ISSN: 2581-3404 (Online) IF: 5.68 (SJIF)
IJIRTM, Volume-8, Issue-5, October-2024.

# Forecasting Public Opinion and Election Outcomes through Sentiment Analysis: A Machine Learning Approach

Pragati Mishra[1], Chetan Agrawal[2], Divya Evney[3]
Dept. of CSE, Radharaman Institute of Technology & Science, Bhopal, India[1, 2, 3]
pragatimishra021091993@gmail.com[1], chetan.agrawal12@gmail com[2], divyarits27ac.in@gmail.com[3]

**Abstract.** *Online social networks have provided end users with a fantastic platform to express their opinions in recent years. Human judgment is so vast that it is difficult to separate how the stimulation of numbers affects people on online social networks like Facebook, Twitter, and others. In order to understand customer direction and make more intelligent decisions, organizations must acknowledge the extreme nature of these feelings. In the area of senate concerns, for example, governmental elements should determine a general appraisal in order to choose their method of advocacy. Indeed, a lot of people use Twitter for political purposes. We discover that the outcome of the political choice is reflected in the mere quantity of communications mentioning a meeting. Sentiment analysis (SA) uses this data to predict the outcome of the political decision. The extreme and inclination of the vast population towards a specific topic, object, or substance is determined by the SA of the tweets. Well-known text mining techniques, such as NaiveBayes and Support Vector Machine, are supervised learning techniques that need input gathering in front of sentiment extraction. The test data is described as certain, negative and unbiased using these computations to create a classifier. The dataset we used in this paper includes the 2024 AAP, BJP, and INC general election statistics. Viewers on sites are communicating both positive and unfavorable audits of these datasets. Once the material has been preprocessed using string to vector filtration, the most significant highlights are selected using include choice procedures. For sentiment analysis, VADER is used, and for reviews and tweets, an improved Naive Bayes computation using TF-IDF calculations is used. Four metrics—accuracy, precision, F-measure, and root mean square error—are being used to compare the results.*

.**Keywords-** Social Media, Tweets, Political Reviews, Opinion Mining, VADER.

## Introduction

Sentiment analysis is only the healthy region of exploration and mining strategy with respect to feelings of individuals, assessment, and their state of mind on specific realities and occasions. It is only the center region of normal language preparation that profoundly manages sentences. With the mammoth investigation of online media in the most recent decade and the blast of web innovation an extremely enormous no of individuals today with no dread set forward their assessment and remain on a specific point by the different methods for tweets, post, remarks, likes, and despises and even by sharing specific news identified with some occasion to their locale. And all such exercises really contain a great deal of

shrouded data and besides breaking down such content [1] can yield immense data about the conduct of the individuals that can be useful in any part of life.

Arising online Social media gave them enough potential and capacity to spread and make their assumptions on some politically persuaded occasions, current issues on sites, and different occasions occurring everywhere in the world particularly on the different interpersonal interaction locales [2]. At first, the idea of Sentiment analysis and its phrasing was put sent by Nasukawa and Yi [3], while on the opposite side opinion mining was proposed by Dave et al. [4]. Here one thing is outstanding that absolute first and early examination in assessment grouping and investigation was subject to the computation of the measure of utilization of descriptors and single word phrases in the sentence or any post just to register the conclusion estimation of the sentence in any case, in ongoing exploration considers it has been seen that action words, modifier, and two word phrases [5] [6] [7] likewise contribute a great deal to comprehend the general assessment of the sentences.

Aside from this, at present numerous sorts of examination, creators, and examiner have begun to study and discovering a portion of the standard based slant investigation and applying the idea of AI draws near, characteristic language handling to discover the genuine significance of semantic importance [8][9][10]. In this way, it causes colossal examination in the politically arranged outcomes and afterward to investigate and broadcast the aftereffect of any political decision. These sorts of exploration are firmly examined. We have fundamentally investigated all such strategies for foreseeing the consequences of political exercises in various situations related to a huge example of the populace and their convictions through opinion mining. Here, we will likewise view a portion of the well-known work done by various analysts in the territory of Sentiment analysis.

