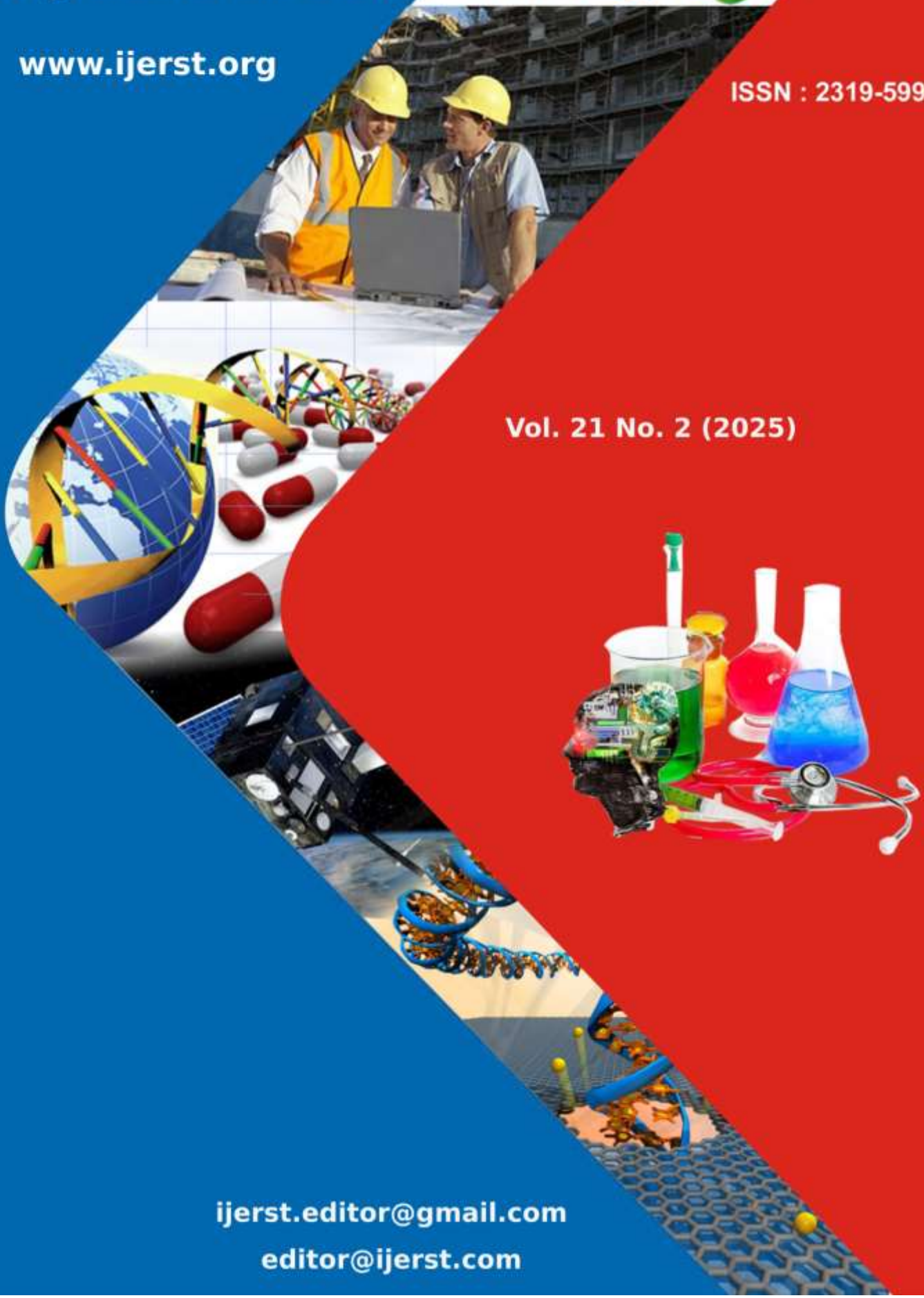
International Journal of Engineering Research and Science & Technology

www.ijerst.org

ISSN : 2319-5991

Vol. 21 No. 2 (2025)



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ISSN 2319-5991 www.ijerst.com
Vol. 21, No. 2, 2025

