iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** IV **Month of publication:** April 2026

DOI: https://doi.org/10.22214/ijraset.2026.80281

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue IV Apr 2026- Available at www.ijraset.com

Fake News Detection on Social Media Using NLP

Prof. Pallavi. A. Pathare[1], Miss. Kale Siddhi Dnyaneshawai[2], Miss. Warunkshe Prerana Vilas[3], Miss. Gholap Aarya Mangesh[4], Miss. Gaidhani Sakshi Devidas[5]
[1, 2, 3, 4, 5]*Department of Computer Engineering, Sir Visvesvaraya Institute Of Technology, Nashik*

Abstract: ***Most of the smart phone users prefer to read the news via social media over internet. The news websites are publishing the news and provide the source of authentication. The question is how to authenticate the news and articles which are circulated among social media like WhatsApp groups, Facebook Pages, Twitter and other micro blogs & social networking sites. It is harmful for the society to believe on the rumors and pretend to be a news. The need of an hour is to stop the rumors especially in the developing countries like India, and focus on the correct, authenticated news articles. This paper demonstrates a model and the methodology for fake news detection. With the help of Machine learning and natural language processing, it is tried to aggregate the news and later determine whether the news is real or fake using Support Vector Machine. The results of the proposed model is compared with existing models. The proposed model is working well and defining the correctness of results up to 93.6% of accuracy.***

Key Words: Fake News Detection, NLP, Machine Learning, BERT, LSTM, Text Classification.

I. INTRODUCTION

In Today's world, anybody can post the content over the internet. Unfortunately, counterfeit news gathers a lot of consideration over the web, particularly via web-based networking media. Individuals get misdirected and don't reconsider before flowing such mis-educational pieces to the most distant part of the arrangement. Such type of activities are not good for the society where some rumors or vague news evaporates the negative thought among the people or specific category of people[1]. As fast the technology is moving, on the same pace the preventive measures are required to deal with such activities. Broad communications assuming a gigantic job in impacting the general public and as it is normal, a few people attempt to exploit it. There are numerous sites which give false data. They deliberately attempt to bring out purposeful publicity, deceptions and falsehood under the pretense of being true news. Their basic role is to control the data that can cause open to have confidence in it. There are loads of case of such sites everywhere throughout the world. Therefore, counterfeit news influences the brains of the individuals. As indicated by study Scientist accept that numerous man-made brainpower calculations can help in uncovering the bogus news. Fake news detection is made to stop the rumors that are being spread through the various platforms whether it be social media or messaging platforms, this is done to stop spreading fake news which leads to activities like mob lynching, this has been a great reason motivating us to work on this project. We have been continuously seeing various news of mob lynching that leads to the murder of an individual; fake news detection works on the objective of detecting this fake news and stopping activities like this thereby protecting the society from these unwanted acts of violence.[1][3][5] The main objective is to detect the fake news, which is a classic text classification problem with a straight forward proposition. It is needed to build a model that can differentiate between “Real” news and “Fake” news. This leads to consequences in social networking sites like 2 Facebook, Instagram, microblogging sites like Twitter and instant messaging applications like WhatsApp, Hike where these fake news gets a major boost and gets viral among people, around the country and globe.[2] The proposed system helps to find the authenticity of the news. If the news is not real, then the user is suggested with the relevant news article.

II. ASCLEPIUS SYSTEM ARCHITECTURE AND METHODOLOGYETL

Early studies on fake news detection mainly relied on linguistic and statistical methods. Pérez-Rosas et al. (2018) introduced a dataset of news articles labeled as fake or real and applied traditional classifiers such as SVM and Logistic Regression with TF-IDF features. Their approach achieved around 85% accuracy. Fake news detection has gained immense attention in recent years as misinformation poses a threat to democracy, journalism, and social stability. Numerous studies have explored various computational approaches—ranging from traditional machine learning methods to advanced deep learning architectures—to identify and mitigate the spread of fake news. Pérez-Rosas et al. (2018) created one of the first publicly available fake news datasets consisting of manually verified news articles. They applied Support Vector Machines (SVM), Naïve Bayes, and Logistic Regression using TFIDF and n-gram features to classify fake and real news. Their findings demonstrated that linguistic cues such as deception.

