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| RESEARCH ARTICLE

Accelerating BRICS Economic Growth: AI-Driven Data Analytics for Informed Policy and Decision Making

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| ABSTRACT
This paper analyzes how the Artificial Intelligence (AI) and Machine Learning (ML) are bridging the gap between economic growth in the BRICS countries. BRICS countries are emerging economies that are challenged by increasing income inequality, industrial transformation and the need for infrastructure development. Driven by AI, this study applies data analytics to macroeconomic datasets, tracking down patterns and functional takeaways regarding policy formulation and strategic decision making. The research employs techniques, including predictive modeling, clustering, and natural language processing (NLP), in areas such as trade optimization, resource allocation and labour market analysis. Case examples document successful introduction of AI systems to solve critical economic problems, from increasing healthcare access to raising productivity in agriculture. The findings illustrate the role of AI and ML in helping BRICS policymakers to an informed, data driven development. The research puts AI as core to the process of economic advancement, a solution to developmental gaps and a driver for growth. This research contributes both to its practical outcomes and by providing insights into how AI and ML can solve the complex economic problems of emerging markets. The paper introduces predictive modeling, which anticipates economic trends based on past data and clustering which groups similar economic behaviors to find patterns as tools that are important in economic analysis. Further, Natural Language Processing (NLP) is covered as a highly effective approach to understand policy documents, news, and unstructured data to improve the ability to make decisions. By helping students, researchers, and policymakers understand these AI powered techniques that optimize trade, resource management and labor, these scalable solutions to sustainable development are available. This study touts data driven innovation as a critical means to solve global challenges, well-equipped readers with the skills and knowledge to leverage AI for economic progress in a geography of the dynamic and connected.

| KEYWORDS
Artificial Intelligence, Machine Learning, BRICS, Economic Development, Predictive Modeling, Data-Driven Policy, Sustainable Development, Clustering Analysis, Natural Language Processing, Global Challenges

| ARTICLE INFORMATION

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1. Introduction

1.1 Overview of BRICS Economies

Brazil, Russia, India, China, and South Africa are a collection of rapidly growing economies whose standing in the world is dramatically changing the global economic reality. Together, these countries comprise more than 40% of the world's population and nearly 25% of global GDP (Siddiqui, 2016). However, the BRICS economies are among the most influential economies globally, but they are shackled with their common challenges that hinder development. Among these are rising income inequality, a critical

demand for modernizing industry, problems with infrastructure, and the burden of transiting the global economy, which is becoming ever more competitive. Solutions to address these obstacles must be innovative and scalable; economic structures and governance among these nations is diverse.

Because of the unique complexities, emerging economies such like those of the BRICS typically face rapidly growing industrial growth that becomes sustainable without compromising the participation of people in it (Gu et al., 2018). However, policymakers in these countries are challenged by a difficult set of issues to solve while promoting healthy economic growth. Arguably, existing traditional policy formulation approaches that depend on systematized, static data and conventional models are not sufficient to address such multi-faceted problems. As a transformative technology Artificial Intelligence (AI) and Machine Learning (ML) will provide within itself new insights and solutions here are the places.

1.2 The Role of AI and ML in Economic Development

When it comes to analyzing complex data sets, extracting trends and insights, an AI or ML models can churn through data sets at unprecedented speed. Unlike traditional approaches, these technologies are orders of magnitude in working with dynamic data that adapts to changing patterns and gives real time guidance (Sarker, 2021). AI and ML have great potential to address the problems of resource allocation, trade optimization and labor market analysis for BRICS economies. With these tools in hand, policymakers can create strategies that are well informed by past trends but are flexible, as well, to changing economic realities.

Three key techniques are in the use of economic context for AI and ML. These are predictive modeling, clustering, and Natural Language Processing (NLP). Predictive modeling can predict GDP growth, trade flow, and employment rate to help government officials to foresee and prepare for upcoming occasions (Yoon, 2021). NLP is able to unravel unstructured data sources on policy documents, news reports, and market reviews while clustering groups together similar economic behaviors to help out spot patterns in trade or even sectorial performance (Schöne, 2024). These tools, together, provide a comprehensive framework for data-driven decision making, a critical function to the BRICS economy.

1.3 Research Objectives and Scope

In this paper, we have set out to find how AI and ML can help close developmental gaps and speed up economic growth across the BRICS nations. This study through the use of areas such as trade optimization, resource management, and labor market analysis proves that the use of AI based insights can be instrumental in the informed policymaking and strategic decision making of the others. Moreover, this paper comprises discussions of real life applications of AI in BRICS economies. This is illustrated with case studies of the use of AI in enhancing access to healthcare in underserved regions and in enhancing agricultural productivity; in streamlining the allocation of resources, among other enhancements. The consequences of AI from the standpoint of economic development are these examples.

1.4 Contributions and Global Implications

This research finds its implications beyond the BRICS economies to provide valuable insights to other emerging markets that are developing AI and ML part of their policies. This paper attempts to contribute to this discussion by analyzing the challenges and successes in AI adoption in BRICS, and then offer a roadmap of how to leverage AI driven strategies in order to fuel growth and development. While it is practical outcome oriented, this research also contributes to academic discourse on the issue of role of technology in economic policymaking. This paper equips students, researchers, and policymakers with such insights into AI applications in order to enable stakeholders to address economically complex challenges with the tools and knowledge necessary. In the end, this should cement data-driven innovation as a key principle of sustainable development to promote equitable global growth in a hyper dynamic and interdependent age.

2. Literature Review

2.1 Key Theories and Models

AI and ML's application in macroeconomics necessarily means assuming a new perspective on the analysis and resolution of economic system issues. Traditional theories of endogenous growth have attributed a central part to technology advancement, further supported by Korinek and Stiglitz (2021). Their findings bring out the instructive nature of AI in breaking the information asymmetry as well as improving resource mobilization and the global economy. Thus, through improving the capability of decision-making based on the information delivered, AI assists the emerging markets such as the BRICS countries to operate in the conditions of globalized economy at the level of development of their economic systems.

Korinek and Stiglitz also explain that these immediate effects of globalization through AI could also lead to increased inequalities if well handled. These findings relate with anxieties on the digital divide in BRICS economies. AI is not a neutral technology; its effects are positive or negative based on the approaches employed to self AI into national economic systems. Likewise, Sun et al.

(2024) discuss how their work on ML can help with financial vulnerability in the emerging markets. Their research highlights machine learning methods including the predictive algorithms in outlining and managing risks in the financial market in volatile economic environment.

The second important theme is technological transformation in the global economy. As a catalyst for industrial transformation, AI is studied by Matyushok et al. (2021) who analyze modern trends in the digitalization of economic systems concluding that emerging economies must embrace technology for their competitiveness. Because AI is already essential in the lives of people around the world, the integration of AI into the economic practices of BRICS countries is not just an option but necessity to render oneself relevant in a context of rapid change of our global reality. These are the foundational studies that serve as a theoretical framework on which this research grows, highlighting multiple AI and ML roles that effectively tackle economic challenges.

