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Digital Financial Inclusion and Economic Growth in India: A Time Series Empirical Analysis

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Abstract: ***In recent years, Financial Technologies and digital payment systems have grown very fast, which has changed the way modern economies work. These developments have made financial services easier to access and more efficient. Digital financial inclusion has emerged as an important innovation that influences economic growth, particularly in developing countries like India, where digital payment systems are expanding quickly. The study focuses on understanding the relationship between digital financial inclusion and economic growth in India using a time-series approach. Economic growth is measured through GDP growth rate, while digital payments are taken as an indicator of digital financial inclusion. Inflation is also considered as a control variable to understand the effect of overall economic stability and digital developments. The research is based on secondary data and applies regression analysis to evaluate how the variables impact economic growth. The findings are expected to show whether digital financial systems contribute to improvements in economic performance. This research also contributes by combining different aspects of digital financial inclusion in the Indian context, and provides suggestions for policymakers to improve digital financial systems and support economic growth.***

Keywords: ***Digital Financial Inclusion, Digital Payments, FinTech, GDP Growth Rate, India, Inflation.***

I. INTRODUCTION

Modern economies have undergone major changes due to the rapid development of financial technology (FinTech) and digital payments systems. FinTech refers to the use of advanced technologies such as artificial intelligence, blockchain, cloud computing, and big data in financial services to improve accessibility and efficiency. These advancements have made financial services more widely available and have supported economic growth by encouraging innovation and improving service delivery [1].

Digital financial inclusion has become very crucial for economic development, especially in developing countries. It refers to providing financial services through digital platforms such as mobile banking, internet banking, and online payments so that all sections of society can access them at very low cost. It helps those people who are not associated with formal financial systems. Despite this, challenges such as lack of digital knowledge, income inequality, and poor infrastructure still limit its usability [2].

Digital payment systems play an important role in changing financial systems, making the transaction process safer and more transparent. Digital payments are an important driver of economic growth because they help reduce transaction costs and inspire people to participate more in economic activities, thus increasing financial inclusion [3].

Digital financial inclusion has become of particular importance in the Indian environment owing to the intensive digitalization process and governmental policies. Empirical evidence implies that the development of FinTech contributes positively to economic growth and per capita income in India, financial stability, and enhances financial inclusion and efficiency [4]. National income, digital infrastructure, and economic shocks represent influencing factors on the development of digital payment systems in India [5].

Government policies and initiatives have played an important role in expanding digital financial systems in India. These efforts have improved internet access, increased digital awareness, and made financial services more efficient. As a result, they have supported economic growth and increased transparency in the system [6].

The increasing use of digital payments has also changed the way individuals and businesses manage their transactions. New payment methods, especially in developing markets, provide faster and more convenient options by reducing dependence on traditional banking and cash systems. Research shows that digital payments not only increase financial inclusion but also directly boost economic activities by increasing liquidity and speeding up transactions [7].

The growth of digital payment systems has been closely interconnected with economic performance through enhanced financial participation and access to financial services. Surveys targeting India suggest that the development of digital payment systems like UPI is positively related to increasing GDP and is affected by income, digitalization, and financial infrastructure [8]. This brings out the role of digital payments as a major element of digital financial inclusion.

Apart from direct benefits, digital financial inclusion also helps indirectly by improving financial literacy and awareness. Systems like UPI have increased financial awareness among people, which further supports economic development [9]. Moreover, digital financial inclusion improves efficiency in financial markets and reduces the cost of transactions, allowing individuals and businesses to access financial resources easily, which increases investment and productivity [10].

Even though digital financial inclusion is becoming more important, many studies are either theoretical or compare different countries, with less focus on detailed analysis of a single country. In India, there are very few time-series studies that include important factors like digital payments and economic variables together. Therefore, this study aims to analyze the relationship between financial inclusion and economic growth in India using a time-series method, to provide a better understanding of how digital systems support economic development.