Rubin et al. (2016) investigated fake news from a journalistic perspective and proposed a framework to categorize news as serious fabrication, large-scale hoax, and satire. They used content-based features and source credibility measures for detection, highlighting the need for both textual and contextual analysis. Rucha sky et al. (2017) introduced the CSI model (Capture, Score, Integrate), which integrates three components: content based text representation, user engagement patterns, and temporal characteristics of news dissemination. This hybrid deep learning approach using Recurrent Neural Networks (RNNs) and Fully Connected Layers achieved significantly higher accuracy compared to standalone textual models. Other studies, such as Wang (2017), introduced the LIAR dataset, containing short statements from politicians and fact checking websites like PolitiFact. Using logistic regression, CNNs, and LSTMs, they demonstrated that metadata features (speaker identity, party affiliation, context) combined with text improve accuracy. While traditional ML models offer interpretability and efficiency on smaller datasets, deep learning and transformer models significantly outperform them on large, unstructured data. However, they also introduce challenges related to data imbalance, domain adaptation, and explainability, which are currently major research directions.

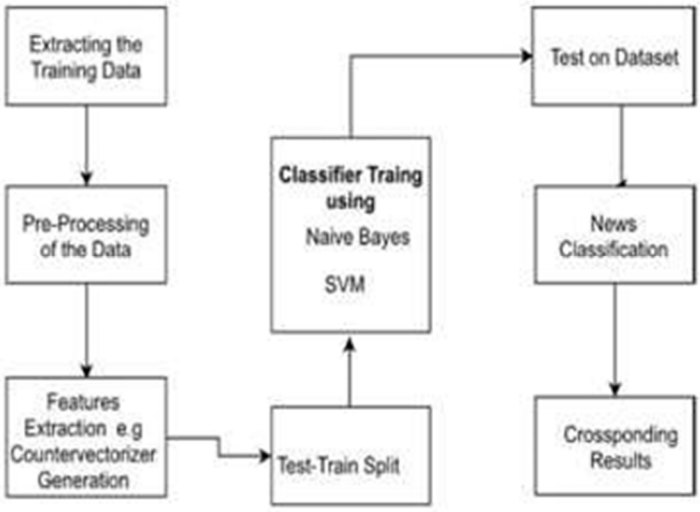

Fig -1: Proposed System Architecture

The methodology also incorporates a rigorous testing and validation cycle. This involves functional testing, integration testing, and performance testing to ensure the system is reliable under various conditions. Once validated, the system is deployed on a secure server with continuous monitoring to handle updates and potential scalability challenges.

III. CONCLUSIONS

In today's digital age, the spread of misinformation through fake news has become one of the most critical challenges for online platforms and society as a whole. This research focused on developing and analyzing fake news detection techniques using Natural Language Processing (NLP) and Machine Learning (ML) models. The study demonstrated that traditional machine learning algorithms such as Support Vector Machine (SVM) and Random Forest are limited in understanding deeper linguistic patterns and contextual meanings present in complex sentences. Deep learning approaches like LSTM and transformerbased models such as BERT have shown significant improvements in detection accuracy. The BERT model, in particular, achieved the best results due to its ability to understand the contextual relationships between words through its bidirectional attention mechanism. The experimental findings confirm that integrating NLP with advanced deep learning techniques provides an effective solution for identifying and filtering fake news across multiple domains and sources. The implementation of such systems can benefit media organizations, fact-checking agencies, and social media platforms by automatically detecting misleading or fabricated content before it spreads widely. Moreover, the model can be integrated into real-time web applications or browser extensions to help users verify the authenticity of news articles instantly. For future work, several directions can be explored. One area involves using cross-domain transfer learning, allowing the model trained on one type of dataset (e.g., political news) to perform effectively on others (e.g., health or finance). Another promising direction is combining textual and visual analysis, where images and videos accompanying news articles are also verified.