Rest of the paper is organized as follows: in section 2 the related work reviews several studies applying sentiment analysis to political events, especially through social media platforms like Twitter, to predict electoral outcomes, Section 3 presents proposed work outlines a sentiment analysis framework utilizing the algorithm, in section 4 The results and discussion presents a comparative analysis of sentiment analysis results across different parameters, Finally, in the section 5 conclusion emphasizes the significance of sentiment analysis in political discourse, suggesting future improvements through larger datasets, enhanced preprocessing techniques, and the application of advanced natural language processing (NLP) methods to better predict public opinion and electoral outcomes.

## Related Work

In the wake of getting essential and fundamental information about estimation and assessment examination we have enough information and thought that this territory of exploration has an all the more wide degree in breaking down a huge populace's assumption and mind-set and this is the reason it is broadly utilized in political situations commonly. What's more, as of late this custom is step by step expanding with a quick rate

Forecasting Political Party Popularity using Ensemble Learning As technology develops social media's pervasiveness in daily life increases. With millions of tweets exchanged every day, Twitter, a microblogging site, becomes a repository of opinionated content [11]. This vast amount offers a wealth of material for investigation, analysis, and the creation of new insights. This article uses Sentiment Analysis (SA) on data gathered from Twitter with an emphasis on the 2019 Indian General Elections. Ensemble Learning improves polarity assignment to tweets by leveraging Naive Bayes (NB), Support Vector

Machine (SVM), and K Nearest Neighbor (k-NN) algorithms. The findings demonstrate how useful Twitter data is for making decisions, supporting political campaigns, and providing information about political performance and reputation.

Hindi-language tweets were examined in a study by Parul S and Teng Sheng Moh [12] in order to forecast the outcomes of the 2016 Indian general election. Over the course of a month, 42,235 tweets were gathered for the study. Three machine learning methods were used: Support Vector Machine (SVM), Naive Bayes, and an unidentified method. The accuracy of SVM was 78.4%, whereas that of the Naive Bayes algorithm was 62.1%. Based on the examined tweets, the study found that SVM was the most accurate technique for predicting election results.

Dr. D. Rajeshwar Rao and colleagues used the 500,000 tweets they collected in 2019 [13]. In between workouts and tests, take breaks. He made a prediction about the political party that would rule social media. Proposed a technique that after two days of dataset training, produced a classifier. Tests showed that SVM was the most accurate model, with an accuracy of 80%.

Using decision trees, Fardin Jo and John Joseph, 2019 [14] forecasted the 2019 Indian general election. The outcome The effectiveness of the suggested approach indicates that it has a bright future in forecasting Indian election results. Meng-Hsiu Tsai and his colleagues [15] at Middle Georgia State University described a machine-learning technique. Use Twitter data to forecast the results of the US municipal elections. They divided their results into five categories: very poor, moderate, negative, positive, and positive. They used the RNTN model to calculate a weighted sensitivity score. Payal Khurana Batra and her team anticipated the outcome of the 2019 Lok Sabha election [16]. He divided the data into two categories after it was prepared, with the Congress and BJP writing different scripts for each group. To train their model, they employed five different machine-learning methods. XGBoost and decision trees produced more than 80% of the findings.

Anunay Kulshrestha, Devin Lu, and Arpan Shah [17] A 2017 study that looked at how different political parties used social media using an enhanced transmission model to facilitate knowledge communication found that the right-wing BJP and its coalition partners adopted a more rigorous and effective social media strategy than other political actors.

Kumar, S., and P. Sharma (2023) [18] Through the use of a variety of classifiers and the integration of sophisticated techniques like word sense disambiguation and negation handling, this paper presents an ensemble-based approach to sentiment analysis on Twitter and offers a promising methodology for effectively capturing public opinion in real time. The suggested approach provides a robust framework for analyzing sentiment in social media data, with implications for both research and practical applications in various domains.