II. LITERATURE REVIEW

The development of financial technologies and digital payment systems is increasing at a very high rate, transforming the modern economy. FinTech is the use of sophisticated technologies — artificial intelligence, cloud computing, blockchain, and big data — in financial systems. It has been established that FinTech creation has contributed to the achievement of the digital economy and economic growth through improving the delivery of financial services and technological innovation [1].

Digital financial inclusion has become an important driver of economic development. Tay, Tai, and Tan [2] explain that digital financial services such as mobile banking, internet banking, and fintech platforms open access to financial services for underprivileged populations. Their literature review highlights that digital financial inclusion can help countries reduce poverty and support the Sustainable Development Goals (SDGs). The study also reveals challenges such as digital literacy gaps, income inequality, and rural-urban disparities that restrict the adoption of digital financial services in developing countries.

Sethi and Manocha [4] assessed the impact of FinTech on the Indian economy by gathering data between 2001–2020. Using a FinTech Index constructed via PCA and the ARDL model, their results indicate that the introduction of FinTech is positively related to the economy, contributing to economic growth, per capita income, and financial efficiency. However, the authors warn that the growth of digital financial services may reduce labor demand as technology eliminates some jobs.

Birigozzi, De Silva, and Luitel [3] analyzed the relationship between digital payment usage and GDP growth across many countries using panel data analysis. They found a positive correlation between the usage of digital payments and GDP growth through reduced transaction costs, greater financial inclusion, and greater economic participation. They also found behavioral factors influencing digital payment adoption, including financial literacy, trust in digital payment systems, and users' attitudes.

Dias and Perera [11] reviewed the literature systematically and studied the role of digital finance as a source of financial inclusion. Their results demonstrate that e-wallets, mobile banking applications, electronic banking, and online payment systems enhance both access and availability of financial services, particularly to marginalized populations. The study also reveals that digital financial systems have the potential to enhance economic growth by enabling businesses and individuals to access financial services more effectively.

Bhavsar and Samanta [5] examined the sustainability of digital payments in India using quarterly data from 2011 to 2021. Using the ARDL bounds testing methodology and Dynamic OLS (DOLS) methods, they showed that national income, demonetization, and economic shocks like the COVID-19 pandemic affect the growth of digital payment systems in India. They contend that the establishment of financial infrastructure is essential for the continued expansion of digital payment systems.

Rafee [6] looked at how the Digital India program affected growth and development in the economy. The study shows that programs like Bharat Net, Digital Locker, and e-governance services helped India build better digital infrastructure and deliver better services, making the internet more accessible, teaching people how to use technology, and creating new jobs.

Gomes, Lopes, and Ferreira [12] studied the period between 2000–2019 in OECD nations regarding how digital growth connects with financial progress. Using the Generalized Method of Moments (GMM) on combined national datasets, their results indicate that tech tools increase production, awaken ideas, and introduce access to knowledge, determining more robust economic performance.

Bajwa et al. [13] considered the impact of digital financial inclusion on economic growth and environmental conditions in ASEAN countries between 2005 and 2022. Using multiple methods including Two-stage Least Squares, Pooled OLS, and GMM, their results show that reliance on digital finance boosted economies because the financial tools are easily available to people. However, the article notes that nations also need to pay close attention to policy management since economic growth related to digital financial systems may generate environmental issues.

Hbata, El Bakkouchi, and Ajraoui [14] studied financial inclusion as a key driver of economic development in emerging economies. Their results show that financial inclusion encourages domestic savings, supports productive investment, and boosts economic productivity. They also highlight that the effectiveness of financial inclusion depends on several factors such as financial literacy, institutional quality, and technological infrastructure.

Zhang et al. [15] explored the role of the digital economy in growth among Belt and Road nations. They found a positive relation between the digital economy and economic development by improving industrial structure, employment opportunities, and trade patterns, and highlighted that digital technologies played an important role in minimizing the economic impact of the COVID-19 pandemic. Despite the key insights provided by global studies, from the Indian context there were limited studies which examine the relationship between digital financial inclusion and economic growth.