Additionally, incorporating explainable AI (XAI) methods will make fake news detection systems more transparent and trustworthy, helping users understand why a particular article was classified as fake or real. Overall, this study highlights that a well-designed NLP and deep learning–based model can play a vital role in reducing misinformation, promoting digital media literacy, and building a more informed and trustworthy online environment.

IV. RESULTS

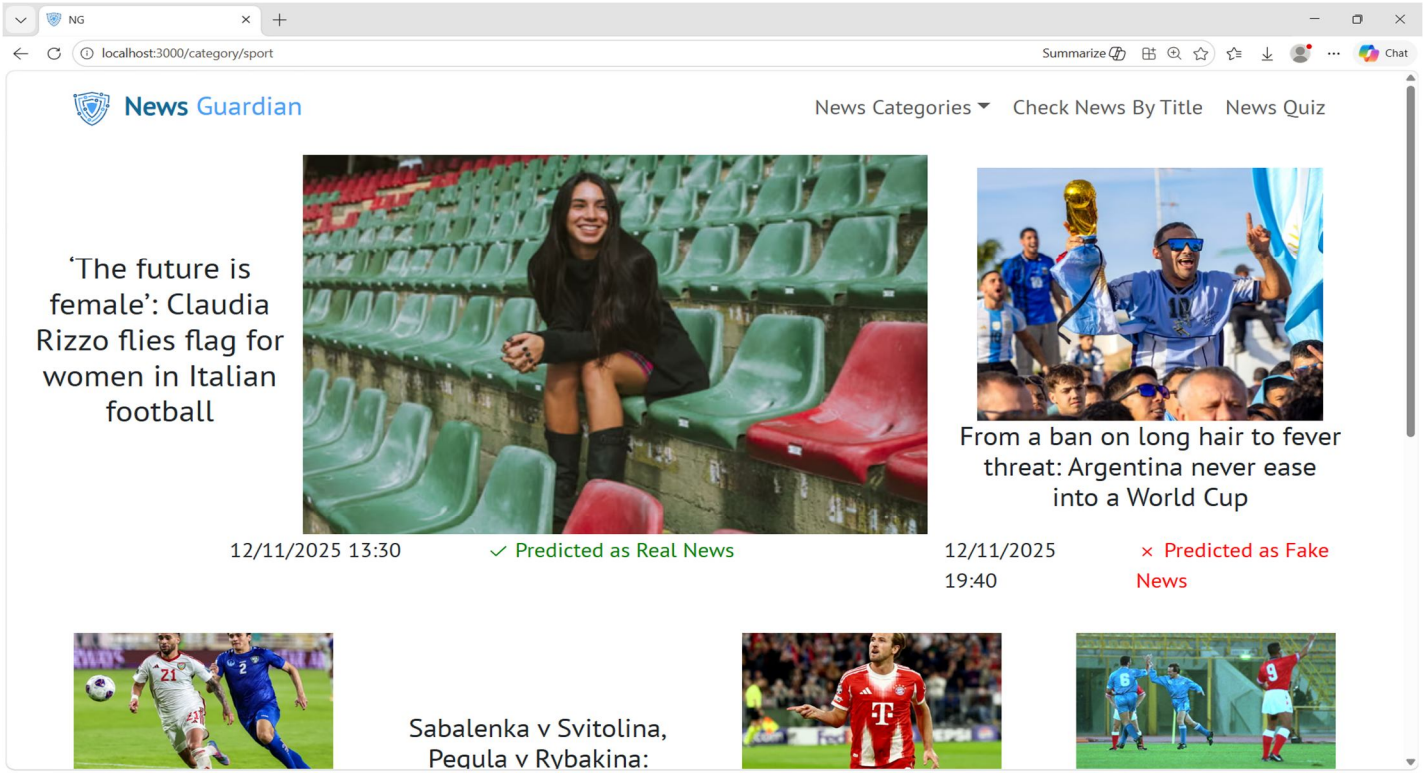

Fig1.Home Page

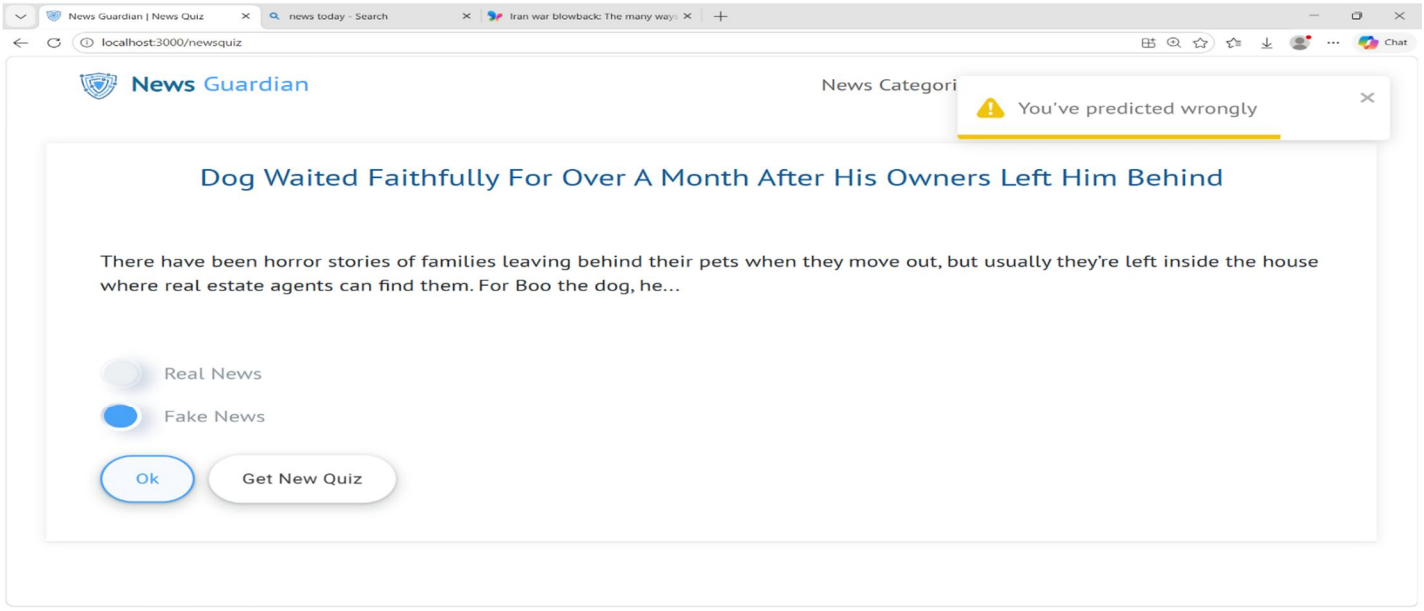

Fig2.Quiz Interface

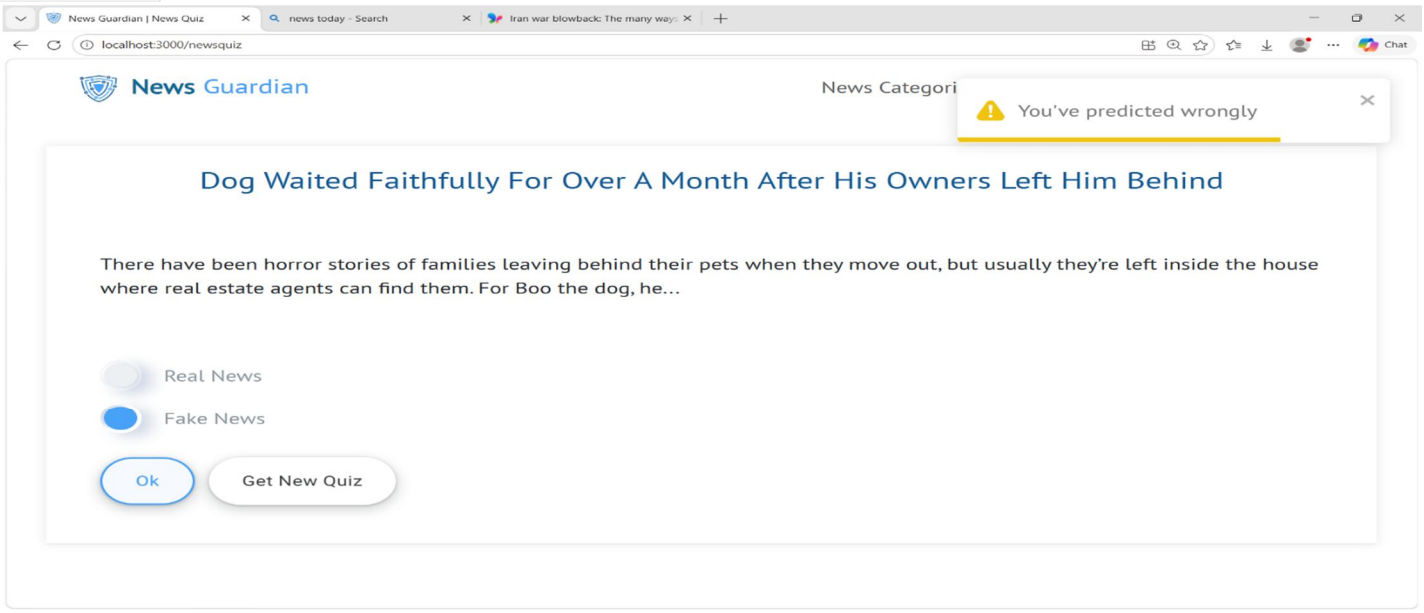

Fig3.Real News Prediction

V. ACKNOWLEDGEMENT

The experiments in this research utilized publicly available datasets, including LIAR and FakeNewsNet, which contain labeled instances of genuine and fake news collected from trusted platforms such as Politifact and Kaggle. The dataset was split into training and testing sets using an 80:20 ratio to ensure proper evaluation of model