By Sundar, R., and Pathan, A. (2023) [19] this document is a license Contextual Text Mining of Political Leaders on Social Media Communication with constituents has changed as a result of political leaders' growing use of social media, according to research on machine learning algorithms. By combining contextual text mining with natural language processing (NLP), leaders' views and opinions on a range of topics may be analyzed, promoting human-machine interaction. They utilize a novel model that compares datasets from Facebook and Twitter the Support Vector Machine (SVM), the Naive Bayes Classifier (NBC), and Ensemble Learning Methods (ELM). This method improves the precision of identifying public opinion, especially in political speech. Experimental results highlight the efficacy of these

approaches by utilizing the word frequency-inverse document frequency, with Naive Bayes showing better accuracy in tweet emotion recognition.

Using sentiment analysis on Twitter to forecast election results, this study examines how democracy, which is ingrained in Indian administration, enables people to choose representatives through frequent elections. According to Verma, M., Suryawanshi, P., Deore, S., Mundhe, P., & Phakatkar [20], more and more people are attempting to predict election results ahead of time by using a variety of sources, including news updates, casual conversations, and internet platforms. Real-time interactions and viewpoints are made possible by social media, especially Twitter, which has become an essential forum for political discourse. Sentiment analysis of Twitter data helps predict elections by providing insights into popular opinion. Interestingly, the BJP receives a lot of positive feedback in Uttar Pradesh, which points to possible electoral triumph. In Punjab, the AAP is also expected to succeed. Differences in Manipur's prognosis, despite its general correctness, show how difficult electoral forecasting can be.

Bhavesh Parmar et al. (2024) [21] the size, shape, and appearance of the tumour tissues make automated brain tumour segmentation difficult. Multiple techniques segmented brain tumour sub-regions using multi-mode MRI imaging. Although the performance of 3D CNN techniques has improved recently, the majority of these techniques do not employ uncertainty information in segmentation. Model prediction is essential for clinical decision-making in terms of knowledge and dependability. This study examines three models for brain tumour segmentation: 3D-UNet, Modified 3D-UNet, and Modified Multistage-3D-UNet. Using z-score normalization, MRI volume bias correction and normalization were performed. Memory use and class imbalance are decreased by two patch creation techniques. For aleatoric and epistemic uncertainties, voxel-wise uncertainty evaluation was performed using dropout and test time augmentation, respectively. The uncertainty of the improved multistage-3D-Unet segmentation model from ground truth is quantified using variance and entropy. Whereas entropy only offers global information, variance generates distinct uncertainty maps for every tumour sub-region. To increase accuracy and weed out miss-segmented forecasts, uncertainty is employed. With dice scores of 0.93, 0.91, and 0.83 for tumour sub-regions WT, TC, and ET, respectively, uncertainty awareness improves model accuracy.

## Proposed Work

The principle approaches towards SA are utilized in the related work depend on discrete opinions categorization and multiclass categorization. In binary categorization, each assessment is categorized into 2 groups i.e. good and bad. Alternatively in multi-class categorization, it is cited to as good, very good, impartial, bad, and very bad. Generally binary categorization is utilized for evaluation of 2 emotions like “glad” and “depressing” etc.

The example proposed assembles on political appraises that are loaded in an unstructured textual design. Unstructured statistics is additionally exchanged into significant confession via pertaining ML algorithms. Conventional schemes of ML algorithms were recycled by investigators but when it arrives to bulky datasets with the speedy streaming of statistics constantly growing gradually it's tough to evaluate with the only ML methods. Meanwhile, we had proposed machine learning algorithms for our main approach.