2.2 AI and ML in Policy Formulation

The use of AI and ML in policymaking is a growing area that hopes to significantly change how governments roll out their economic development models. Specifically, Goodell et al. (2021) define key clusters of research areas from AI applications, and in particular finance, where machine learning algorithms have been used to model risk, optimize portfolios and predict market trends. These tools are not limited to finance, however, they can be used to generate data driven insights in the macroeconomic policy space to help with decision making.

Additionally, Saheb et al. (2022) study how AI can support sustainable energy initiatives by analyzing how contextual topic modeling and content analysis can extract actionable insights from complex datasets. Energy policies within BRICS economies matter, and their findings have huge implications for the balancing of industrial growth and sustainability. Through AI driven approaches, policymakers can predict need/future demand, find inefficiencies in energy use, and optimize the allocation of resources.

Sokolov et al. (2019) note that AI enhanced policy formation benefits the international collaboration between BRICS nations. A quantitative analysis of science, technology and innovation (STI) policies in BRICS region demonstrates the use of data driven tools to facilitate collaborative efforts. Here AI applications can be to improve resource sharing; identify areas of mutual interest; and track progress of joint initiatives. Using AI, BRICS nations can increase their collective ability to tackle some of their common economic problems and realize sustainable development goals.

2.3 Research Gaps and Significance

Although the literature has argued about the potential of AI to support economic development, the contributions of this literature have remained behind, especially when it comes to incorporating the economics of BRICS in AI development. The impact of AI and its moderating effects of governance on employment and economic growth are investigated by Saba and Ngepah (2024). They argue that AI brings great potential but risky implementation, risks like job displacement and discrimination against women and people of color. This observation further illustrates that governance mechanisms appropriate to the circumstances of BRICS nations are required.

Latif et al. (2023) address another critical gap which is the roles that economic integration, financial development, and AI play for each other. Their research focuses on the two rebound effects of green ICT initiatives in BRICS economies to show that technology can in fact have its unforeseen impacts. For instance, AI in resource utilization brings efficiency and depletes resources while on energy it brings efficiency though it can bring a high consumption if not considered sustainable. Solving these concerns requires the acknowledgement of the economic and social relations in the BRICS countries.

Another area that requires attention to is the regulatory landscape. As Cyman et al. (2021) demonstrate, there is significant difference in BRICS and EU regulation of AI. Although the BRICS nations are able to adopt of AI technologies, their regulatory frameworks often remain outpaced in protecting ethical and equitable implementation. In light of the diverse economic structures and governance models of each of the BRICS, context specific regulatory strategies are required for this gap.

2.4 Synthesis and Implications for Research

The literature highlights a consensus on the transformative potential of AI for and through economic challenges, but it also draws attention to important gaps that must be filled in order to arrive at effective use of AI and ML for addressing economic challenges. Korinek and Stiglitz (2021) and Matyushok et al. (2021) explore theories and models with which to understand the contribution of technological innovation to economic development. Yet these insights are underexplored when applied to the unique BRICS economies.

Studying studies like Goodell et al. (2021), Saheb (2022) and Abir, S. I., et al. (2024) which apply the use of AI in statistical policy formulation is interesting, but usually limited to certain areas or sectors. For developing comprehensive strategies, this research

needs to be expanded to cover all the diverse economic landscapes of the BRICS nations. Saba and Ngepah's (2024) and Cyman et al. (2021) research gaps further emphasize the exigency for addressing these BRICS economies as specific and in light of their socio-economic and regulatory contexts.

This study seeks to close these gaps, resulting in the addition of new information about the usage of AI and ML applications for economic development. The paper aims at offering information that is actionable for policy and practice to policymakers, researchers, and practitioners to depict how AI driven tools can be fruitfully used to inform economic systems to solve problems and promote growth of BRICS nations.

3. Methodology

3.1 Research Design

This thesis is based on a mixed methods approach to explore the role of AI and Machine Learning (ML) as drivers of e*conomic growth in BRICS. T*he research seeks to combine the strengths of these methodologies to offer a holistic understanding of the economic challenges faced by these AI driven solutions. It concerns analysis of macroeconomic datasets using machine learning algorithms, each of which amounts to a quantitative aspect; each supplemented with a qualitative component in the form of policy documents, case studies, and expert interviews to offer context and depth.

3.1.1 Data Collection

For this study, the data were collected from publicly available macroeconomic databases such as World Bank, international money fund and BRICS specific databases. Among them are GDP growth based on metrics, export flows and employment rates, sectorial productivity, etc. Furthermore, a substantial amount of unstructured data such as policy documents, news articles, and reports on policy dynamics around AI adoption in BRICS economies were collected.

The main source of data collection was interviewing policymakers, economists and AI practitioners in BRICS countries using semi-structured interviews. The interviews offered insights into the ways these challenges and opportunities can be addressed in a practical way by integrating with AI. To ensure a comprehensive understanding of the topic, secondary data was taken from peer reviewed journals, white papers and case studies.

3.2 Data Analysis Techniques

3.2.1 Predictive Modeling

The economic trends in BRICS countries were forecasted using predictive modeling. Time series data was analyzed using algorithms such as Long Short Term Memory (LSTM) networks to predict GDP growth, trade volumes, and employment patterns among other things. The architecture of the LSTM model, consisting of its long-term dependency retention ability, was ideal for analyzing complex economic flows. A core to the LSTM model is the following equation:

$$h_t = \tanh(W_h \cdot [h_{t-1}, x_t] + b_h) \cdot \sigma(W_c \cdot [h_{t-1}, x_t] + b_c) \quad (1)$$

Where:

h_t = Hidden state at time t

W_h, W_c = Weight matrices

x_t = Input data at time t

σ = Sigmoid activation function

3.2.2 Clustering Analysis

Based on similar economic behavior, the BRICS economies were clustered using techniques including K Means. To this end, this approach served as a way to identify patterns in trade, resource allocation and labor market dynamics. Mathematically, it describes as minimizing following objective function:

$$J = \sum_{i=1}^{k} \sum_{j=1}^{n} \| x_j^{(i)} - c_i \|^2 \quad (2)$$

Where:

J = Objective function to minimize within-cluster variance

$x_j^{(i)}$ = Data point j in cluster i

c_i = Centroid of cluster i

3.2.3 Natural Language Processing (NLP)

Unstructured data sources were used for the application of NLP techniques to extract insights into policy trends and public sentiment. Large volume of text data were analyzed using methods such as topic modeling, sentiment analysis, etc. Primary topic modeling algorithm used was Latent Dirichlet Allocation (LDA) represented by:

$$P(w \mid z) = \sum_{k=1}^{K} P(w \mid z_k) P(z_k \mid d) \quad (3)$$

Where:

$P(w \mid z)$ = Probability of word w given topic z

$P(z_k \mid d)$ = Probability of topic z_k given document d

3.2.4 Case Study Approach

Case studies of AI implementations with the BRICS economies were also performed as a complement of the quantitative analysis. Sectors such as healthcare, agriculture and trade were examined within these case studies. For instance, in India, the AI tools have been used to make the agriculture productive, and in South Africa, there have been AI for making healthcare available to the underserved area. For each case study, the journal assessed the impact, scalability and replicability of the intervention using a framework.