performance. A range of machine learning and deep learning techniques were applied, including Logistic Regression, Support Vector Machine (SVM), Random Forest, LSTM, and BERT. Traditional machine learning approaches showed satisfactory performance when trained on textual features derived from TF-IDF and word frequency methods. Among these, the SVM model delivered the highest accuracy of about 88%, largely due to its effectiveness in handling high-dimensional data. The Random Forest model achieved approximately 85% accuracy but was slightly affected by noisy text inputs. However, these conventional models lacked the ability to fully capture contextual and semantic relationships within the text. To address this limitation, advanced deep learning and transformer-based models were employed. The LSTM model, trained using word embeddings, improved performance to around 91% accuracy by capturing sequential dependencies and sentence-level patterns. The BERT model achieved the best results, with an accuracy of nearly 95–96%, due to its bidirectional attention mechanism that enables a deeper understanding of context and word relationships. This makes it highly suitable for complex tasks such as fake news classification.

Performance evaluation was carried out using precision, recall, and F1-score to ensure balanced classification between fake and real news. Additional tools such as confusion matrices and ROC curves were used to analyze the results, showing that deep learning models significantly reduced false positives compared to traditional methods. The findings suggest that transformer-based models not only enhance accuracy but also provide better generalization on unseen data. In summary, while traditional models like SVM and Random Forest offer faster and more interpretable results, deep learning approaches—especially BERT— demonstrate superior accuracy and robustness. Therefore, BERT-based models can be considered the most effective solution for real-world fake news detection tasks.