Sentiment analysis is the automated process of recognizing an sentiment concerning to a specified topic from text or verbal speech. It is needed so much in today’s world due to online reviews taken from different users regarding any product, services and any types of issues. So sentiment analysis has to be done accurately otherwise inaccurate results will lead to us in a wrong path. In this work we have shown

the sentiment analysis on the reviews taken on the behalf of political parties like BJP, Congress and AAP. People have given their reviews towards the political party in India. Our proposed sentiment analysis is based on Valence Aware Dictionary and sEntiment Reasoner (VADER) which shows improved classification than other tradition natural processing tool.

**3.1 Proposed Algorithm**

```
BEGIN
  # Step 1: Import Libraries
  Import necessary libraries (numpy, pandas, sklearn, etc.)
  # Step 2: Load Dataset
  Load political dataset from Kaggle (e.g., BJP, Congress, AAP)
  # Step 3: Preprocess Data
  FOR each data entry in dataset DO
    Remove stop words
    Apply lemmatization
    Reduce dimensionality if needed
    Apply stemming
  END FOR
  # Step 4: Set Input and Labels
  Define input features and labels with sentiment polarity
  Extract relevant features for analysis
  # Step 5: Prepare Dataset
  Store preprocessed dataset for further evaluation
  # Step 6: Split Dataset
  Split dataset into training and testing sets
  # Step 7: Perform Sentiment Analysis
  Initialize VADER as Sentiment Intensity Analyzer
  Initialize Analyzer as Sentiment Analyzer
  FOR each data entry in training set DO
    Analyze sentiment using VADER and Analyzer
  END FOR
  # Step 8: Calculate Performance Metrics
  Calculate accuracy, precision, recall, F1 score, and confusion matrix

END
```

