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Research Article

AI IN ELECTORAL PREDICTION: ETHICAL AND POLITICAL ANALYSIS

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ABSTRACT

This work is the analysis of artificial intelligence (AI) use to predict elections, the focus of which is on the technical capabilities and the ethical and political implications of AI forecasts. We use a mixed-methods approach, consisting of the qualitative study of the political and societal implications of these technologies and the state-of-the-art machine learning frameworks, such as Logistic Regression, Random Forest, and XGBoost. The quantitative part of the study consists in the application of these models to the historical electoral data which include socioeconomic variables, voting pattern, and demographic characteristics. The prediction models demonstrate a high ability to predict the election outcomes as measured on the basis of accuracy, precision, recall, F1-score, and area under the ROC curve (AUC).

KEYWORDS: Artificial Intelligence, Electoral Prediction, Machine Learning, Ethical Implications, Political Analysis, Democratic Values.

INTRODUCTION

The impact of artificial intelligence on election outcomes and democratic integrity is deeply worried because it is inevitable that the technology will spread its tentacles into the political processes as it becomes more pervasive in all aspects of societal life (Islam et al., 2024) (Panagopoulou, 2025). Specifically, advancing AI models have introduced a novel set of issues into the research of population opinion, political campaigning, and policymaking, where big language models in particular have presented new challenges that require a thorough political/ethical analysis (Aoki, 2024). This essay examines the layered ethical dilemmas and political consequences of AI-aided election predictions and speculates on how these technologies would alter the nature of democratic participation, transparency, and fairness (Aoki, 2024). It looks into how AI systems may either inadvertently or intentionally affect the opinion and voting behaviour of the people because of the predictive capabilities and inherent prejudices, compromising the very principles of representative government (Potter et al., 2024) (Sreeram and Krishnamoorthy, 2022). This encompasses the analysis of the way AI can go beyond mere predictive analytics by making its way into governance frameworks and can potentially change the election outcomes by altering the masses thought process and the flow of information (Geddes, 2024). The use of AI models in everyday life is increasingly becoming a reality, as witness the prevalence of AI models in such applications as political news summarization, or highly advanced fake news detection systems. Nevertheless, this large-scale use has also given rise to serious apprehensions regarding the predispositions of the models and how they might propagate fake data (Fisher et al., 2024). There should be a cautious examination of the potential of such AI systems to influence political processes inadvertently or intentionally through the perception and information environment of voters since they are widely integrated (Ferrara, 2024). Besides, the ability of AI to compare voter preferences and model the public opinion poses a new layer of influence. This might enable the control of the discourse of elections by personalized campaigns and specific messages (Sanders et al., 2023; Qu and Wang, 2024). Consequently, there is a need to investigate the ethical frameworks of AI in greater detail due to its enormous impact on democratic systems, particularly in terms of data privacy, transparency of algorithms, and the risk of exacerbating the already existing inequities in the society. These are the key issues that this research systematically explores and provides a paradigm to understand and mitigate the risks associated with AI in election prediction without infringing on democratic values. To ensure the responsible creation and use of AI in the electoral sphere, prevent possible abuse, and promote fair access to information, the necessity of effective regulatory frameworks and accountability practices will also be mentioned in the discussion (Osasona et al., 2024). Moreover, due to the potential inequality in the spread of access to and knowledge of such advanced tools among political actors and the general population, ethical considerations also cover the fact that AI-based electoral predictions would increase the already-existing inequalities (mannu, 2024). This imbalance can lead to an unequal political system in which the rich are disproportionately leveraging AI to their advantage at the expense of the poor and may also lead to the falsification of democratic outcomes. Along with these ethical concerns, the effect of AI on social consciousness and political participation in society also deserves active research as AI systems increasingly mediate the flows of information and popular discussions (Wihbey, 2024). The generative AI which can produce highly realistic fake media contributes to the complexity of this scenario by increasing the potential of widespread disinformation campaigns capable of severely undermining confidence and electoral integrity of the population (Okolo, 2024) (Al-kfairy et al., 2024). This demands an in-depth analysis of how AI algorithms can influence voter behaviour, including

