An Importance of Sophisticated Sentiment Analysis on X (Twitter) Using Big Language Models for Accurate Election Outcome Prophecy

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Abstract

We are conducting sentiment analysis on Twitter with the power of huge language models, specifically GPT, to forecast election results. The widespread adoption of digital technology has resulted in a notable surge in the creation of user-generated content, which has therefore provoked a profound shift in the dynamics of communication across diverse platforms. Specifically, social media platforms have developed into veritable gold mines of behavioral data that offer profound insights into a range of industries, including politics, e-commerce, healthcare, and education. The application of predictive analytics to political tweet mining presents several difficulties, the most important of which are the precise evaluation of sentiment correctness and the identification of propagandistic storylines. We recommend employing LLMs as a solution because of their expertise in natural language processing (NLP) tasks, particularly GPT. LLMs have received extensive training, which has enabled them to understand context, sentiment, and other intricate linguistic subtleties. They are crucial to sentiment analysis because of their capacity to write coherent language. Our objective is to anticipate the outcomes of the Indian Lok Sabha Elections in 2024 by combining sentiment research with GPT models and taking advantage of these advantages. This study addresses the pressing need for reliable methodology in election outcome prediction by utilizing the strengths of LLMs and NLP approaches.

Keywords: Sentiment analysis, Large Language Models (LLMs), Societal media, Twitter, Election forecasting, Natural Language Processing (NLP),

1. Introduction

The ultimate aim of this research project is to use LLMs' ability to analyze sentiment on Twitter to estimate election results. By exploring the wide range of popular emotions expressed on social media, this study attempts to enhance election prediction algorithms. Since the advent of the digital age, user-generated content has grown significantly as a result of the rapid development and widespread acceptance of online technology. The ever-expanding digital environment has altered traditional communication methods, enabling the public to freely voice their ideas on any issue of interest in a variety of settings. The complete utilization is the aim of this study project.

This social media-dominated, content-rich environment is a valuable source of behavioral insights for a range of industries, including politics, education, market research, cyber security, healthcare, and urban planning. Using these insights to develop plans and activities in these various sectors has grown more and more important. The complete utilization is the aim of this study project. This social media-dominated, content-rich environment is a valuable source of behavioral insights for a range of industries, including politics, education, market research, cyber security, healthcare, and urban planning. Using these insights to develop plans and activities in these various sectors has grown more and more important. The main areas of work concerning the data extraction of electoral tweets for predictions are humour and sarcasm detection, trustworthiness verification, automatic propagandist and disinformation detection, user participation fundamentals, and individual biases. Precise sentiment analysis involves all of these aspects.

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Due to their considerable training on a variety of text corpora, they are able to understand linguistic nuances such as mood, context, idioms, and slang. Therefore, the purpose of this research is to anticipate the outcome of the future Indian Lok Sabha Elections in 2024 by applying sentiment analysis on tweets using GPT models.

2. Literature Review

Sentiment analysis is an essential component of Natural Language Processing (NLP) that entails gathering and analyzing subjective data from a variety of sources in order to ascertain people's opinions or feelings about particular subjects. Its development occurs in three stages: lexicon-based methods, machine learning (ML) strategies, and the present Transformer model period. Sentiment analysis was first based on lexicon-based techniques, which determined sentiment scores by looking at both positive and negative terms in texts.

These approaches were easy to learn and straightforward, but they had trouble with linguistic complexity and contextual knowledge. With the rise of machine learning, two supervised learning algorithms that were better at adapting to textual intricacies were introduced: Naive Bayes and Support Vector Machines. Traditional methods struggled with linguistic nuances despite advances in machine learning, which led to the emergence of Transformer models such as BERT and GPT-3. These deep learning models do exceptionally well in understanding context, managing intensifiers, negations, and implicit emotions with ease. With their enormous parameter sizes, transformer models represent a revolutionary advance in natural language processing (NLP) research, providing unmatched power for producing text and deciphering intricate linguistic structures. Large language models, which use extensive knowledge bases and complex learning methods to attain human-like comprehension of textual material, have essentially taken center stage in NLP. Their notoriety highlights a pivotal stage in the field of sentiment analysis, indicating potential opportunities for additional progress in comprehending and analyzing human emotions in other fields.