### 3.2 Proposed Flowchart

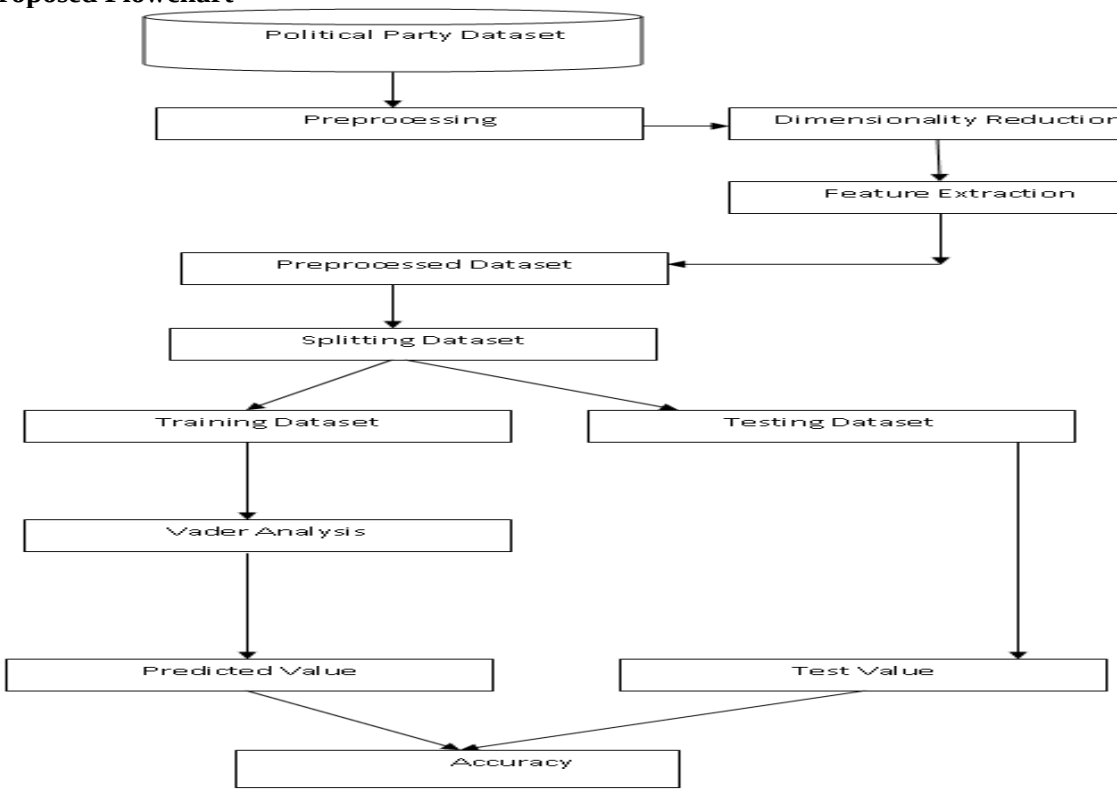


**Fig.1:** flow graph of proposed method.

## Results And Discussion

The parameters which we will consider for evaluation are as follows:

**Confusion matrix**

| | | True class | |
|---|---|---|---|
| | | Positive | Negative |
| Predicted class | Positive | True Positive Count (TP) | False Positive Count (FP) |
| | Negative | False Negative Count (FN) | True Negative Count (TN) |

**Table 1:** Confusion matrix table.

For evaluating statistical classification model, confusion matrix is used in machine learning which is also known as error matrix. The predicted class of instances is represented in the row whereas actual classes are represented in columns.

**2. Accuracy**: $\frac{TP+FN}{TP+TN+FP+FN}$

Accuracy can be defined as the percentage of the total number of predictions that are correct is known as Accuracy.

**3. Precision:** $\frac{TP}{TP+FP}$

Precision can be defined as the percentage of positive predictions that are correct is known as Precision.

**4. Recall:** $\frac{TP}{TP+FN}$

Recall can be defined as the percentage of positive cases that are predicted as positive is known as Recall.

**5. F1 Score:** $\frac{2TP}{2TP+FP+FN}$

F1 scores can be defined as the Harmonic mean of precision and recall. Also known as F1-measures**.**

**Result Analysis**

The implementation with different aspects and to analyze those parameters is the significant part of result analysis in thesis. In this section we will compare the performance metrics like accuracy, precision, recall and f1 scores with the graphical representation and the comparative table. The observation had done mainly with the domain of supervised learning approach of machine learning classifier namely NaiveBayes, Support Vector Machines, Staring with comparative graph on different evaluation parameters are as follows:

**Analysis of the AAP Dataset**

Proposed Accuracy: 1.0
Proposed Precision: 1.0
Proposed Recall: 1.0
Proposed F1 measure: 1.0

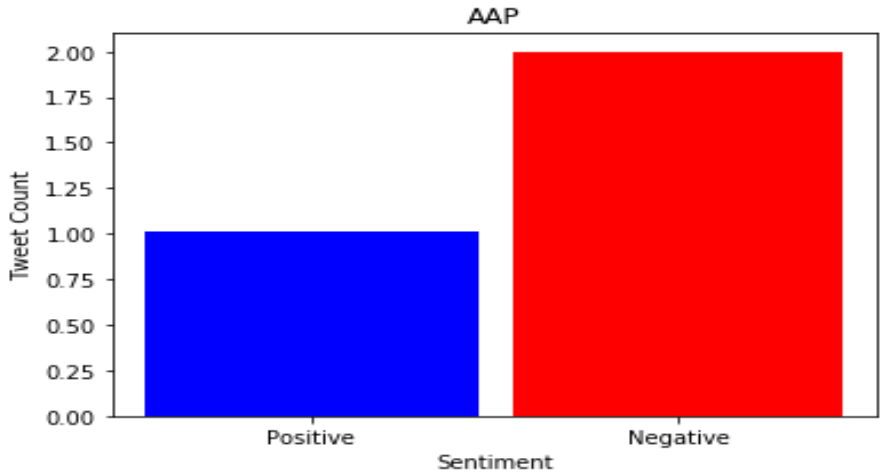


**Fig. 2:** Results of Aam Aadmi Party Dataset.

**Result analysis of BJP Dataset**
Accuracy: 0.7333333333333333
Precision: 0.7142857142857143
Recall: 1.0
F1 measure: 0.8333333333333333