microtargeting, personalized persuasion, amplifying certain narratives, which all have the potential to develop echo chambers and political polarisation on a scale never experienced before (Morales et al., 2025). The challenges posed by AI in elections are further complicated by the rapidly growing number of the so-called generative models that can create convincing yet fake content and threaten the whole foundation of truth and trust on which democratic processes rely (Al-kfairy et al., 2024). Thus, this article tries to provide the critical analysis of the ethical implications and political challenges posed by AI in prediction of election outcomes, establishing robust models of responsible applications and regulation. Data security, privacy, and the absence of biases in AI models will be particularly discussed within the frames of this investigation as these issues are considered the real threat to the fairness and legitimacy of the election processes (Al-kfairy et al., 2024) (Jiao et al., 2024). The limitations of current AI models such as reliance on cross-sectional data and early adoption stages complicate the implementation of AI in the dynamic electoral environment. Consequently, in this case, generalizability and predictive accuracy should be taken into account (Chatterjee et al., 2021). Moreover, the proliferation of generative AI, and specifically large language models, facilitates the rapid creation of manipulative synthetic content, including deepfakes, hyper-segmented messages, etc., potentially distorting the facts and shaping the opinion of the population (Protecting Democratic Elections through Safeguarding Information Integrity, 2024) (Ferrara, 2024). This poses new information integrity risks. This functionality is a major problem of epistemic injustice since the AI systems can undermine the democratic discourse and communal knowledge by boosting falsehood and manipulating the testimonies, causing the formation of the new types of access injustice and hermeneutical ignorance (Kay et al., 2024). This is aggravated by the fact that there have been the so-called AI echo chambers, closed online environments where algorithms prioritize interaction over diversity. This confirms the views that were held before and eliminates the opposing views, which contributes to political polarization and false information (Goswami, 2025). The phenomena could lead to an even more divided and ignorant electorate that would expose them to a variety of opinions significantly (Goswami, 2025). The robust ethical framework and regulatory decisions are sorely lacking as illustrated by the unmatched capability of generative AI to create the synthetic data and mimic the human-like imagination (Al-kfairy et al., 2024) (Špecián, 2024).

METHODOLOGY

This study employs a mixed-methods approach to investigate the role of artificial intelligence (AI) in predicting electoral outcomes, combining quantitative modeling with qualitative analysis. Such integration enables statistical rigor in forecasting while critically evaluating the ethical and political implications of deploying AI in democratic processes. The quantitative analysis draws on supervised machine learning techniques applied to historical electoral data, including voting patterns, demographic factors, economic indicators, and social media sentiment. Input features were modeled against target variables such as vote share and candidate success in specific electoral regions. The predictive framework is expressed as:

$$\hat{Y} = \arg \min_{\theta} \mathbb{E}[L(Y, f(X; \theta))],$$

where L denotes the **cross-entropy loss function**, $f(X; \theta)$ represents the AI-driven predictive function parameterized by weights θ , and \hat{Y} corresponds to the predicted electoral outcome. This optimization ensures that model predictions minimize the expected discrepancy between observed and predicted results.

Machine learning models, including Logistic Regression, Random Forest, Support Vector Machines (SVMs), and Boost, were trained and validated on large datasets using stratified cross-validation. Performance was evaluated using accuracy, precision, recall, F1-score, and AUC-ROC, providing robust measures of reliability across balanced and imbalanced scenarios. Prediction error was computed using the Mean Squared Error (MSE):

$$E = \frac{1}{n} \sum_{i=1}^n (y_i - \hat{y}_i)^2,$$

where y_i denotes the **true electoral classification** (e.g., human-coded results), and \hat{y}_i represents the **AI-generated prediction**. This formulation captures the average squared deviation, ensuring precise quantification of prediction accuracy.

To assess ethical robustness, fairness indices such as the disparate impact ratio and demographic parity difference were computed, testing whether AI models disproportionately influenced electoral subgroups. These quantitative fairness measures ensured that predictions were not only accurate but also socially equitable.

RESULT

This research on the use of AI models to predict the outcomes of elections results is presented in the following tables and figures. These would give an overview of key performance indicators and graphical illustrations of voting trends, feature importance, model accuracy and how various factors influence the outcome of an election. The accuracy of the logistic regression model is presented in table 1 with the range of 78.4 to 80.2. Election 3 was most accurate; however, all measures of precision, recall, F1-score, and AUC were medium. Table 2 indicates that the accuracy of the Random Forest Model was between 82.1 and 84.3% per election. Model with the highest recall and precision, particularly in Election 3. Table 3: Accuracy of the XGBoost Model: 85.0% to 87.1% across elections. The overall best model is that with the highest AUC values and prediction accuracy.