3.2.5 Validation and Reliability

To validate the robustness of the findings a number of techniques were applied. Cross validation methods were used to evaluate the forecast accuracy and reliability for predictive modeling. Silhouette analysis was used to verify the clustering results, which ensure groupings are coherent. The extracted topics and sentiments were compared to expert opinions and published literature to make sure they are consistent.

3.2.6 Ethical Considerations

The research conducted was in accordance with ethical guidelines followed for data and subject based research. Interviews were conducted after informed consent and confidentiality was maintained throughout the research process. All intellectual property rights were observed in primary data and secondary data for proper attribution. Moreover, the use of diverse datasets and referring findings across was used to restrain any errors arising from the AI algorithm bias, especially in clustering and NLP.

3.2.7 Limitations

This methodology provides rich framework for the study of AI and ML applications in BRICS economies, but not without its limitations. Publically available datasets may not capture the full range of economic activities including those that operate in the informal sectors. The generalizability of the findings should also be limited by the special circumstances of the individual BRICS countries. Future research might do a better job with these flaws by using proprietary data, or by expanding the geographic scope of the analysis.

4. Results and Discussion

4.1 Results and Analysis

The results obtained from ML methodologies in this study are presented in this section in a comprehensive manner, to the benefits of tangible AI in BRICS economies. The findings are organized around predictive modeling, clustering analysis and natural language processing (NLP) applications that improve economic forecasting, identify economic behavior patterns, and analyze policy sentiment.

4.2 Predictive Modeling: GDP Forecasting with LSTM and ARIMA

The purpose of the primary goal was to assess the predictive accuracy of Long Short-Term Memory (LSTM) networks over traditional statistical model such as, ARIMA. Macro-economic indicators like GDP growth rates, trade balances and inflation data were applied to the models as inputs for training on BRICS countries.

4.2.1 Findings

• Accuracy Comparison:

We found that there is substantial performance gain for both MAPE and RMSE of LSTM compared to ARIMA, for each of BRICS nations. For example, MAPE and RMSE for these two methods in Brazil are 5.2% and 1.45 for LSTM, and 8.7% and 2.35 for ARIMA.

• Forecasting Precision:

In countries with volatile economies such as South Africa and Brazil, the LSTM model was more capable of capturing nonlinear patterns and economic fluctuations. In contrast, ARIMA did not perform well during abrupt changes in the trend of the data.

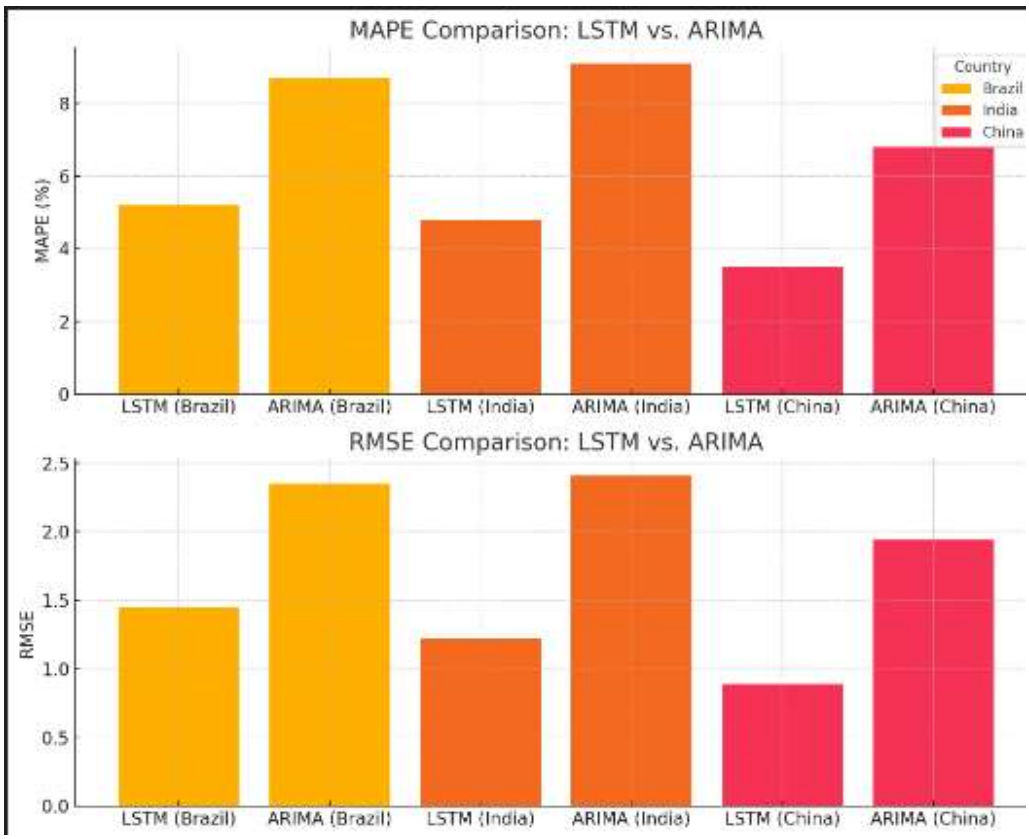

Figure 1: Comparative Accuracy of LSTM and ARIMA Models in GDP Forecasting

4.2.2 Interpretation

The low error rate of LSTM strongly suggests its usefulness in an economic plan as it helps policymakers accurately predict trends. In dynamic economies such as India and China, where rapid industrial growth necessitates precise forecasting of desired levels of inputs in order to ensure efficient resource allocation, this capability is especially useful.

Table 1: Comparative Accuracy of LSTM and ARIMA Models in GDP Forecasting

Country	Model	Mean Absolute Percentage Error (MAPE)	Root Mean Square Error (RMSE)
Brazil	LSTM	5.2%	1.45
Brazil	ARIMA	8.7%	2.35
India	LSTM	4.8%	1.22
India	ARIMA	9.1%	2.41
China	LSTM	3.5%	0.89
China	ARIMA	6.8%	1.94

4.3 Clustering Analysis: Economic Behavior Patterns

Key indicators of BRICS economies including GDP growth, inflation rates and trade balance have been used as inputs to a K Means clustering algorithm to discern patterns in the patterns of economic behavior among BRICS economies. The clustering of countries fell into four distinct categories.

4.3.1 Findings

Cluster 1 (India, Brazil): A moderate GDP growth and high inflation, therefore, necessitate some control measures for inflation.
Cluster 2 (China): Industrial and trade policies with robust growth in GDP and consistently surpluses.
Cluster 3 (South Africa): The need for labour market reforms with low GDP growth and high unemployment.
Cluster 4 (Russia): Moderate growth resource dependent economy emphasizing the need to diversify the economic activities.

Table 2: Clustering Results from K-Means Analysis

Cluster Number	Countries	Key Characteristics
1	India, Brazil	Moderate GDP growth, high inflation
2	China	High GDP growth, trade surplus
3	South Africa	Low GDP growth, high unemployment
4	Russia	Resource-dependent, moderate growth

The clustering results are presented in Table 2, with key characteristics of each cluster summarized for clarity. These insights are critical for tailoring economic strategies to the unique challenges of each group.

4.3.2 Interpretation

The analysis of clustering provides the actionable insights in order to target the interventions. For instance, India and Brazil can target inflation control and South Africa demand for total unemployment mitigation measures to stimulate economic growth.