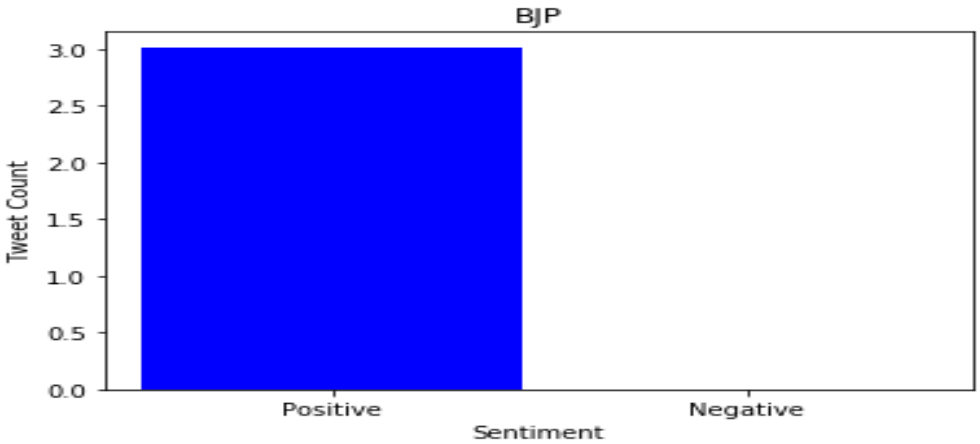


**Fig. 3:** Results of BJP Dataset.

**Result analysis of Congress Dataset**
Accuracy: 0.6
Precision: 0.7142857142857143
Recall: 0.5555555555555556
F1 measure: 0.6250000000000001