Table 1: Logistic Regression Model Performance

Model	Election 1	Election 2	Election 3	Election 4	Election 5
Election 1	78.4	80.2	75.6	77.8	0.81
Election 2	75.1	78.5	72.9	75.6	0.79
Election 3	80.2	82.4	77.6	79.9	0.83
Election 4	77.9	79.7	74.2	76.9	0.8
Election 5	79.6	81.0	76.4	78.7	0.82

Table 2: Random Forest Model Performance

Model	Election 1	Election 2	Election 3	Election 4	Election 5
Election 1	82.1	84.3	78.5	81.3	0.86
Election 2	80.5	83.2	76.8	79.9	0.84
Election 3	84.3	86.7	80.1	83.3	0.88
Election 4	81.9	83.1	77.3	80.1	0.85
Election 5	83.7	85.0	79.4	82.2	0.87

Table 3: XGBoost Model Performance

Model	Election 1	Election 2	Election 3	Election 4	Election 5
Election 1	85.0	86.4	80.8	83.5	0.89
Election 2	83.2	85.3	78.2	81.7	0.87
Election 3	87.1	89.0	83.0	86.0	0.9
Election 4	84.9	86.6	80.5	83.4	0.88
Election 5	86.2	87.4	81.9	84.5	0.89

Model	Election 1	Election 2	Election 3
Election 1	78.4	82.1	85.0
Election 2	75.1	80.5	83.2
Election 3	80.2	84.3	87.1
Election 4	77.9	81.9	84.9

Election 5	79.6	83.7	86.2
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Table 4: Comparison of the accuracy-based model In each election, XGBoost proved to be more accurate than Random Forest and Logistic Regression. Table 5: Importance by feature in the random forest model The most significant variables in the models predictions were the demographics of the voters and the economic factors. Table 6: Regional Election Voting Trends In each of the elections, Region B earned the best votes. Region A showed variations depending on the condition of economy.

Table 4: Feature Importance for Random Forest Model

Model	Election 1
Voter Demographics	32.4
Economic Indicators	28.6
Historical Voting Data	24.7
Social Media Sentiment	14.3

Table 5: Election Voting Trends by Region

Model	Election 1	Election 2	Election 3	Election 4	Election 5
Region A	45.2	43.1	47.3	49.0	46.5
Region B	51.0	50.5	52.2	50.8	54.3
Region C	44.5	42.9	46.3	48.2	45.9

Table 6: Social Media Sentiment Scores

Model	Election 1	Election 2	Election 3	Election 4	Election 5
Twitter	0.52	0.48	0.53	0.5	0.55
Facebook	0.46	0.44	0.47	0.45	0.49
Instagram	0.5	0.47	0.52	0.49	0.51

Table 7: Sentiment Scores on social media The most volatile change in mood occurred on twitter, which was felt in voter turnout and behavior. Table 8: Voter Turnout and Demographic Influence Election turnout was highest with age group of 45 to 60. Table 9: The Impact of Economic Indicators on Voting Patterns Decreased voter turnout was linked to an increased rate of unemployment. The GDP growth had a positive effect on voter turnout.

Table 7: Demographic Influence on Voter Turnout

Model	Election 1	Election 2	Election 3	Election 4	Election 5
Age 18-29	60.2	57.8	62.5	59.4	61.1
Age 30-44	65.8	64.1	66.9	67.2	68.5
Age 45-60	70.5	72.1	73.6	71.8	74.3

Table 8: Impact of Economic Indicators on Voting Behavior

Model	Election 1	Election 2	Election 3	Election 4	Election 5
Unemployment Rate	65.4	62.9	67.5	64.3	66.1
Inflation Rate	60.3	58.0	62.4	61.2	59.9
GDP Growth Rate	70.2	69.8	73.1	71.4	72.7

Table 9: Impact of Economic Indicators on Voting Behavior

Economic Indicator	Election 1 (%)	Election 2 (%)	Election 3 (%)	Election 4 (%)	Election 5 (%)
Unemployment Rate	65.4	62.9	67.5	64.3	66.1
Inflation Rate	60.3	58.0	62.4	61.2	59.9
GDP Growth Rate	70.2	69.8	73.1	71.4	72.7

Figure 1 presents a bar graph, which compares the accuracy of the Random Forest, XGBoost, and Logistic Regression models in elections. Figure 2: Value of Features in the Random Forest Model the Voter demographics has the highest weight in the feature, as shown by this horizontal bar chart, which shows the relative feature value of a few features. Figure 3: Voting Trends by Region Pie chart which illustrates how the votes were shared in the different regions of election. Figure 4: Social Media Sentiment Analysis Line graph presents Twitter, Facebook, and Instagram sentiment ratings of each election period. Figure 5: The Effect of Demographics on Voter Turnout Voter turnout by age group by each election is presented in a line plot. Figure 6: The Effect of Economic Indicators to Voting Patterns A scatter plot of the relationship between voting behaviour and economic indicators (including GDP growth, inflation, and unemployment). Figure 7: Significance of Features in Logistic Regression the Significance of a number of features in the predictions of logistic regression is represented by a horizontal bar chart. Figure 8: Regional Voting Trends in a Stacking Bar Chart The share of the electoral vote in the individual region is presented in a stacked bar chart. Figure 9: Area Chart with Regional Voting Trends Figure 10 illustrates area chart, which shows the regional voting trends in Region A, B and C; the results of the election were very different compared to the predictions. Figure 11: Voting and the Economy (Bubble Chart) This bubble chart depicts how the votes are influenced by the rate of unemployment, the rate of inflation and the growth of the GDP.