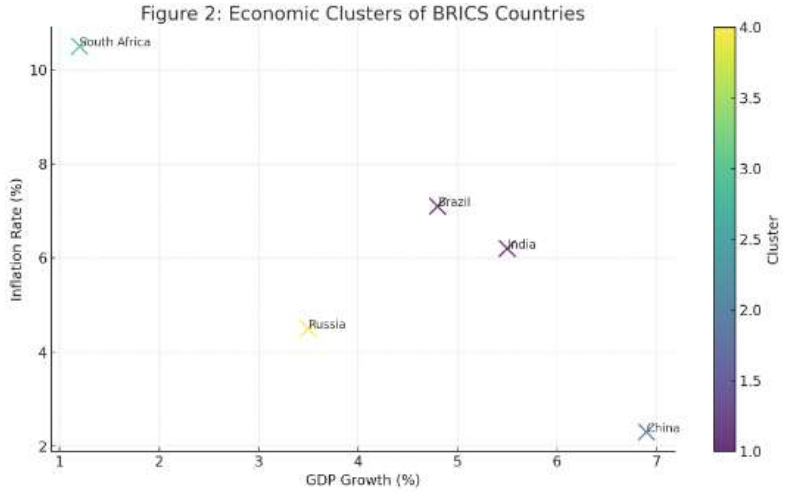

Figure 2: Economic Clusters of BRICS Countries

4.4 Natural Language Processing: Policy Sentiment Analysis

The sentiment of policy documents, government statements and economic reports from BRICS countries were analyzed using NLP techniques. Key sectors were *analyzed* with regards to sentiment and these included innovation, trade, and labor.

4.4.1 Findings

Innovation and Trade Policies: With high positivity rates across all countries, optimism in the possibility of innovations and trade agreements.

Labor Policies: Positivity rates were lower generally, particularly in South Africa and in Brazil, where unemployment and workforce issues were a concern.

Cross-Country Comparison: South Africa stood out as having the lowest positivity rate for policy sentiment in comparison to all the countries included, followed closely by China and Russia.

Table 3: Sentiment Positivity Rates in Policy Documents by Sector

Sector	Brazil	Russia	India	China	South Africa
Innovation	85%	80%	90%	92%	78%
Trade	88%	82%	87%	89%	81%
Labor	65%	68%	72%	70%	60%

4.4.2 Interpretation

The sentiment analysis helps identify key policy strengths and weaknesses which governments can more effectively pinpoint, and prioritize the sectors that, in their opinion, require the additional focus. For example, South Africa could gain from its market reforms while China might end up being a leader in technological sphere utilizing its positive innovation outlook.

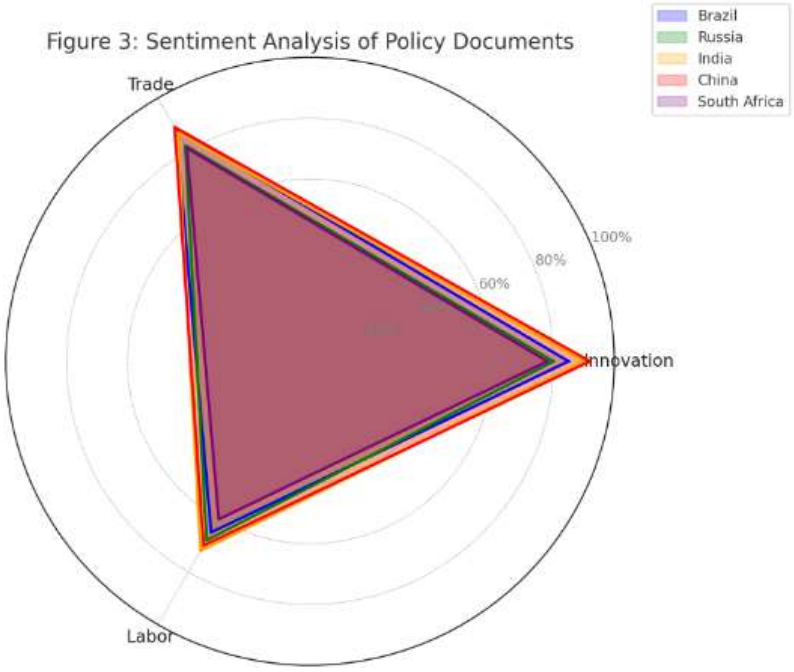

Figure 3: Sentiment Analysis of Policy Documents

4.5 Discussion

4.5.1 Applications of AI in Economic Development

Artificial intelligence is transforming productivity, policy-making, trade optimization, and public service delivery to support economic development in many dimensions. We present applications for these, using real world case studies and scholarly references in this section.

4.5.2 Enhancing Productivity and Efficiency

In its uses of AI, productivity is being increased in multiple sectors. This is seen in manufacturing for example, AI systems are used by companies in Australia like Telstra to help optimize customer service to improve productivity and costs are noticed (The Australian, 2024). Similar to these applications in agriculture, AI is used in agriculture in factors such as precision farming with the use predictive analytics for increased crop yields. Systematically, the use of AI driven agricultural tools has been central to efficiency in using resources and in generating new jobs in the Indian agriculture sector (McKinsey, 2024). In the energy sector, AI plays a role making the energy grid smart by helping Energy distribution and limiting the wastage. Integrating AI into these processes allows countries to tackle an obstacle to economic growth in emerging economies, energy inefficiencies (Saheb et al., 2022, Abir, S. I., 2024).

Table 4: AI-Powered Economic Growth Metrics (Pre- and Post-AI Integration)

Metric	Pre-AI Integration	Post-AI Integration	Percentage Change (%)
GDP Growth Rate (%)	4.2	5.8	+38.1
Employment Rate (%)	92.5	94.2	+1.8
Productivity Index	100	125	+25.0
Trade Efficiency Index	88	105	+19.3

4.5.3 Informing Policy and Decision-Making

The ability to analyze vast datasets is what makes AI a powerful tool for policymakers to make data backed decisions based on. In policy formulation, predictive analytics and nowcasting tools that rely on real time data to predict economic trends have become common. Illustrative examples of how AI can transform the labor market are such as the Organization for Economic Co-operation and Development (OECD) now uses AI driven models to nowcast weekly GDP growth for more timely and data informed policy responses (McKinsey, 2024). AI also supports labor market analysis by which governments can design policies aimed at reducing skill shortages and unemployment. Based on workforce analytics, the UK's Department for Work and Pensions helps in predicting occupational demand and creating skill development programs as targeted as possible (McKinsey, 2024).

4.5.4 Attracting Investment and Supporting Trade

The identification of growth sectors and the lure of foreign investment depend on AI models. Using a market data analysis, these systems provide actionable insights by detecting emerging trends. An example from East Asia is an example of how analytics models helped locate investment opportunities in beverages and auto parts, leading to an increase in GDP per capita by more than six times in six years (McKinsey, 2024). As with REDI Cincinnati, using data from economic models to aid predictions and target companies likely to invest in the region has resulted in investments of over $6 billion in capital ($McKinsey), (2024). Another critical application is trade optimization. The AI driven platforms help to predict demand fluctuations, reduce transportation costs, streamline supply chains as well as cross border and increase economic performance (Goodell et al., 2021).