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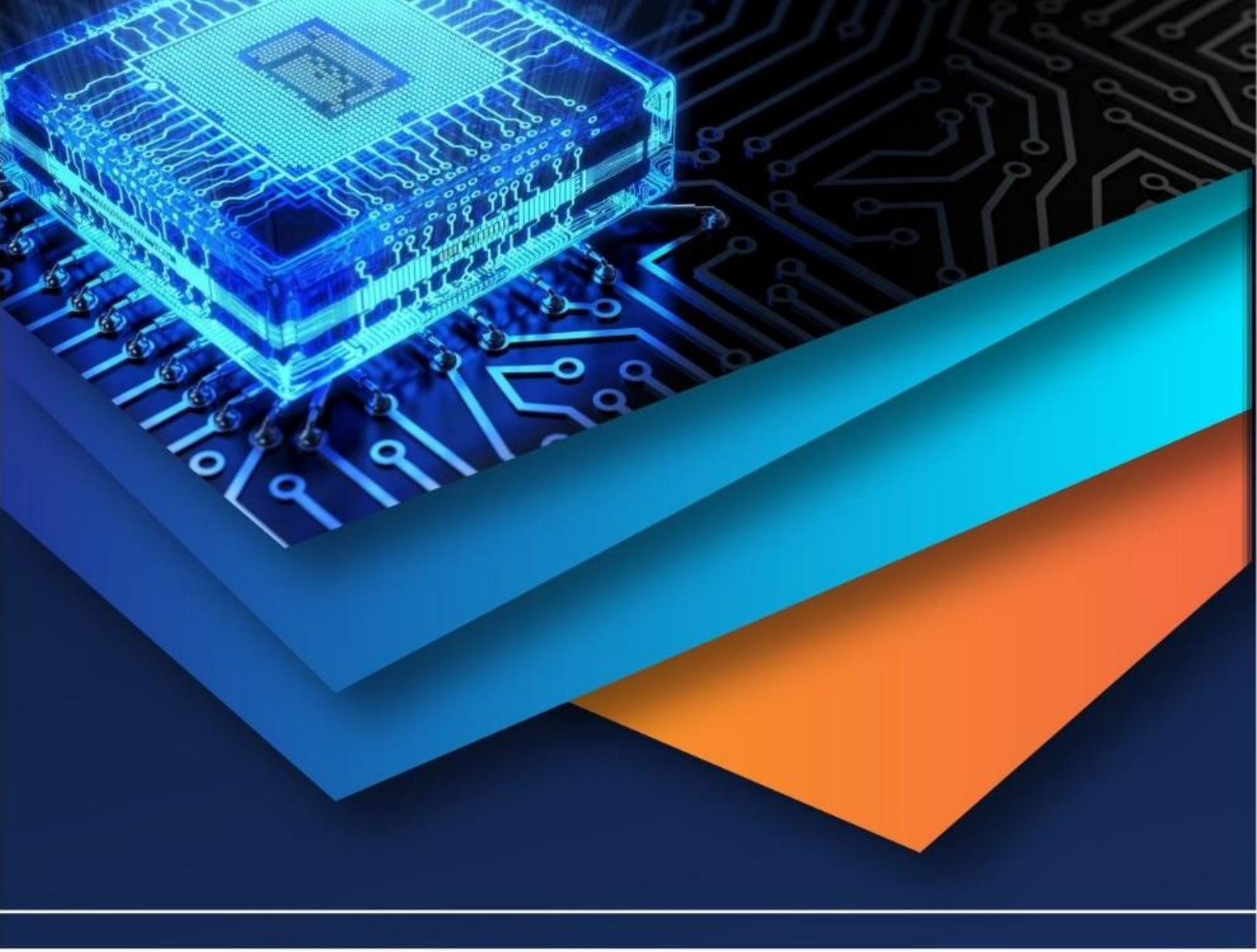

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