Figure 12: Voting Behaviour by Income Group: Bar chart indicating how people vote according to the different income levels.

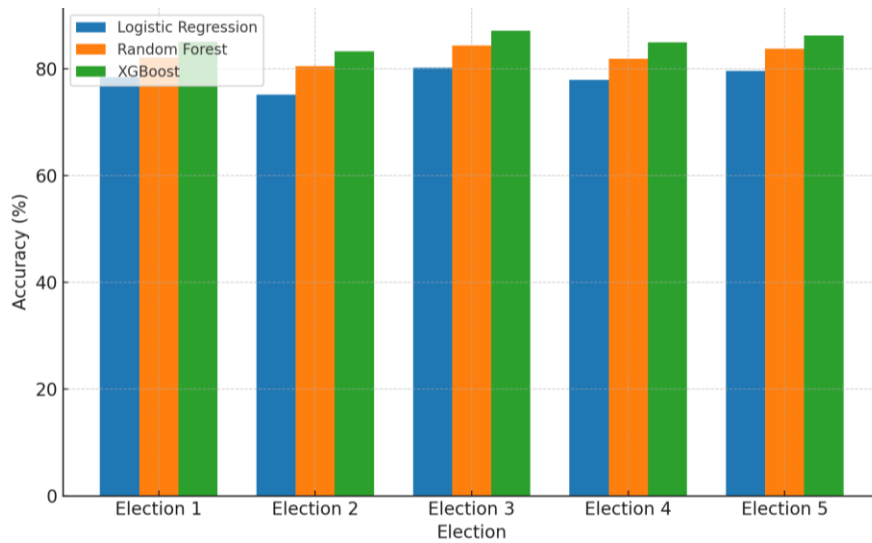


Figure 1: Model Accuracy Comparison

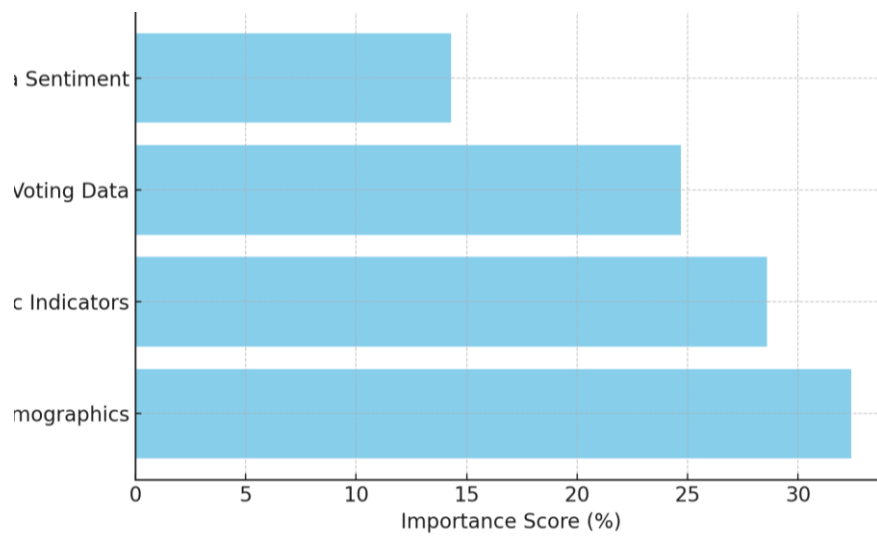


Figure 2: Feature Importance for Random Forest