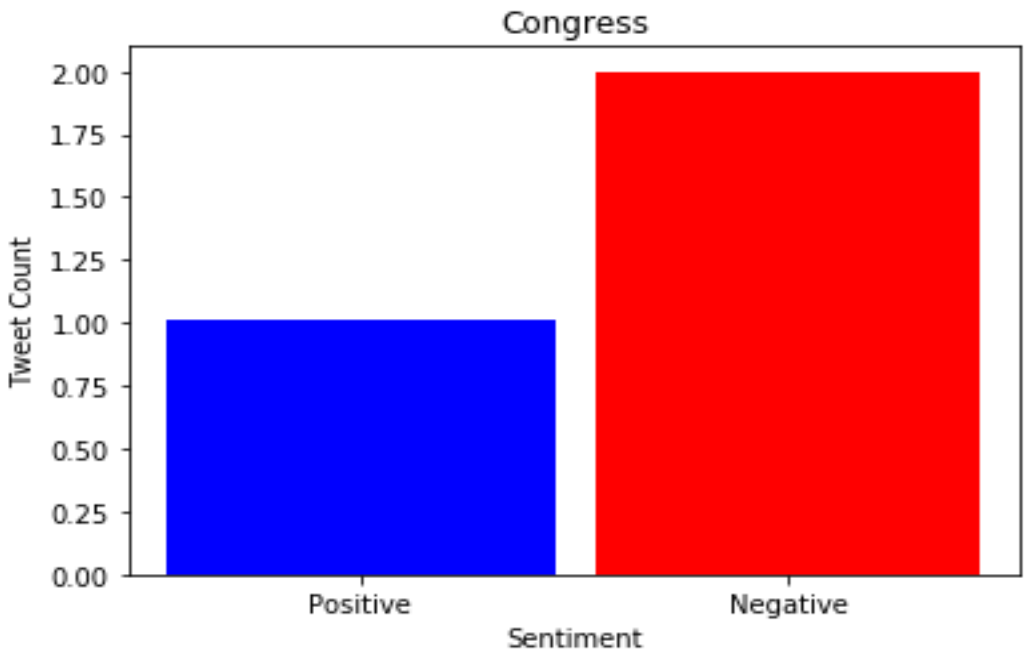


**Fig. 4:** Results of Congress Dataset.

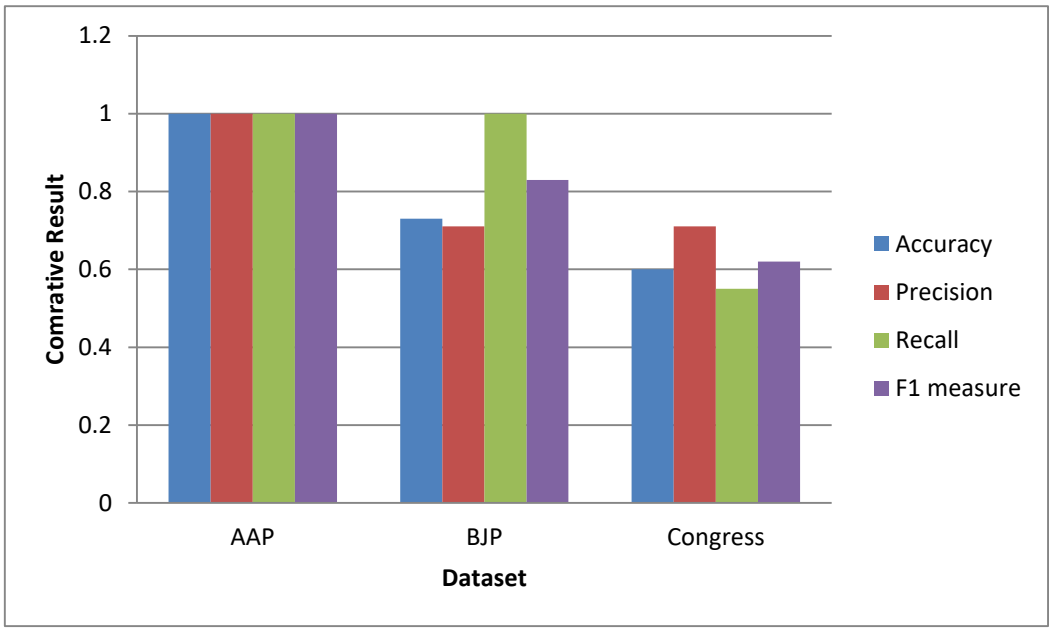


**Fig. 5:** Comparative Results of All Datasets.

| Dataset | Accuracy | Precision | Recall | F1 measure |
|---|---|---|---|---|
| **AAM AADMI PARTY** | 1 | 1 | 1 | 1 |
| **BJP** | 0.73 | 0.71 | 1 | 0.83 |
| **Congress** | 0.6 | 0.71 | 0.55 | 0.62 |

**Table 2:** Comparative Analysis of Results.

## Conclusion

Sentiment analysis is a rapid and low-cost method for general election supervision and its estimations. Diverse sort's information is created from online Social media organizations that should be prepared and to watch an individual's point of view toward items, objects, political reviews, and so on as it is realized that the issue with data gain is the qualities with an enormous number of qualities. In this work, we extricated new highlights that strongly affect deciding the extremity of the political reviews and applied calculation etymological techniques for the preprocessing of the information. In our proposed work we have improved the accuracy by utilizing VADER and we have additionally demonstrated that expanding the size of the dataset will likewise improve the precision and different boundaries. Later on, we might want to assess the competence of the proposed sentiment analysis and methods for different undertakings, for example, conclusion order. We might want to apply inside and out ideas of NLP for a better forecast of the extremity of the report. We might likewise want to stretch out this procedure to different areas of sentiment mining likes text mining, political conversation discussions, and so forth. This investigation has trade with only the English speech. While a lot of of the perceptions would pertain to other speeches, particularly roman speeches, this stays untried. Further domain-definite emotion lexicons in another fields could also be investigated, which might be utilized in revolve for advance investigation so that the restrictions of the this research in the domain of SA could be determined forward.

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