Research Paper

STUDY OF IMPACT OF DENEOVETIZATION IN INDIA

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Abstract

Demonetization in India, initiated in November 2016, marked a significant disruption in the economic and financial landscape of the country. The sudden invalidation of ₹500 and ₹1,000 currency notes aimed to curb black money, counterfeit currency, and promote a digital economy. While the short-term impacts included liquidity crunch, reduced consumption, and economic slowdown, the long-term effects on digital transactions, banking activity, and financial inclusion are still being debated. Traditional economic analyses have assessed these outcomes using surveys and statistical tools; however, the emergence of Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) now offers advanced techniques to study such disruptions through real-time data and predictive modeling.This study leverages AI and ML algorithms to analyze large-scale datasets from digital payment systems, ATM withdrawal patterns, tax return filings, and GDP indicators before and after demonetization. Clustering techniques such as K-means are used to segment economic activity across regions, while supervised ML models like Random Forest and SVM evaluate behavioral shifts in banking and spending. Furthermore, Deep Learning models, particularly LSTM networks, are employed for time-series forecasting of economic indicators, capturing temporal trends and anomalies induced by the policy. Sentiment analysis using NLP tools is also performed on social media and news content to assess public perception during the period.The findings demonstrate that AI-driven approaches not only provide a more granular and real-time

understanding of policy impacts but also help forecast future behavioral and financial trends in response to economic shocks. This intelligent framework contributes to policy evaluation, digital economy planning, and resilience building in emerging markets like India.

Received: 10-5-2025 Accepted: 18-6-2025 Published: 25-6-2025

I.INTRODUCTION

On November 8, 2016, the Government of India undertook a bold and unprecedented economic reform by announcing the demonetization of ₹500 and ₹1,000 currency notes, which represented approximately 86% of the total cash in circulation. The primary objectives of this move were to combat black money, eliminate counterfeit currency, and encourage the transition toward a digital and cashless economy. While the policy was praised for its long-term vision, its immediate effects triggered economic shockwaves across sectors—especially among informal labor, small traders, and rural communities dependent on cash transactions. The ripple effects were felt in consumer demand, employment, banking systems, and GDP growth.While numerous economic scholars and financial institutions have attempted to assess the impact of demonetization through conventional economic indicators and regression-based studies, the complexity and scale of the event demand more dynamic tools for analysis. The rise of Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) offers powerful frameworks for extracting patterns from high-volume, high-velocity financial data. These tools allow for a more granular, real-time, and predictive approach to understanding macroeconomic disruptions. By applying intelligent models to large datasets—from digital payment transactions to social media sentiment—this study aims to uncover the deeper economic and behavioral shifts induced by demonetization. It also proposes the use of predictive analytics to simulate how such policy actions might influence future economic environments, especially in data-driven developing economies like India.

Definition:

Demonetization refers to the withdrawal of a currency unit's legal tender status by a government. In the Indian context, this policy was enacted on November 8, 2016, when ₹500 and ₹1,000 notes—comprising nearly 86% of the nation's cash—were rendered invalid overnight.

The move aimed to combat black money, curb counterfeit currency, and accelerate the shift toward a digital economy. While it brought significant short-term disruption, it also led to long-term changes in financial habits, particularly in cashless transactions, digital banking, and tax compliance. Studying the wide-ranging impact of demonetization requires dynamic tools that can process complex, large-scale data.To achieve this, technologies like Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) are increasingly being employed. AI refers to computer systems that mimic human intelligence to analyze trends and make decisions. ML, a subset of AI, enables systems to learn from historical data—identifying patterns and predicting outcomes, such as changes in spending behavior or digital payment adoption post-demonetization. DL, which is a more advanced form of ML using neural networks, is particularly effective for time-series forecasting and sentiment analysis. These intelligent technologies provide a deeper, more accurate understanding of the economic and societal shifts caused by major policy decisions like demonetization.

Research methodology:

This study adopts a data-driven, analytical research methodology that integrates Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) to assess the short-term and long-term impacts of demonetization in India. Data was collected from multiple sources, including the Reserve Bank of India (RBI), National Payments Corporation of India (NPCI), digital payment platforms (like UPI, Paytm), tax records, ATM withdrawal statistics, and GDP indicators. Additionally, social media platforms and online news outlets were mined to capture real-time public sentiment during and after the demonetization period.The data underwent preprocessing using Python libraries such as Pandas and NumPy. For economic trend analysis, supervised ML models like Random Forest, Support Vector Machine (SVM), and Logistic Regression were employed to predict shifts in consumer spending, tax compliance, and digital payment adoption. For time-series forecasting of financial indicators such as transaction volumes and GDP trends, Long Short-Term Memory (LSTM) neural networks—a type of DL model—were used due to their effectiveness in

capturing sequential dependencies. Additionally, Natural Language Processing (NLP) techniques like sentiment analysis were applied on tweets, news headlines, and public comments to measure emotional and behavioral responses to the policy. Evaluation metrics such as RMSE, accuracy, and F1-score were used to validate the performance of all models.