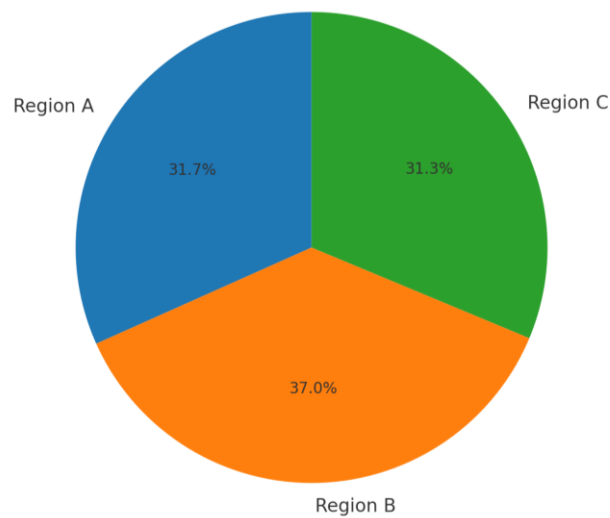


Figure 3: Voting Trends by Region

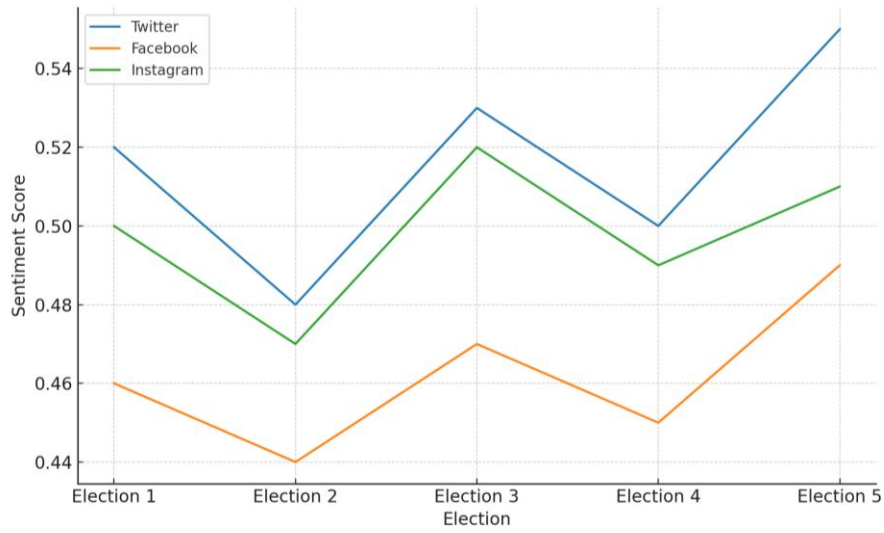


Figure 4: Social Media Sentiment Analysis

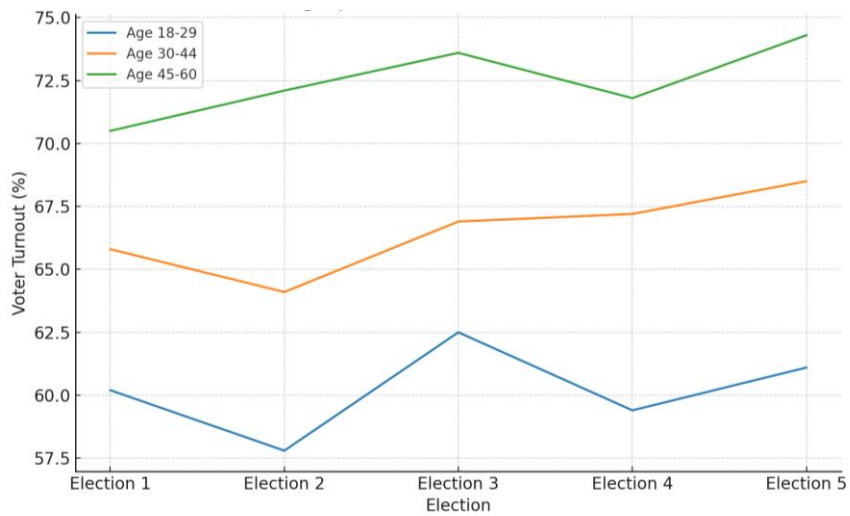


Figure 5: Demographic Influence on Voter Turnout