In this study [1] the possibility of modeling political mood and forecasting vote intents during an election cycle using Twitter material is discussed. The recent Irish General Election serves as a case study for the writers' investigation of this possibility. The writers also note a few things about keeping an eye on public opinion throughout an election campaign. They look at several approaches to qualitatively examining the underlying material as well as different sample sizes and time periods. The paragraph poses the concern of whether tweets accurately reflect the opinions of their followers and accurately reflect the intentions of voters in a country.

This paper [2] is a bibliography of all major researches related to the topic of predicting elections through use of twitter data. It highlights the major flaws and disadvantages of popular approaches. The author has presented a balanced view on the topic. Electoral prediction using social media is commented on.

This study [3] evaluates the efficacy of various sentiment and social network methodologies in predicting significant decisions using online social media platforms. This technique is employed to predict election results by assessing public sentiment through social media. The study examines sentiment analysis methods, emphasises the difficulties in forecasting election results, and makes recommendations for future lines of inquiry into the use of social media material in election prediction.

The article [4] claims that supervised machine learning and LLM techniques outperform the rule-based model, which primarily relies on expert-engineered features. Despite their advantages, LLMs are not a perfect solution due to confabulation, privacy concerns, and validity and reliability limitations. In order to identify difficulties and their bounds in groups, this study investigates the usage of three distinct NLP models: a Large Language Model (LLM), a supervised machine learning model, and a rule-based expert model. A discussion of model transparency and its implications for meaningful analytical feedback is included in the paper's conclusion.

This paper [5] highlights the use of a sophisticated sentiment analysis method called Aspect Sentiment Triplet Extraction to identify important characteristics in textual material.

Existing approaches suffer from data drifts and have trouble handling complex concepts since they rely on vast manual datasets and BERT models. This paper presents the ASTE approach that makes use of few-shot and fine-tuning methods in a GPT Model. The approach has worked well for term simplification, output triplet structuring, and data analysis in unfamiliar domains. The models, tested on Russian and English data, demonstrated the benefits of few-shot learning and achieved results comparable to enterprise solutions.

This research [6] evaluates Twitter users' political awareness through demographic comparisons with the general population. It illuminates biases and constraints inherent in employing Twitter data for political analysis, emphasising the necessity of acknowledging user population characteristics. Understanding these factors is crucial for accurate interpretation and contextualization of political sentiments derived from social media platforms, contributing to more nuanced and representative insights into public opinion and political dynamics

This study [7] looks at the divide between parties on Twitter by analysing users' opinions and interactions. It emphasises polarisation's influence and discusses its ramifications for election forecasting using Twitter data. Understanding the extent and dynamics of polarisation on social media platforms is essential for accurate interpretation of political discourse and prediction of electoral outcomes, shedding light on the role of digital communication in shaping public opinion and political landscapes.

The use of social media in last few decades have been helpful in determining people's attitude with respect to specific topics or events, a wide research interest in natural language processing and determining the sentiments based on it.

This paper highlights [10], the collected tweets are analyzed using lexicon based approach to determine the sentiments of public and a comparison is made among the candidates over the type of sentiment. Also, a word cloud is plotted representing most frequently appearing words in the tweets.

This study focus Sentiment analysis on social media data has been done by authors of [11] as it is an effective tool to monitor user preferences and inclination. Popular text classification algorithms like Naive Bayes and SVM are Supervised Learning Algorithms which require a training data set to perform Sentiment analysis.

This research evaluates Corpus collection, linguistic analysis and Training a classifier was performed step by step in [12]. Corpus is a collection of written texts. They collected a corpus of 300,000 text posts from Twitter then evenly split into three sets of texts: Positive, Negative and Neutral. It is based on the Naive Bayes classifier that uses N-gram and POS-tags as features.