A. Empirical Evidence from India

Some empirical research studies have specifically focused on digital payments, financial inclusion, and economic development in India. Rooj and Sengupta [7] showed that the relationship between digital payment systems and economic growth is bidirectional, as a BVAR model demonstrated that both have a reinforcing effect on each other. Rastogi et al. [9] pointed out that UPI has an indirect effect on economic development by enhancing financial inclusion and financial literacy. D'Souza and Ghosh [8] established that UPI growth is closely associated with GDP growth and is affected by digital adoption and infrastructure. Furthermore, Kumar [10] proved that digital payments, financial inclusion, and economic growth in India have a long-run relationship using ARDL and DOLS models, underlining the significance of digital infrastructure and income levels. Angamuthu [16] found heavy expansion in digital transactions, which helps financial system transparency and efficiency, but the long-run effect on GDP is small. Most recently, Dolai [17] showed that UPI has improved financial inclusion, investment, and economic activity, and is a transformative aspect of the Indian digital economy. The current literature gives substantial conclusions about the impact of digital payments, financial technology, and financial inclusion on economic growth at both global and national dimensions. However, most studies are either conceptual or cross-country analyses, with limited country-specific time-series evidence. From the Indian context, there is an absence of comprehensive analysis integrating diverse indicators of digital financial inclusion such as banking access, internet penetration, and digital transactions. Thus, this study seeks to address this gap by empirically examining the relationship between digital financial inclusion and economic growth in India using a time-series empirical approach.

III. OBJECTIVES OF THE STUDY

The goal of the study was to use time-series data to examine how digital payments — as a sign of digital financial inclusion — affect India's economic growth. To analyze the impact of internet penetration and inflation as control variables on India's GDP growth rate.

IV. SCOPE OF THE STUDY

This paper looks at how digital financial inclusion is connected to economic growth in India. It uses historical information to see how digital payments affect the rate at which the economy grows, taking into account internet access and the rate of inflation. The study focuses on parts of digital financial inclusion but does not look at everything, such as financial literacy or how institutions work. The study uses existing secondary data covering a specific period of time. It is hoped that findings from this study will help policymakers find ways to improve financial inclusion and make the economy in India grow in a sustainable manner.

V. THEORETICAL FRAMEWORK

The theoretical construct employed for this study is the correlation between digital financial inclusion and economic growth. The theory of financial inclusion holds that the availability of financial services to individuals and organizations increases the capacity of both entities to participate in economic activities. Hence, savings, investment, and productivity are promoted by having financial services readily available to citizens. As technology advances, digital financial inclusion extends traditional financial inclusion by making the financial service system available through digital technology, reducing transaction costs, and improving efficiency.

Based on financial intermediation theory, efficient financial systems are able to distribute resources effectively through productive investment. The process of saving becomes easier due to faster, safer, and cheaper transactions. Moreover, digital payment systems improve the liquidity of money and reduce frictions in financial markets, thus positively affecting economic growth through increased use of online payments. Moreover, inflation is considered as a factor to understand economic stability. Economic theory says that inflation affects how much people can buy, how much they spend, and how much they invest, which in turn affects economic growth. When inflation is stable, it usually signals healthy times for the economy, but high inflation can hurt growth by making the future uncertain.

Accordingly, this study assumes that digital financial inclusion — measured by digital payments — has a significant impact on India's economic growth. The study examines GDP growth rate as the dependent variable, and uses digital payments, internet use, and inflation to understand the relationship. The growth of payments and internet use, along with stable inflation, can help the economy grow. Digital financial inclusion helps people and businesses access financial services easily, which can boost economic growth in India.

VI. DATA AND METHODOLOGY

A. Data Source

The study is based on secondary time-series data acquired from credible and publicly available sources. The World Bank database was used to obtain information on GDP growth rate, inflation rate, and the number of commercial bank branches per 100,000 adults. Data on digital payments was sourced from the Reserve Bank of India (RBI) Database on Indian Economy. Logarithmic transformation of digital payments was applied to enhance the consistency of data and reduce variability. Any missing data was supplemented using the Federal Reserve Bank of St. Louis (FRED) database to ensure data continuity.