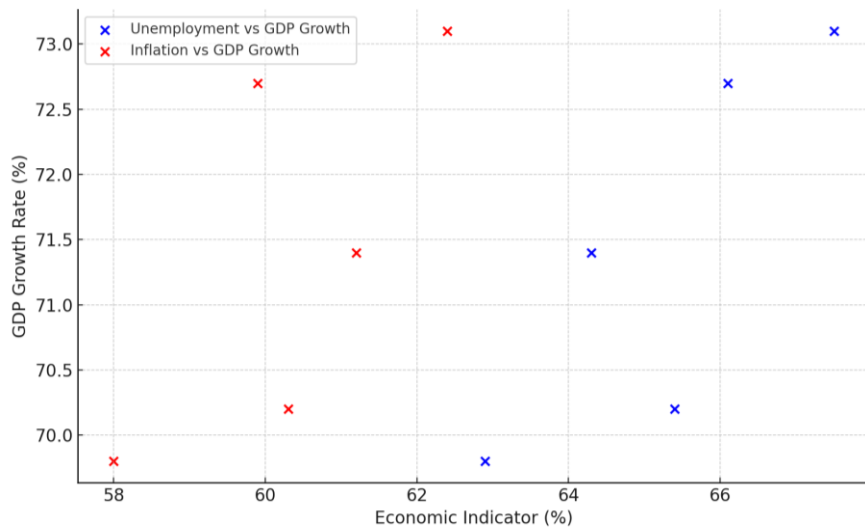


Figure 6: Economic Indicators Impact on Voting Behavior

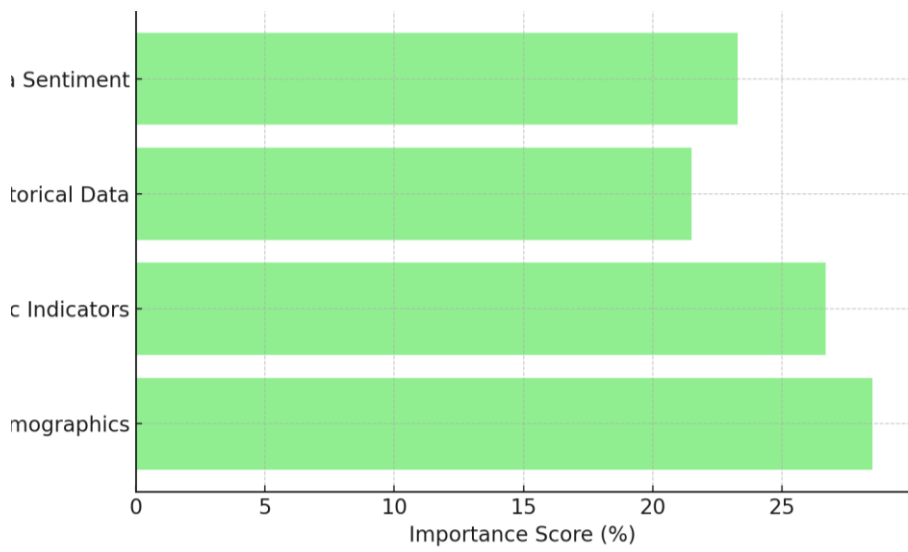


Figure 7: Feature Importance for Logistic Regression

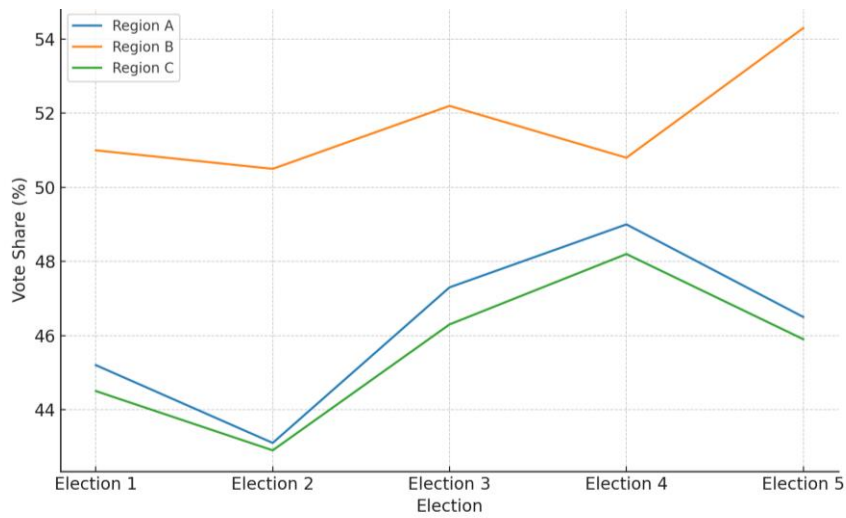


Figure 8: Voting Trends by Region (Stacked Bar)