In this study With respect to [13], the mere number of messages reflects the election result and even comes close to traditional election polls. Using LIWC text analysis software, they conducted analysis of over 100,000 messages containing a reference to either a political party or a politician. Their result shows that Twitter is indeed used extensively for political deliberation and mere number of messages mentioning a party reflects the election result.

This paper focused Utilization of Dictionary Based, Naive Bayes and SVM algorithm to build the classifier was done by [14] and classified the test data as positive, negative and neutral. They identified the sentiment of Twitter users towards each of the considered Indian political parties.

The result of the analysis for Naive Bayes was the BJP (Bhartiya Janta Party), for SVM it was the BJP (Bhartiya Janta Party) and for the Dictionary Approach it was the Indian National Congress.

This research [8], authors have used Lexicon based approach with machine learning to find emotions in tweets and predict sentiment score. The research also showed that lexicon based sentiment analysis improves the prediction result, but the improvements also vary in different states.

The researcher of this article [9], used fast and in memory computation framework 'Apache Spark' to extract live tweets and perform sentiment analysis. This paper provides a method for analyzing sentiment score in noisy twitter streams and reports on the design of a sentiment analysis by classifying user's perception via tweets into positive and negative.

3. Problem Statement

Sentiment analysis of political tweets with accuracy is quite challenging, especially in the areas of humor and sarcasm identification. Linguistic complications like colloquial idioms and context-specific nuances can lead to errors in analysis. Self-selection bias and problems with credibility verification make it harder to detect propaganda, deception, and sock puppets. These challenges may have far-reaching consequences, such as inaccurate forecasts and a decline in the reliability of research. Precise sentiment prediction models that can detect linguistic nuances, perceive irony and sarcasm, and automatically identify erroneous information are needed to address this. Given the profusion of user-generated content on social media platforms, it is critical to process massive amounts of data effectively.

4. Objectives of Study

- The goal of the research project is to use sophisticated GPT LLM to conduct sentiment analysis on social media data.
- Automatically identifying propaganda, detecting comedy and sarcasm, and accurately predicting tweet sentiment are crucial areas of focus.
- Moreover, the project involves credibility testing, individual bias correction, and demographic research.
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- The study includes demographic research, individual bias correction, and credibility assessment.
- The goal of the project is to use LLMs to develop an accurate sentiment prediction model for forecasting the outcomes of the 2024 Indian Lok Sabha Elections.
- Apart from promoting sentiment analysis, the Endeavour aims to explore the extent to which LLMs are able to interpret and predict public opinion.

5. Proposed Methodology

5.1 Data Collection

For scientific research, data collecting is essential since it makes it easier to examine hypotheses and evaluate results. Our study collects tweets related to the impending election in an effort to create an extensive dataset. We retrieve tweets containing election-related hashtags or keywords by using web scraping APIs. Relevance and diversity of data provide challenges. A comprehensive dataset is ensured by diversity, necessitating tweets from a range of demographic, linguistic, and geographic origins. This adds depth to analysis by integrating several viewpoints. A total of 2000 tweets spanning from 01/01/2024 to 01/03/2024 were gathered in the collection process. The small number of tweets is in part due to the increased restrictions applied by Twitter in its access. Some hashtags and keywords used were as follows: #IndianGeneralElection, #indianelections, #narendramodi, #electioncampaign, #rahulgandhi, #congress, etc. The tweets were collected related to BJP and Congress Parties only.

Table 1. Dataset Characteristics after Cleaning

Total Tweets	Non-English Tweets	Longest Tweet Character count	Shortest Tweet Character count	Average Tweet Character count
2000	500	917	20	156.03

5.2 Data Preprocessing

Preprocessing, which includes data cleaning and the management of noise and outliers, comes after data gathering in data science. Analysis is impacted by the heterogeneity of real-world data, which frequently contains inconsistent, noisy, or missing parts. LLMs are able to offer remedies for these issues. Transfer learning, contextual understanding, end-to-end learning, and automatic feature extraction are all possible with GPT models. It can work on data without requiring a lot of preprocessing thanks to all of this. The text column was exclusively utilized for sentiment analysis. Since stemming, stop-word removal, and other cleaning chores would only be applicable to English tweets, we decided against employing them. We rely on the model's capacity to comprehend various contexts and languages. We purge the gathered data of urls, duplicates, and retweets, among other things.