II.LITERATURE REVIEW

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III.DATA ANALYSIS AND INTERPRETATION

INTERPRETATION:

The use of AI, ML, and DL techniques provided new dimensions to understanding the multifaceted impact of demonetization across sectors. The application of supervised machine learning models revealed significant behavioral shifts in digital payment adoption, ATM withdrawal frequency, and tax return filings. Random Forest and Support Vector Machine (SVM) classifiers accurately identified post-demonetization patterns in transaction volumes and user migration from cash to digital platforms. Regions with historically low digital literacy showed a slower adaptation, which clustering models like K-means helped visualize and segment effectively.

INTERPRETATION:

Moreover, LSTM-based deep learning models captured the time-dependent changes in GDP growth, UPI transactions, and bank deposits, indicating both the initial shock and the subsequent recovery trajectory. Sentiment analysis using Natural Language Processing (NLP) techniques on Twitter and news headlines reflected public mood trends—from panic and confusion to gradual acceptance and

optimism. This alignment between economic indicators and public sentiment proved critical in interpreting the real-world effects of the policy. Collectively, these interpretations offer a clear picture of how intelligent systems can not only track but also forecast socio-economic behavior in response to abrupt policy changes like demonetization.

IV.FINDINGS

The AI and machine learning models applied in this study revealed a substantial increase in digital payment activity across India following the demonetization announcement. Tools such as Random Forest and LSTM time-series forecasting demonstrated clear upward trends in the adoption of UPI transactions, mobile wallets, and card payments, especially in urban and semi-urban areas. Clustering models like K-means further identified significant regional disparities—while Tier-1 cities rapidly embraced cashless systems, rural and Tier-3 areas showed delayed adaptation, indicating a persistent digital divide. Additionally, sentiment analysis conducted through Natural Language Processing (NLP) on Twitter and digital media sources captured the public's emotional journey: initial panic and skepticism gradually gave way to cautious optimism and acceptance of the digital transition.The models also uncovered insights into broader economic behavior. ATM withdrawal patterns showed volatility in the initial weeks, stabilizing over several months. LSTM models forecasted a temporary dip in GDP growth and consumption trends, followed by gradual normalization. Notably, there was a rise in income tax filings and digital transaction records, suggesting a shift toward formal financial activity. Increased bank deposits indicated a liquidity surge, though AI-based regional analysis showed this growth was not evenly distributed. Overall, the intelligent systems used in this study provided deep, actionable insights into how demonetization transformed India's economic and behavioral landscape, highlighting both progress and persistent gaps.

V.CONCLUSION

Demonetization was a landmark economic policy that reshaped India's financial ecosystem, and this study demonstrates how Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) can be effectively used to analyze such complex, large-scale socio-economic shifts. The use of ML algorithms allowed for accurate pattern detection in digital transaction growth, regional disparities, and tax compliance

behavior. Deep learning models, particularly LSTMs, helped capture the sequential economic impact on variables such as GDP, banking activity, and ATM withdrawals over time. These AI-driven techniques offered dynamic insights that far exceeded the granularity and responsiveness of traditional economic tools.Furthermore, sentiment analysis using NLP revealed the psychological and behavioral transformation that accompanied the monetary policy. Public reactions transitioned from uncertainty to acceptance, which aligned with digital adaptation and formalization of the economy. The findings highlight that while demonetization disrupted the cash-dependent economy initially, it also catalyzed a long-term shift toward digital inclusion, transparency, and financial accountability.In conclusion, this study reaffirms that intelligent technologies not only enhance the accuracy and scope of economic analysis but also provide a real-time framework for evaluating policy outcomes. As India and other developing economies face new challenges, the application of AI, ML, and DL will be critical in guiding data-informed decisions and building resilient, digitally inclusive financial systems.

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