B. Variable Description

In this study, there is one dependent variable, two independent variables, and one control variable, as follows:

1) Dependent Variable: Economic growth, measured using GDP Growth Rate — a general measure of economic performance.
2) Independent Variables: (i) Log of Digital Payments — representing digital financial inclusion and the degree of computerized transactions in the economy. (ii) Commercial Bank Branches (per 100,000 adults) — as a proxy of financial inclusion, implying the availability of formal banking services.
3) Control Variable: Inflation (CPI) — representing economic stability and how macroeconomic conditions affect economic performance.

C. Model Specification

This model assists in estimating the influence of both digital and traditional financial inclusion, along with control variables, on economic growth in India.

$$GDPt = \beta 0 + \beta 1\ ln(DPt) + \beta 2\ BBt + \beta 3\ INFt + \varepsilon t$$

Where: GDPt = GDP Growth Rate; ln(DPt) = Log of Digital Payments; BBt = Commercial Bank Branches; INFt = Inflation; β0 = Intercept; β1, β2, β3 = Coefficients; εt = Error term.

This model allows estimating the effect of digital and traditional financial inclusion, as well as control variables, on the growth of the Indian economy.

[Fig. 1: Conceptual Framework — Placeholder]

Fig. 1 Conceptual framework showing the relationship between financial inclusion, digital payments, and GDP growth rate, with inflation as a control variable.

D. Econometric Techniques

The study uses time-series econometric research methods to examine the connection between digital financial inclusion and economic growth. The first step involves summarizing the characteristics of the data by means of descriptive statistics, followed by correlation analysis between variables. Additionally, multiple linear regression analysis is carried out to approximate the effect of the log of digital payments, commercial bank branches, and inflation on the GDP growth rate. Logarithmic transformation is used to stabilize variance and enhance results interpretability. Proper statistical tests are applied to ascertain the reliability and validity of the model.

VII. EMPIRICAL RESULTS AND DISCUSSION

A. Model Summary

TABLE I MODEL SUMMARY

Model	R	R^2	Adjusted R^2	Std. Error	Durbin-Watson
1	0.753	0.567	0.351	3.6	2.068

Source: Author's Calculation using SPSS

The R-squared value of 0.567 indicates that approximately 56.7 percent of the variation in the GDP growth rate is explained by the independent variables. The Adjusted R-squared of 0.351 signifies the model's capacity to explain the information when the number of predictors is adjusted. The Durbin-Watson value of 2.068 is near the ideal value of 2.00, indicating no significant autocorrelation in the model.

B. ANOVA

TABLE II ANOVA

Source	Sum of Squares	df	Mean Square	F-value	P-value
Regression	101.972	3	33.991	2.622	0.145
Residual	77.788	6	12.965	—	—
Total	179.760	9	—	—	—

Source: Author's Calculation using SPSS

The ANOVA results show that the general form of the regression is not statistically significant at the 5% level, with the p-value of 0.145 being greater than 0.05. Nevertheless, the model represents an improvement over previous specifications, indicating that the elimination of highly correlated variables has improved model performance.

C. Regression Results

TABLE III REGRESSION RESULTS

Variable	Coefficient (B)	Std. Error	T-Value	P-Value
Constant	-37.040	67.039	-0.553	0.601
Inflation	-1.556	1.096	-1.421	0.205
Log Digital Payment	29.338	12.485	2.350	0.057
Bank Branches	-13.292	5.371	-2.475	0.048

Source: Author's Calculation using SPSS

The regression results show that the log of digital payments has a positive coefficient ($\beta = 29.338$) and is significant at the 10% level ($p = 0.057$), implying that the use of digital payments has a positive effect on economic growth.
The commercial bank branches coefficient is negative ($\beta = -13.292$) and significant at the 5% level ($p = 0.048$), showing that traditional banking expansion does not affect economic growth positively in the short term, possibly as a result of structural changes to the digital financial system.
The coefficient of inflation is negative ($\beta = -1.556$) and not statistically significant ($p = 0.205$), indicating no significant effect of inflation on economic growth during the study period.

