lecture notes in electrical engineering*, 2023, pp. 59–70. doi: 10.1007/978-981-99-0047-3_6.

[16]. C. Chuku, A. Simpasa, and J. Oduor, "Intelligent forecasting of economic growth for developing economies," *International Economics*, vol. 159, pp. 74–93, Oct. 2019, doi: 10.1016/j.inteco.2019.06.001.

[17]. A. K. Lagat, "Support Vector Regression and Artificial Neural network Approaches: Case of economic growth in East Africa Community," *American Journal of Theoretical and Applied Statistics*, vol. 7, no. 2, p. 67, Jan. 2018, doi: 10.11648/j.ajtas.20180702.13.

[18]. S. Dhamodharavadhani and R. Rathipriya, "COVID-19 mortality rate prediction for India using statistical neural networks and gaussian process regression model," *African Health Sciences*, vol. 21, no. 1, pp. 194–206, Apr. 2021, doi: 10.4314/ahs.v21i1.26.

[19]. "Prediction of infant mortality rate in Pakistan using the artificial Neural network approach," *International Research Journal of Innovations in Engineering and Technology*, vol. 5, no. 3, Art. no. 2581–3048, Mar. 2021.

[20]. "Forecasting Covid-19 new cases in Bhutan," *International Research Journal of Innovations in Engineering and Technology*, vol. 5, no. 6, Art. no. 2581–3048, Jun. 2021, doi: 10.47001/IRJIET/2021.506112.

[21]. S. Neeragatti and R. K. Dehury, "Determinants of satisfaction in the usage of healthcare information systems by hospital workers in Hyderabad, India: Neural network and SEM approach," *Asia Pacific Journal of Information Systems*, vol. 33, no. 4, pp. 934–956, Dec. 2023, doi: 10.14329/apjis.2023.33.4.934.

[22]. "Fintech, the Fourth Industrial Revolution Technologies, Digital Financial Services and the Advancement of the SDGs in Developing Countries," *International Journal of Social Science Research and Review*, vol. 6, no. 1, pp. 533–553, Jan. 2021, doi: 10.47814/ijssrr.v6i1.752.

[23]. "Generative Artificial Intelligence: Prospects for Banking Industry," *International Journal of Research in Engineering, Science and Management*, vol. 7, no. 3, Art. no. 2581–5792, Mar. 2024.