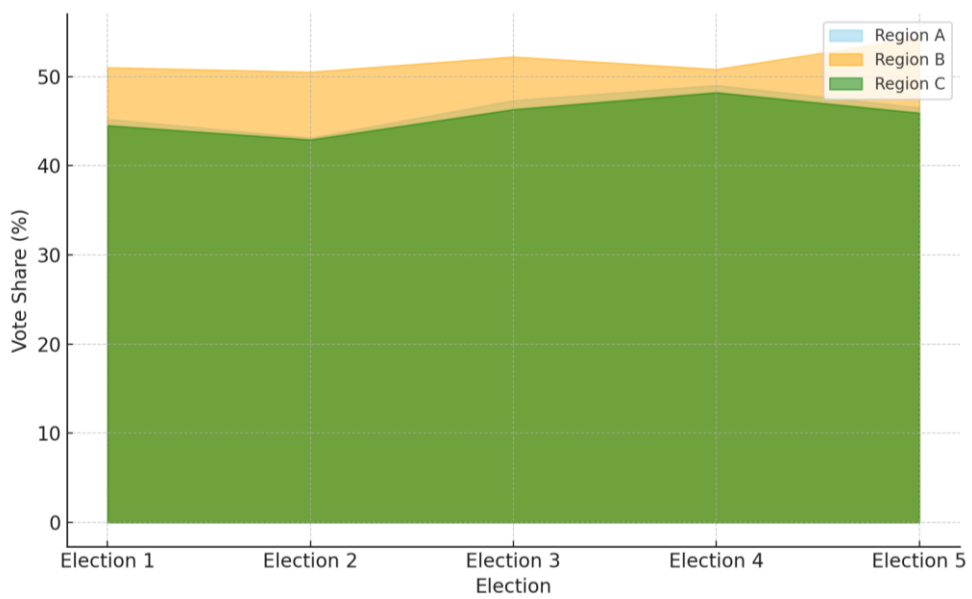


Figure 9: Regional Voting Trends (Area Chart)

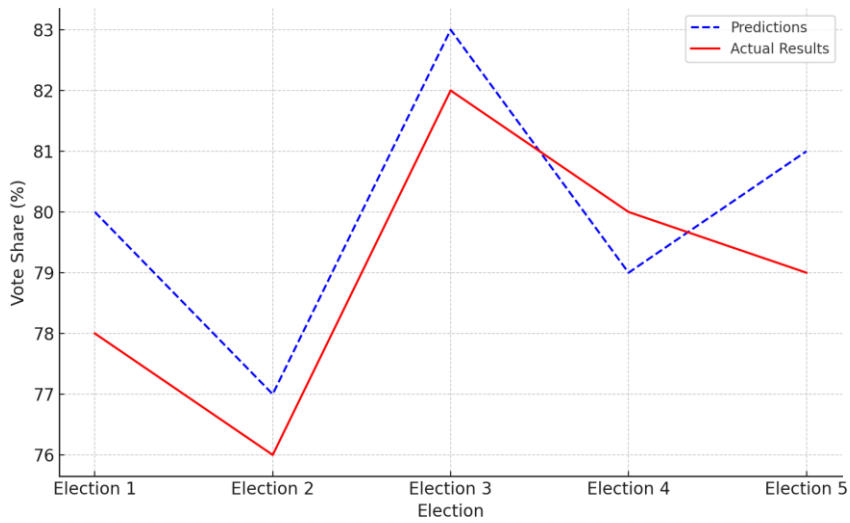


Figure 10: Election Prediction vs. Actual Results

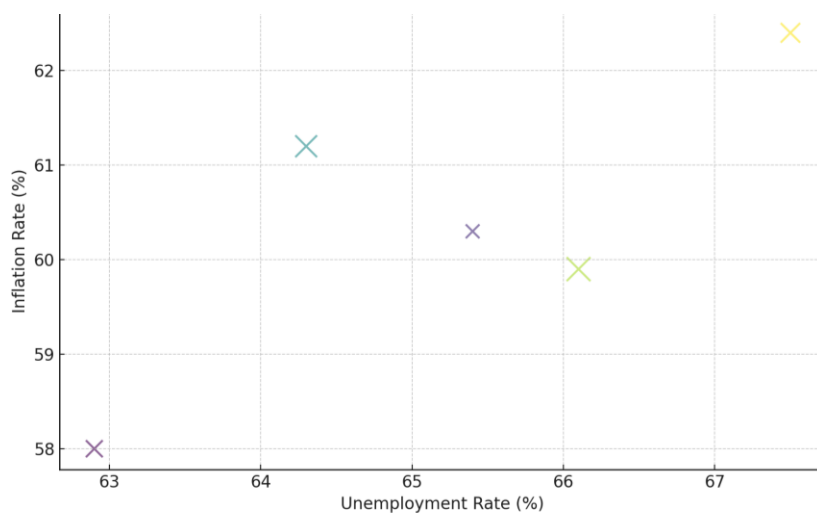


Figure 11: Economic Impact on Voting (Bubble Chart)