VIII. DISCUSSION

The findings of the empirical analysis present significant information on the correlation between digital financial inclusion and economic growth in India. The positive effect of digital payments on economic growth — though significant only at the 10% level — implies that digital financial inclusion is slowly becoming a major driver of economic operations, even though its full effects are not yet fully felt within the limited study period. The increasing use of digital payment systems, especially over the last few years, indicates high efficiency, lower transaction costs, and improved financial accessibility, which are bound to have a positive impact on economic growth in the long run.

With the advancement of financial systems, a negative correlation between commercial bank branches and economic growth was observed. In the past, development of banking facilities has been connected to improved financial inclusion and economic growth. The change in banking from traditional to digital services may explain the negative sign in the research — particularly in cities and semi-urban regions where the use of physical banking infrastructure is being reduced due to increasing adoption of digital platforms. The negative, yet insignificant, impact of inflation on the economic growth rate indicates a minor role played by macroeconomic stability during the period under consideration. This may suggest that the stability of inflation rates, or other structural and technological factors such as the information revolution, play a greater role in economic growth.

The overarching conclusions from this research are consistent with the existing literature, which shows a positive correlation between expanding access to financial services and creating greater economic efficiency through digital technology. The near-significant value between digital payments and economic development also shows that digital financial inclusion is at a transitional stage in India. As digital infrastructure continues to advance and financial literacy rises, the role of digital financial systems in economic growth is likely to enhance.

IX. POLICY IMPLICATIONS

A. *Expanding Digital Payment Infrastructure*

The positive impact of digital payments on economic growth demonstrates the need to extend digital payment systems. Governments and stakeholders should support platforms such as UPI, mobile wallets, and online banking to enhance the efficiency of the economy by making transactions seamless, secure, fast, and widely accessible.

B. *Enhancing Digital Literacy*

Many people lack access to digital finance due to low levels of digital literacy, especially in rural areas. The government and financial institutions must provide resources — including training and awareness campaigns — that promote the benefits of digital payment systems and build user confidence.

C. *Internet and Digital Infrastructure Development*

Although internet penetration was not included in the final model, it remains an important component of digital financial inclusion. Policymakers should invest in high-speed internet infrastructure to improve connectivity, enabling consumers to use digital payments and participate more widely in the economy.

D. *Promoting Financial Technology Innovation*

The government should provide an enabling regulatory framework for start-ups working in the financial technology environment. Implementation of new technologies such as artificial intelligence, blockchain, and big data will increase both the efficiency and accessibility of financial services, thus creating greater opportunities for economic growth.

E. *Strengthening Traditional Banking Productivity*

The negative correlation between commercial bank branches and economic development implies that traditional banking infrastructure may not be as efficient in the new digital age. Policymakers should aim to enhance the quality of service delivery in traditional banks and encourage their digitalization to minimize operational inefficiencies.

F. *Enhancing Regulatory Framework and Security*

With the growing number of digital financial services, security and trust are paramount. Policymakers should enhance cybersecurity networks, data protection laws, and fraud prevention standards to protect users and build confidence in online financial systems.

X. CONCLUSION

This article analyzed the relationship between economic growth in India and digital financial inclusion using an empirical time-series model. Including variables such as digital payments, commercial bank branches, and inflation allowed the study to examine both traditional and digital components of financial inclusion and their impact on GDP. Empirical findings indicate that digital payments have a positive and near-significant effect on economic growth, indicating that digital financial inclusion is developing into a significant contributor to economic activity in India. Digital technologies are changing how people access financial services, reducing the cost of financial transactions, and improving efficiencies in the financial system.

Commercial bank branches exhibit a negative and statistically significant relationship with economic growth, suggesting that traditional banking infrastructure may not contribute positively toward short-term economic growth compared to rapidly growing digital financial services. This reflects a shift in the Indian financial system from traditional to digital intermediation.

The impact of inflation on economic growth is negative yet not statistically significant, suggesting that macroeconomic stability as measured by inflation is not the leading determinant of economic growth during the study period, possibly due to relatively stable inflation rates or the rising significance of structural and technological variations in economic performance.