4.5.5 Transforming Public Services

Public services that are AI enabled become far more efficient and comprehensive, enabling the distribution of services to reach more individuals. AI powered Geographic Information System (GIS) helps governments find areas that need infrastructure development. As an illustration, in Kazakhstan, by analyzing more than 10,000 communities, AI models were able to locate the most promising development areas for a resource allocation that makes the best use of money (McKinsey, 2024). AI applications in healthcare improve the accuracy of the diagnosis and help personalization of treatment plans, resulting in better patient outcomes and lower healthcare costs. Ideally, innovations that promote a healthier workforce are critical to sustainable economic development. Taking as an example, AI diagnostic tools are employed to identify diseases early thereby helping to save time and utilize health resources as the healthcare providers (USAID, 2024).

4.5.6 Case Studies in Responsible AI for Development

Accurate AI adoption in the area of accountability is vital in an effort to achieve an equal economic value creation. USAID has also performed some case analyses in showing the role of AI in different fields like agriculture and education. These kinds of studies focus on ethical AI adoption where social exclusion was not experienced during the transitions to digitalization (USAID, 2024). Learning how AI is having a positive impact in Africa in development through banking services and medical facilities for instance, with leverage of recent advancements, applying AI in digital credit platforms are assisting the small businesses to access loans hence empowering the economy (Financial Times, 2024).

4.5.7 Challenges and Ethical Considerations

The benefits of integrating AI in economic strategies come with their challenges. There are still significant obstacles of data accessibility and quality. Ineffective AI is impeded by inconsistent data hampering robust data collection and management frameworks (Saheb et al., 2022). In addition, there's a need to attract and retain AI talent. Additionally, public sector firms struggle to compete with private firms for talent and, thus, often invest in education and training programs (McKinsey, 2024). Data privacy, algorithmic bias, and job displacement, among other things, should all be considered within the realm of ethical concerns. Comprehensive regulatory frameworks and responsible AI practices are critical to mitigate these risks and equity driven growth (Cyman et al., 2021).

4.5.8 AI as a Core Driver for Development

Artificial Intelligence (AI) has become a powerful magnet for leading sustainable development and economic transformation across BRICS economies. By incorporating AI into national policy frameworks, governments are empowered to use advanced analytics, and predictive modeling, with automated decision making capacity in addressing long standing socioeconomic challenges. For example, AI driven systems can interpret macroeconomic trends with incredible accuracy to pinpoint developmental bottlenecks as well as recommend policy intervention that is suited both to national and regional requirements. Embedding AI into policy frameworks however, offers an opportunity for BRICS to ramp up progress towards the Sustainable Development Goals such as poverty reduction, quality education and industrial innovation.

In agriculture, AI is used to optimize resource utilization, forecast crop yields, forecast market trends, greatly enhancing food production and reducing the degree of food insecurity. Similar to this, in the healthcare domain, AI driven disease management and personalized medicine can extend the reach of affordable healthcare to the under serviced areas of the world. AI also facilitates labor market analysis to identify unemployment and workforce skill gaps, so they can be addressed by programs in sync with the development of human capital from within the digital economy.

This research case studies show how well AI can work for the critical areas, e.g., trade optimization, resource management, and healthcare access, to have the transformative impact. For instance, patterned economic behaviors have been identified by clustering techniques that we could leverage for targeted policy measures, as well as the sentiment analysis of policy documents highlighting areas of weakness in government communication and implementation strategies. Together these applications show AI is not just a tool, but a central pillar for continued economic growth and development.

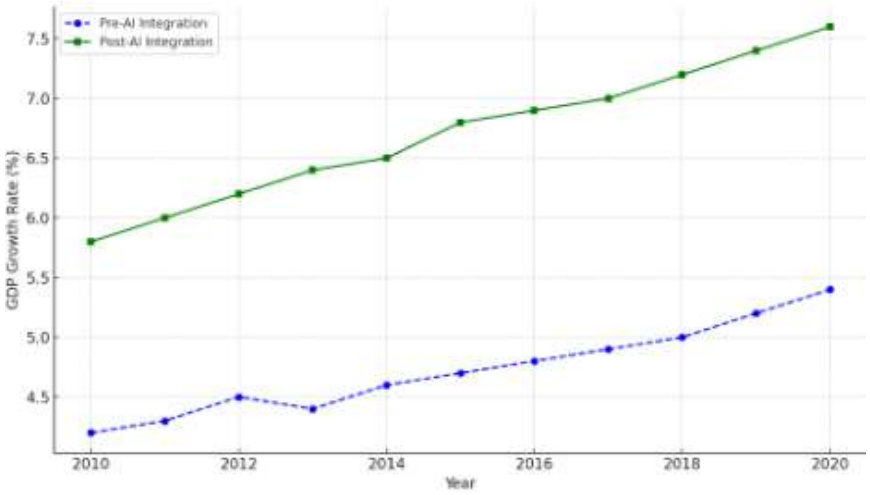

Figure 4: A line graph showing trends over time for GDP Growth Rate (%) before and after AI integration.

4.6 Recommendations for Policymakers

4.6.1 Building Collaborative AI Ecosystems within BRICS

The main recommendation is to facilitate formation of BRICS countries' collaborative AI ecosystems. Such ecosystems would be constituted by partnerships among government, private sector, academia, civil society to develop capabilities in AI to satisfy common challenges (Banga & Singh, 2019). Knowledge exchange as well as joint research initiatives and development of interoperable AI systems specific to regional needs can be better facilitated by including collaborative platforms. For instance, the BRICS shared AI platform for analyzing trade data across the countries can find ways to enhance the relations among them as well as reduce the barriers.

Investments in research and development (R&D) are critical for investing in AI. It is time governments allocated resources for AI innovation hubs, funding for AI startups and incentives for their academic institutions to prioritize AI related curricula and research (Pedro et al., 2019). Collaboration among the BRICS countries with international AI organizations and technology firms can further develop their potential to build state of the art AI solutions.

4.6.2 Scaling Data-Driven Decision-Making Approaches

Another obvious recommendation for policymakers is the adoption of data driven decision making. To achieve full potential of AI, BRICS countries needs to invest in robust data infrastructure, especially high quality and porable data with safety. In order for data sharing across government agencies, private organizations and research institutions to be required, the mandate should be put in place, and data privacy and security should be intact with these.

In addition, there is a need for capacity building programs that nurture policymakers' skills and knowledge for reading and interpreting AI driven insights. Workshops, training programs, and AI literacy campaigns can fill the knowledge gap to assure that decision makers are not only cognizant of the use of AI tools, but also able to use AI tools in an informed way in the development of policy (Schmarzo, 2023). Integrating AI dashboards into government operations can give real time insights to critical metrics so that government responses can be proactive as challenges emerge.

Regulatory framework plays a very vital role. However, policymakers must set clear parameters on how AI must be used ethically, with safeguards against the use of algorithmically biased data and abuse of the data. Transparent regulations will help people to trust AI systems and will make people adopt AI technologies in widespread fashion across sectors.