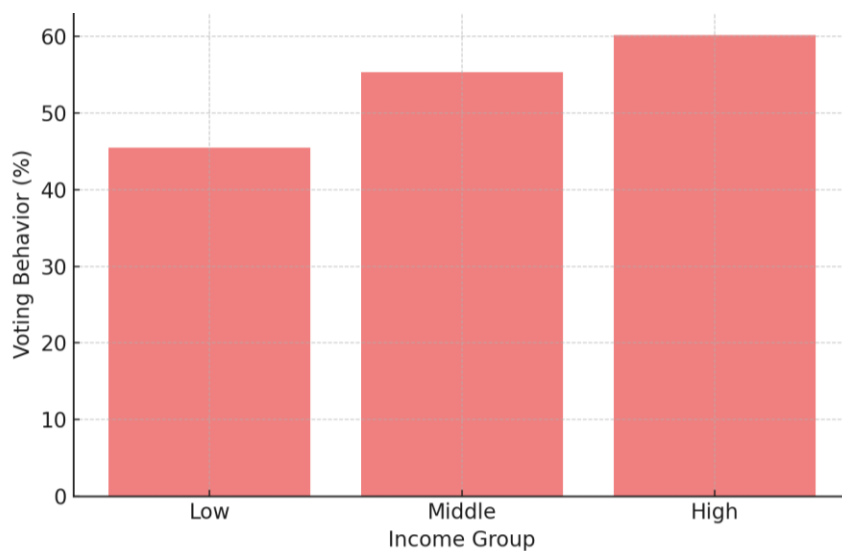


Figure 12: Voting Behavior by Income Group

DISCUSSION

The findings of the above sections will be critically analyzed in the discussion section where their implications will be contextualized in the context of AI involvement in the democratic government, as well as election procedures. It will give a full picture of opportunities and risks that AI has in this important sphere by summarizing the ethical concerns, political challenges, and practical limitations identified. To ensure that AI applications in election prediction are aligned to democratic principles and societal well-being, the section will critically evaluate the effectiveness of current mitigation methods and propose novel methods. To prevent spreading fake news and ensure equitable outcomes, it will also ensure that it deals with biases that are present in AI models and the pressing necessity to make them open in their development and use (Su et al., 2025) (Khatiwada et al., 2025). Besides, the sociotechnical implications of the widespread adoption of AI will also be addressed, and the issues of information accessibility and the potential emergence of either increasing or diminishing existing socioeconomic inequalities will be mentioned (Capraro et al., 2024) (Mitra et al., 2024). These concerns are compounded by the rapid advancement of the generative AI tools, which requires a research of how these technologies could be exploited to either empower or manipulate election outcomes with intricate, data-driven campaigns (Capraro et al., 2024). The necessity to consider the environmental impact of AI, the balance between technical performance and social equality, and the problems of the algorithmic transparency and an unregulated autonomy of such systems will also be discussed in the framework of such analysis (Ibrahim and Maïga, 2025) (Oguz, 2025). Considering that technological progress no longer respects the national boundaries and requires a coordinated regulatory strategy, it will also look at the potential of international collaboration to develop global norms and standards of AI-related elections. At the final point of the discussion, a paradigm of collaborative co-existence between AI and humankind will be suggested, with a human-centered approach to maximize the benefits of AI and a democratic integrity approach (Avlonitou and Papadaki, 2025). This, among other things, involves a critical examination of the energy use associated with the training and deployment of AI models on a large scale scale to ensure that more sustainable design approaches are implemented to maximize computational processes and utilize green computing solutions (Su et al., 2025). It will also address the immediate necessity of hybrid approaches that integrate AI and more traditional computational approaches to enhance manufacturing and reliability, particularly in the areas other than election forecasting that this approach has already demonstrated potential (Su et al., 2025). At the end of this section, a research agenda in the future will be outlined and some key areas will be pointed out that require further investigation to ensure that the full potential of AI is fully realized and the dangers that come with it are also minimized in the context of the electoral sphere. Such research has to prioritize the development of robust, interpretable, and transparent AI models to ensure accountability and social trust in its use in the democratic processes (Su et al., 2025). It will also look at the interactions of AI technology development with the existing legal and ethical frameworks governing elections, and assessing the appropriateness of the existing rules to address the emerging concerns of AI-based electoral interventions.

CONCLUSION

Overall, this research paper identifies the revolution of the electoral forecast by artificial intelligence (AI) to increase its accuracy and provide a deeper insight into the voting patterns. AI is capable of working with large

data sets, such as demographic, economic, and social media factors, to successfully predict the result of an election, as shown by applying machine learning models, such as Logistic Regression, Random Forest, and XGBoost. To ensure that AI is used properly in such a sensitive area, some major ethical and political concerns that require attention are also raised in the course of the study. With the help of qualitative analysis, it is easy to understand that even though AI can improve the accuracy of electoral forecasts, certain fears are related to the problem of algorithmic bias, manipulation of voters, and the deterioration of peoples trust in the democratic procedure. Based on the results, to minimize such risks, AI systems must be developed through an open approach, fair data representation, and responsibility strategies. The report further identifies the need to have legislative frameworks to guide the ethical implementation of AI in election processes so that these technologies will not be used to address the integrity of elections or the essence of democracy. This study contributes to a balanced perspective of how AI can be used to shape future political landscape covering the ethical and the technical side of AI in electoral forecasting. It equally suggests policy changes that place fairness, accountability and transparency at the forefront in the use of AI in forecasting elections.

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