5.3 LLM Model Selection

Because GPT models can reliably understand and interpret human language in a variety of languages, they have been chosen for multilingual sentiment analysis. Especially useful for sentiment analysis jobs, they can manage complex and nuanced textual nuances. In terms of performance, ChatGPT has outperformed other sentiment analysis technologies. Furthermore, ChatGPT has performed better than OPT, with a 6% increase in accuracy and a 4%–7% increase in F-measure. These results demonstrate the considerable predictive performance advantage of GPT methods, outperforming the state-of-the-art by more than 22% in F1-score.

GPT models have demonstrated their suitability for the task through the implementation of few-shot and fine-tuning procedures. They have demonstrated the ability to structure output triplets consistently, simplify terms without sacrificing their meaning, and analyze data from uncharted domains. As a result, the GPT-2 model was chosen due to its open source nature.

5.4 LLM Model Fine Tuning

Owing to the widespread usage of social media platforms like Twitter, training large language models (LLMs) with a focus on multilingualism comes after preprocessing the data. LLMs should be adept at writing and understanding communication in multiple languages, addressing frequent social media text concerns such as sarcasm and context nuances. LLMs are increasingly being utilized for few-shot and zero-shot learning, which helps students apply and assimilate new concepts from sparse examples. Although GPT performs exceptionally well on English tasks, we used the ai4bharat/IndicSentiment dataset to train the model for multilingual competency in Indic languages. With default parameters, it was trained in the Google Colab T4 Python environment.It received a 0.9302 accuracy score, which is in line with traditional models.

5.5 Model Implementation

Dynamic scenario modeling, which incorporates sentiment analysis during elections, requires adaptive models to accommodate abrupt shifts in public opinion. The reason GPT performs well in this domain is that it can understand human language. The refined GPT-2 model is utilized to do sentiment analysis on the collected tweets.
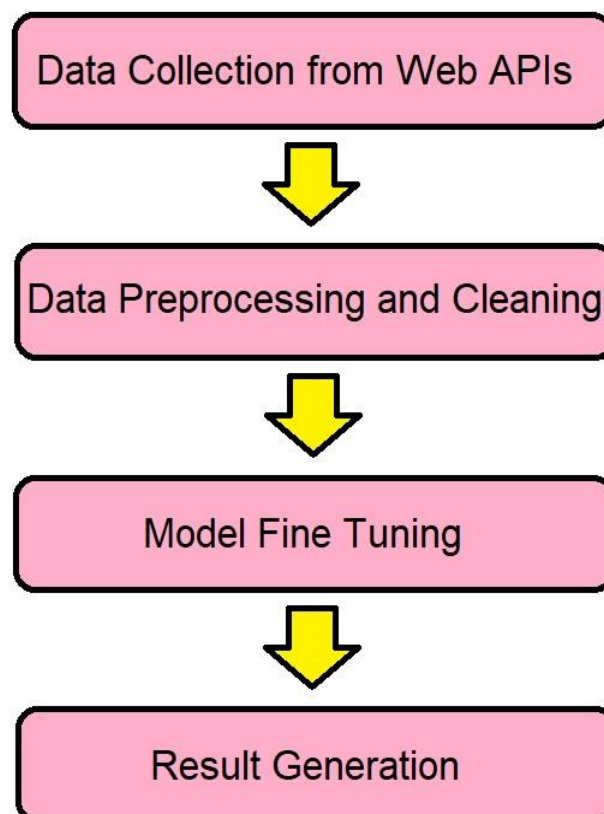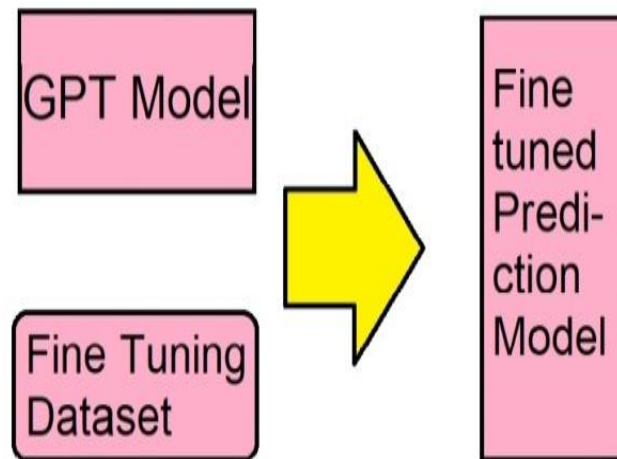