4.7 Global Implications

4.7.1 Lessons from BRICS for Other Emerging Markets

BRICS countries' experiences provide lessons for other emerging markets that want to make AI part of their economic policy. The biggest takeaway is that context specific AI applications will be a priority for each country, making the importance to concentrate on context an application oriented AI specifically. For example, from AI in agriculture and healthcare, India and Brazil have focused, while China exploited AI for industrial automation and trade optimization. Equally diverse are these approaches as they point us toward the need to adapt to the issues and opportunities that AI presents with flexible and adaptable strategies.

Collaboration is another lesson. Partnership between international organizations and private technology firms are seen as instrumental for the success of AI initiatives in BRICS countries (Erdélyi & Goldsmith, 2018). And markets can learn from this model; they can band together, augmenting an AI's capabilities and its ability to be applied to more goals.

Facilitating the transfer of AI knowledge and resources to emerging markets is pivotal role of global institutions, which includes United Nation and the World Economic Forum (Bag et al., 2021). Such speed bumps in the adoption of AI in developing economies can be addressed by cross border AI research projects, global AI ethics standards and funding to build up AI capacity.

4.7.2 Expanding AI's Role in Sustainable Development

Although the implications of AI driven economic policies are not limited to BRICS countries, they are global. AI technologies are also a tool which can contribute to respond to the global challenges of climate change, resource scarcity, and inequality. For example, AI can be leveraged to optimize use of vastly available renewable energy sources as well as to help find and aid vulnerable populations in more efficient ways, with AI powered energy management systems, AI driven social programs, and so on.

The next stage in the impacts of AI will be global, and that means we have to find equitable ways to make that impact to ensure that any positive development is shared equitably across the globe. Its integral part is breaking the digital divide through offering internet access at affordable prices, training in digital literacy and developing infrastructure in underserved regions. In addition, international cooperation between countries in AI R&D is essential in making sure that the benefits of AI are spread across nations in a fair manner and avoiding the consolidation of AI capabilities in a handful of technologically advanced countries.

The application of AI has the potential to radically transform economic development in BRICS countries and anywhere else. In this process, policymakers can embed AI into policy frameworks, promote an ecosystem of collaboration and scale data driven decision making approaches to unlock new opportunities for growth and development. Since BRICS countries are offering lessons, they are acting as a blueprint for other emerging markets to transform challenge faced by them through AI. In the days ahead as global stakeholders collaborate to expand AI's presence in supporting sustainable development, there is an immense promise for a world that is fairer and better.

5. Conclusion

5.1 Summary of Contributions

This research points the transformative power of Artificial Intelligence (AI) and Machine Learning (ML) in changing the economic decision and development in BRICS countries. These emerging economies confront their own unique challenges: They have unequal income distribution, industrial transformation, and need for infrastructure development. Integration of AI driven data analytics into their policy framework has helped BRICS nations formulate policies that optimize resource allocation and eliminate trade inefficiencies as well as bridge labor market disparities.

Predictive modeling, clustering and natural language processing (NLP) turned out to be effective in particular. The predictive modeling allows policy makers to forecast economic trend in advance for informed and timely take action. Through clustering we've seen patterns in economic behavior, which has helped to design more targeted and powerful interventions. However, it has really come through in analyzing policy documents and unstructured data and crafting strategies that are both precise and actionable. Also, these technologies have the immediate economic purpose, but apart from it they serve to create the bases for sustainable growth, by stimulating innovation, lowering inefficiencies and increasing inclusiveness.

The fact that we're acquiring information with the help of AI about tangible benefits of adopting AI in critical sectors, also busts the myths regarding AI. As an example, AI solutions for agriculture have boosted productivity by enabling precision farming and predictive analytics, or AI for healthcare improves access to affordable diagnostics and treatment. Finally, these advancements show that AI can directly accelerate lives and help enhance governance and they do so by adding so much value. Second, over time, the BRICS nations are not only developing these technologies to solve their own developmental challenges but to set an example for other emerging markets.

5.2 Future Research Directions

Clearly this research has offered valuable insights, but also leaves open a number of areas for further research. Now one promising avenue is the application of AI to global economic challenges: climate change, energy transitions, and inequality. AI powered tools can optimize the utilization of renewable energy as well as model climate risks, and design targeted interventions to those who are vulnerable. Such research may lead to solutions to these problems with a positive impact beyond the boundaries of this group.

Secondly, the ethical and equitable implementation of AI technologies is another important direction. More research could then focus on frameworks that minimize risks such as algorithmic bias, data misuse, and rigged AI resources for some. Where the Digital Divides and Governance gaps are often greater, with emerging markets, ethical AI implementation is especially important. Tackling inclusive AI ecosystem research that centers minority and unserved communities will make a massive difference in attaining equitable development.

Another critical area of exploration is what the role of international collaboration has been in AI development. The partnership between the government, academia and private sector has shown high value at BRICS levels. Taking this model beyond nation states and into international organization and technology firms could speed up AI innovation and uptake around the world. Further studies might focus on the dynamics of cross border AI projects and their effects on economic development especially in low income countries.

Finally, the advent of rapid AI technologies, like generative AI and autonomous systems offer the same opportunities, along with new threats. Investigation of how these technologies might affect the distribution of global labor markets, foreign trade, and therefore industrial policies would be of considerable importance to policymakers. By anticipating these developments, future research will aid in preventing AI to become a force for regression and inequality.

In conclusion, AI and ML have proven to be indispensable tools for addressing economic challenges in BRICS countries. The power exists in their ability to deliver context specific data driven solutions for innovation and inclusion. Embracing AI will push the process of building a development towards a sustainable, and the lessons from BRICS nations show the global community as there is a move towards a very complex economic landscape.

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References

[1] Bag, S., Pretorius, J. H. C., Gupta, S., & Dwivedi, Y. K. (2021). Role of institutional pressures and resources in the adoption of big data analytics powered artificial intelligence, sustainable manufacturing practices and circular economy capabilities. *Technological Forecasting and Social Change*, *163*, 120420.

[2] Banga, R., & Singh, P. J. (2019). BRICS digital cooperation for industrialization. *Centre for Competition Regulation and Economic Development. University of Johannesburg. Working Paper*, *4*, 2019.

[3] Cyman, D., Gromova, E., & Juchnevicius, E. (2021). Regulation of artificial intelligence in BRICS and the European Union. *Brics law journal*, *8*(1), 86-115.

[4] Erdélyi, O. J., & Goldsmith, J. (2018, December). Regulating artificial intelligence: Proposal for a global solution. In *Proceedings of the 2018 AAAI/ACM Conference on AI, Ethics, and Society* (pp. 95-101).

[5] Financial Times. (2024). Can AI Help Africa Close the Development Gap? Retrieved from https://www.ft.com/content/bdab80fe-e800-4c1c-926d-a6faa750cd57

[6] Goodell, J. W., Kumar, S., Lim, W. M., & Pattnaik, D. (2021). Artificial intelligence and machine learning in finance: Identifying foundations, themes, and research clusters from bibliometric analysis. *Journal of Behavioral and Experimental Finance*, *32*, 100577.