In general, the research shows that digital financial inclusion is an increasingly important aspect of economic development in India, but its effects are yet to be fully realized. The study is limited by a relatively small sample size and time frame. Future researchers can enhance this study with a longer time-series sample, inclusion of variables like financial literacy and institutional quality, and the application of enhanced econometric methods to derive richer and more robust findings.

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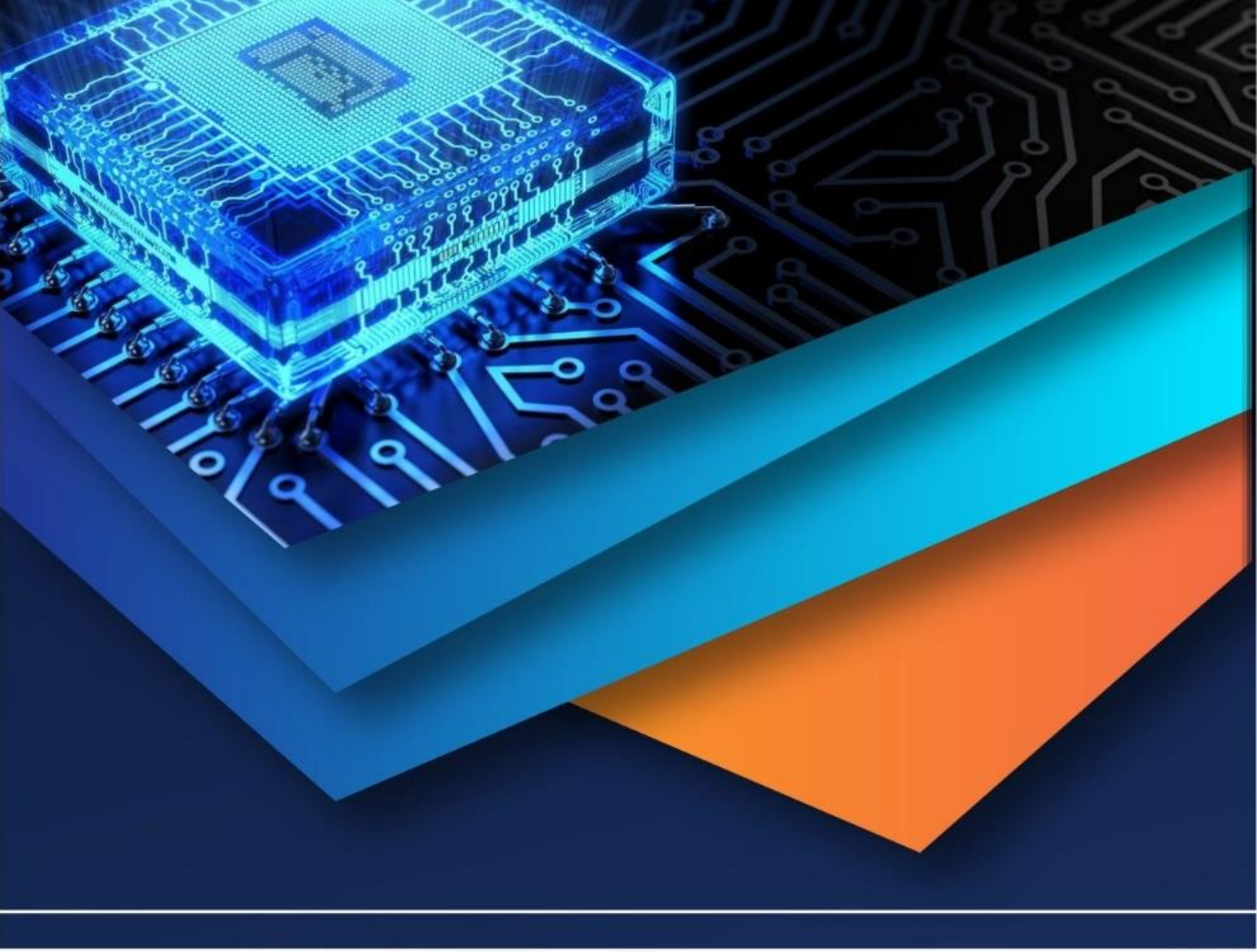

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