Figure 1. Flow Chart of the System

Figure 2. Model Tuning

6. Benefits of Proposed System

● **Addressing Challenges in Social Media Data Gathering:-** LLMs' adept handling of negation and sarcasm, slang interpretation, hashtag analysis, and cultural context consideration enable accurate sentiment analysis in a range of linguistic circumstances. Social media data offers organizations valuable insights because of its sophisticated comprehension and versatility.

● **Benefits in Data Processing: -** LLMs are useful for automating text tasks such as entity recognition, summarization, and categorization. Their scalability allows for the processing of large amounts of data, and its multimodal capabilities encompass audio, video, and images. Through transfer learning, LLMs increase output.

● **Advantages in Sentiment Analysis:** - LLMs are superior in sentiment analysis due to their linguistic support, scalability, adaptability, and contextual comprehension. They are more effective across a range of platforms and sectors because they can handle complex linguistic structures and accurately identify the polarity of emotions. Additionally, LLMs facilitate sentiment analysis across a range of linguistic situations and the generation of cross-cultural insights.

7. Results and Discussions

7.1 Results

Through the examination of political tweets, this work demonstrates the efficacy of Large Language Models (LLMs), particularly GPT, in sentiment analysis on Twitter. The findings provide insights into the relationship between elections and public mood, highlighting trends that are essential for precise forecasting. Processing large amounts of Twitter data is made possible in large part by machine learning algorithms, such as those that are integrated with GPT. Based on sentiment research, the positivity rate of tweets pertaining to the Congress party was around 31%, but tweets about the BJP party had a positivity score of approximately 34%. These findings shed light on political and electoral dynamics.

7.2 Discussions

The findings show that there are different attitude patterns on Twitter, with tweets about the BJP showing somewhat greater positivity rates than tweets about the Congress. This suggests that the BJP is more likely to prevail in the forthcoming Indian Lok Sabha Elections of 2024. Negativity prevailed with 52% of tweets, while neutral tweets made up 9%. Election forecast accuracy is increased when social media data is combined with conventional techniques. This study emphasizes how viral information and celebrities may spark public attention. But it's important to remember that there are constraints as well, such diversity and the difficulty of identifying the right attitude on social media. To improve Twitter-based election forecasts, sentiment analysis tools and methods must be continuously improved. This includes utilizing sophisticated language models like as GPT.

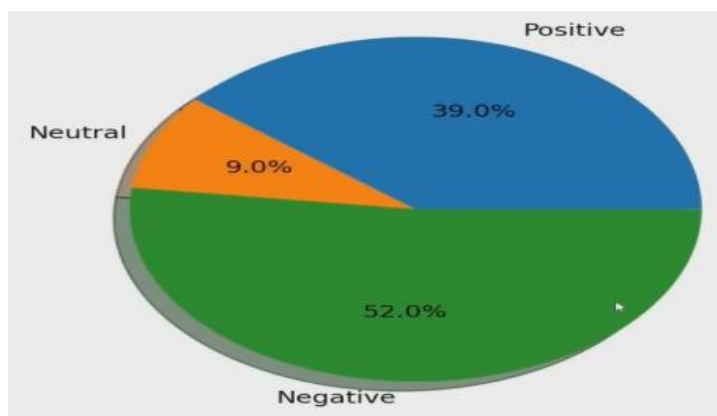**Figure 3. Word Cloud of BJP and Congress Party Tweets**