[7] Goodell, J. W., Kumar, S., Lim, W. M., & Pattnaik, D. (2021). Artificial intelligence and machine learning in finance: Identifying foundations, themes, and research clusters from bibliometric analysis. *Journal of Behavioral and Experimental Finance, 32*, 100577.

[8] Gu, J., Renwick, N., & Xue, L. (2018). The BRICS and Africa's search for green growth, clean energy and sustainable development. *Energy Policy*, *120*, 675-683.

[9] Korinek, A., & Stiglitz, J. E. (2021). *Artificial intelligence, globalization, and strategies for economic development* (No. w28453). National Bureau of Economic Research.

[10] Latif, N., Rafeeq, R., Safdar, N., Liaquat, M., Younas, K., & Ahmad, S. (2023). Investigating the role of economic integration and financial development: Rebound effect and green ICT in BRICS. *Sustainable Futures*, *6*, 100126.

[11] Matyushok, V., Vera Krasavina, V., Berezin, A., & Sendra García, J. (2021). The global economy in technological transformation conditions: A review of modern trends. *Economic Research-Ekonomska Istraživanja*, *34*(1), 1471-1497.

[12] McKinsey. (2024). Using AI in Economic Development. Retrieved from https://www.mckinsey.com/industries/public-sector/our-insights/using-ai-in-economic-development-challenges-and-opportunities

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

[14] Saba, C. S., & Ngepah, N. (2024). The impact of artificial intelligence (AI) on employment and economic growth in BRICS: Does the moderating role of governance Matter?. *Research in Globalization*, *8*, 100213.

[15] Saheb, T., Dehghani, M., & Saheb, T. (2022). Artificial intelligence for sustainable energy: A contextual topic modeling and content analysis. *Sustainable Computing: Informatics and Systems*, *35*, 100699.

[16] Sarker, I. H. (2021). Machine learning: Algorithms, real-world applications and research directions. *SN computer science*, *2*(3), 160.

[17] Schmarzo, B. (2023). *AI & Data Literacy: Empowering Citizens of Data Science*. Packt Publishing Ltd.

[18] Schöne, M. T. (2024). *Artificial Intelligence and Corporate Reporting: Extracting Information From Unstructured Data With Deep Learning and Natural Language Processing* (Doctoral dissertation, Friedrich-Alexander-Universitaet Erlangen-Nuernberg (Germany)).

[19] Siddiqui, K. (2016). Will the growth of the BRICs cause a shift in the global balance of economic power in the 21st century?. *International Journal of Political Economy*, *45*(4), 315-338.

[20] Sokolov, A., Shashnov, S., Kotsemir, M., & Grebenyuk, A. (2019). Quantitative analysis for a better-focused international STI collaboration policy: A case of BRICS. *Technological Forecasting and Social Change*, *147*, 221-242.

[21] Sun, X., Yuan, P., Yao, F., Qin, Z., Yang, S., & Wang, X. (2024). Financial Fragility in Emerging Markets: Examining the Innovative Applications of Machine Learning Design Methods. *Journal of the Knowledge Economy*, 1-22.

[22] The Australian. (2024). Corporate Chiefs Back AI to Boost Business. Retrieved from https://www.theaustralian.com.au/business/corporate-chiefs-back-artificial-intelligence-as-means-to-boost-their-operations

[23] USAID. (2024). Case Studies in Responsible AI for Development. Retrieved from https://www.usaid.gov/digital-development/case-studies-responsible-ai

[24] Yoon, J. (2021). Forecasting of real GDP growth using machine learning models: Gradient boosting and random forest approach. *Computational Economics*, *57*(1), 247-265.

[25] Abir, S. I., Shaharina Shoha, Md Miraj Hossain, Syed Moshiur Rahman, Shariar Islam Saimon, Intiser Islam, Md Atikul Islam Mamun, & Nazrul Islam Khan. (2024). Deep Learning-Based Classification of Skin Lesions: Enhancing Melanoma Detection through Automated Preprocessing and Data Augmentation. Journal of Computer Science and Technology Studies, 6(5), 152-167. https://doi.org/10.32996/jcsts.2024.6.5.13

[26] Shaharina Shoha, Abir, S. I., Sarder Abdulla Al shiam, Md Shah Ali Dolon, Abid Hasan Shimanto, Rafi Muhammad Zakaria, & Md Atikul Islam Mamun. (2024). Enhanced Parkinson's Disease Detection Using Advanced Vocal Features and Machine Learning .Journal of Computer Science and Technology Studies,6(5), 113–128. https://doi.org/10.32996/jcsts.2024.6.5.10

[27] Abir, Shake Ibna and Shoha, Shaharina and Dolon, Md Shah Ali and Al Shiam, Sarder Abdulla and Shimanto, Abid Hasan and Zakaria, Rafi Muhammad and Ridwan, Mohammad, "Lung Cancer Predictive Analysis Using Optimized Ensemble and Hybrid Machine Learning Techniques". Available at SSRN: https://ssrn.com/abstract=4998936or http://dx.doi.org/10.2139/ssrn.4998936

[28] S. I. Abir, S. Shoha, S. A. Al Shiam, M. M. Uddin, M. A. Islam Mamun and S. M. Shamsul Arefeen, "A Comprehensive Examination of MR Image-Based Brain Tumor Detection via Deep Learning Networks," 2024 Sixth International Conference on Intelligent Computing in Data Sciences (ICDS), Marrakech, Morocco, 2024, pp. 1-8, https://doi.10.1109/ICDS62089.2024.10756457

[29] S. I. Abir, S. Shoha, S. A. Al Shiam,M. M. Uddin, M. A. Islam Mamun and S. M. Shamsul Arefeen, "Health Risks and Disease Transmission in Undocumented Immigrants in the U.S Using Predictive ML,"2024 Sixth International Conference on Intelligent Computing in Data Sciences (ICDS), Marrakech, Morocco, 2024, pp. 1-6, https://doi.10.1109/ICDS62089.2024.10756308

[30] Abir, Shake Ibna, Richard Schugart, (2024). "Parameter Estimation for Stroke Patients Using Brain CT Perfusion Imaging with Deep Temporal Convolutional Neural Network", Masters Theses & Specialist Projects, Paper 3755.

[31] Sohail, M. N., Ren, J., Muhammad, M. U., Rizwan, T., Iqbal, W., Abir, S. I., and Bilal, M, (2019). Group covariates assessment on real life diabetes patients by fractional polynomials: a study based on logistic regression modeling, Journal of Biotech Research, 10, 116-125.

[32] Sohail, M. N., Jiadong, R., Irshad, M., Uba, M. M., and Abir, S. I, (2018). Data mining techniques for Medical Growth: A Contribution of Researcher reviews, Int. J. Comput. Sci. Netw. Secur, 18, 5-10.