Figure 3. Sentiment Distribution of Tweets

Table 2. Sample Output of the Sentiment Analysis

Tweet	GPT Model Output
🜨Celebrating BJP's Rajya Sabha win, he highlights the 'historic' Ram Mandir 'Pran Pratishtha' in Ayodhya. Adityanath vows continued service if BJP secures a third term. #YogiAdityanath…	Positive

|	
Gujarat : The State ruled by BJP 2017 - Porbandar Port- 1500 kg Heroin 2022 - Mundra Port - 3000 kg Heroin 2022 - Porbandar-Jamnagar - 750kg Contraband 2023 - Gandhidham - 80 kg Cocaine 2024 - Veraval Port - 50 kg Heroin 2024 - Porbandar Port - 3300 kg Heroin #BJPHataoDeshBachao😟😟	Negative
BJP should translate all the talk to real time in Tamil for all the people here locally to understand. More for the DMK and its supporters to understand.	Neutral
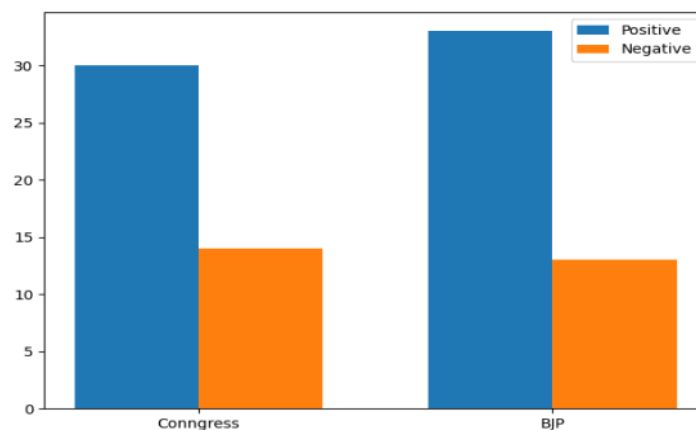
Figure 4. Polarity classification

8. Conclusion and Future scope

With an emphasis on the 2024 Indian Lok-Sabha Elections, this study highlights the effectiveness of Large Language Models (LLMs), particularly GPT, in improving sentiment analysis for election forecasting on social media. By using LLMs, we were able to establish a correlation between election results and Twitter sentiment trends, highlighting the significance of sophisticated natural language processing. Accurate predictions are made easier by LLMs, which address issues such as slang comprehension and emoji interpretation. Our research informs policymaking, public opinion tracking, political analysis, and decision-making processes that involve citizens and decision-makers. Refinement of sentiment analysis models and sampling procedures to mitigate biases are essential for dependable outcomes, even in the face of constraints such as platform biases and problems with data representativeness.

In the future, multimodal data sources may be integrated for enriched sentiment analysis, and ethical concerns will guarantee model deployment transparency. It is possible to simulate dynamic public mood to predict elections more accurately.

Two supervised learning algorithms that are used to categorize data based on parties are Naive Bayes and SVM. The majority of studies have only retrieved data from Twitter, however we can also retrieve data from Facebook, Instagram, and other social media platforms. To ascertain the polarity of the word, sentiment analysis is performed to the data, which is now in the form of words. Voter sentiment and volume-based prediction are the foundations of this method.

Prior to the announcement of the Indian Election Commission, political election predictions and outcomes were shared on social media. It demonstrates how social media platforms can be used to predict election outcomes ahead of time.

When the suggested strategy is used to events in nations where the majority of people utilize social media to voice their opinions, there is also a chance that the results will improve. Preprocessing data in multiple languages can increase prediction accuracy.

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