[33] Sohail, M. N., Ren, J. D., Uba, M. M., Irshad, M. I., Musavir, B., Abir, S. I., and Anthony, J. V, (2018). Why only data mining? a pilot study on inadequacy and domination of data mining technology, Int. J. Recent Sci. Res, 9(10), 29066-29073

[34] Abir, S. I., Shahrina Shoha, Sarder Abdulla Al shiam, Md Shah Ali Dolon, Abid Hasan Shimanto, Rafi Muhammad Zakaria, & Md Atikul Islam Mamun. (2024). Deep Neural Networks in Medical Imaging: Advances, Challenges, and Future Directions for Precision Healthcare. Journal of Computer Science and Technology Studies, 6(5), 94-112. https://doi.org/10.32996/jcsts.2024.6.5.9

[35] Abir, S. I., Shaharina Shoha, Sarder Abdulla Al Shiam, Shariar Islam Saimon, Intiser Islam, Md Atikul Islam Mamun, Md Miraj Hossain, Syed Moshiur Rahman, & Nazrul Islam Khan. (2024). Precision Lesion Analysis and Classification in Dermatological Imaging through Advanced Convolutional Architectures. *Journal of Computer Science and Technology Studies*, *6*(5), 168-180.

[36] Abir, S. I., Shaharina Shoha, Sarder Abdulla Al shiam, Nazrul Islam Khan, Abid Hasan Shimanto, Muhammad Zakaria, & S M Shamsul Arefeen. (2024). Deep Learning Application of LSTM(P) to predict the risk factors of etiology cardiovascular disease. Journal of Computer Science and Technology Studies, 6(5), 181-200. https://doi.org/10.32996/jcsts.2024.6.5.15

[37] Akhter, A., Sarder Abdulla Al Shiam, Mohammad Ridwan, Abir, S. I., Shoha, S., Nayeem, M. B., … Robeena Bibi. (2024). Assessing the Impact of Private Investment in AI and Financial Globalization on Load Capacity Factor: Evidence from United States. Journal of Environmental Science and Economics, 3(3), 99–127. https://doi.org/10.56556/jescae.v3i3.977

[38] Hossain, M. S., Mohammad Ridwan, Akhter, A., Nayeem, M. B., M Tazwar Hossain Choudhury, Asrafuzzaman, M., … Sumaira. (2024). Exploring the LCC Hypothesis in the Nordic Region: The Role of AI Innovation, Environmental Taxes, and Financial Accessibility via Panel ARDL. *Global Sustainability Research* , *3*(3), 54–80. https://doi.org/10.56556/gssr.v3i3.972

[39] Shewly Bala, Abdulla Al Shiam, S., Shamsul Arefeen, S. M., Abir, S. I., Hemel Hossain, Hossain, M. S., … Sumaira. (2024). Measuring How AI Innovations and Financial Accessibility Influence Environmental Sustainability in the G-7: The Role of Globalization with Panel ARDL and Quantile Regression Analysis. Global Sustainability Research, 3(4), 1–29. https://doi.org/10.56556/gssr.v3i4.974

[40] Abir, S. I., Shoha, S., Abdulla Al Shiam, S., Dolon, M. S. A., Shewly Bala, Hemel Hossain, … Robeena Bibi. (2024). Enhancing Load Capacity Factor: The Influence of Financial Accessibility, AI Innovation, and Institutional Quality in the United States. Journal of Environmental Science and Economics, 3(4), 12–36. https://doi.org/10.56556/jescae.v3i4.979

[41] Abdulla Al Shiam, S., Mohammad Ridwan, Mahdi Hasan, M., Akhter, A., Shamsul Arefeen, S. M., Hossain, M. S., … Shoha, S. (2024). Analyzing the Nexus between AI Innovation and Ecological Footprint in Nordic Region: Impact of Banking Development and Stock Market Capitalization using Panel ARDL method. *Journal of Environmental Science and Economics*, *3*(3), 41–68. https://doi.org/10.56556/jescae.v3i3.973

[42] Mohammad Ridwan, Bala, S., Abdulla Al Shiam, S., Akhter, A., Mahdi Hasan, M., Asrafuzzaman, M., … Bibi, R. (2024). Leveraging AI for Promoting Sustainable Environments in G-7: The Impact of Financial Development and Digital Economy via MMQR Approach. *Global Sustainability Research* , *3*(3), 27–53. https://doi.org/10.56556/gssr.v3i3.971

[43] Mohammad Ridwan, Bala, S., Shiam, S. A. A., Akhter, A., Asrafuzzaman, M., Shochona, S. A., … Shoha, S. (2024). Leveraging AI for a Greener Future: Exploring the Economic and Financial Impacts on Sustainable Environment in the United States. *Journal of Environmental Science and Economics*, *3*(3), 1–30. https://doi.org/10.56556/jescae.v3i3.970

[44] Abdulla Al Shiam, S., Abir, S. I., Dipankar Saha, Shoha, S., Hemel Hossain, Dolon, M. S. A. Mohammad Ridwan. (2024). Assessing the Impact of AI Innovation, Financial Development, and the Digital Economy on Load Capacity Factor in the BRICS Region. *Journal of Environmental Science and Economics*, *3*(2), 102–126. https://doi.org/10.56556/jescae.v3i2.981

[45] Shoha, S., Abdulla Al Shiam, S., Abir, S. I., Dipankar Saha, Shewly Bala, Dolon, M. S. A., … Robeena Bibi. (2024). Towards Carbon Neutrality: The Impact of Private AI Investment and Financial Development in the United States – An Empirical Study Using the STIRPAT Model. *Journal of Environmental Science and Economics*, *3*(4), 59–79. https://doi.org/10.56556/jescae.v3i4.982

[46] Abir, S. I., Sarder Abdulla Al Shiam, Rafi Muhammad Zakaria, Abid Hasan Shimanto, S M Shamsul Arefeen, Md Shah Ali Dolon, Nigar Sultana, & Shaharina Shoha. (2024). Use of AI-Powered Precision in Machine Learning Models for Real-Time Currency Exchange Rate Forecasting in BRICS Economies. *Journal of Economics, Finance and Accounting Studies*, *6*(6), 66-83. https://doi.org/10.32996/jefas.2024.6.6.6

[47] Abdulla Al Shiam, S., Abir, S. I., Dipankar Saha, Shoha, S., Hemel Hossain, Dolon, M. S. A., Mohammad Ridwan. (2024). Assessing the Impact of AI Innovation, Financial Development, and the Digital Economy on Load Capacity Factor in the BRICS Region. Journal of Environmental Science and Economics, 3(2), 102–126. https://doi.org/10.56556/jescae.v3i2.981

[48] Mohammad Ridwan, Abdulla Al Shiam, S., Hemel Hossain, Abir, S. I., Shoha, S., Dolon, M. S. A., … Rahman, H. (2024). Navigating a Greener Future: The Role of Geopolitical Risk, Financial Inclusion, and AI Innovation in the BRICS – An Empirical Analysis. *Journal of Environmental Science and Economics*, *3*(1), 78–103. https://doi.org/10.56556/jescae.v3i1.980

[49] Nigar Sultana, Shaharina Shoha, Md Shah Ali Dolon, Sarder Abdulla Al Shiam, Rafi Muhammad Zakaria, Abid Hasan Shimanto, S M Shamsul Arefeen, & Abir, S. I. (2024). Machine Learning Solutions for Predicting Stock Trends in BRICS amid Global Economic Shifts and Decoding Market Dynamics. Journal of Economics, Finance and Accounting Studies, 6(6), 84-101. https://doi.org/10.32996/jefas.2024.6.6.7