

# Unveiling the Impact of Indian Government Policies using Aspect Based Sentiment Analysis with Multi-Criteria Decision-Making and Hybrid Deep Learning

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**Abstract:** This study conducts a succinct assessment of the effect of Indian governmental policies using aspect-based sentiment analysis. The ABSA (Aspect-Based Sentiment Analysis), with MCDM (Multi-criteria Decision-Making) frameworks and the Hybrid Deep Learning model are used in this project to develop a more profound understanding of the coexistence of the trends of governmental policy outcomes and electoral sentiment. First of all, the multifaceted methodology of our course concerns the various aspects of government policies and its impact on electoral activities. Hence, the process of sentiment analysis starts with the separation of documents with the same aspect category, which provides distinct details that eventually lead to individual assessments of the sentiment toward each aspect. Next, MCDM frameworks will be used to rank policy issues along multiple dimensions, and these dimensions will include but are not limited to economic impact, social welfare, and environmental sustainability. Additionally, deep learning model, including BiLSTM, CNN, and Transformer models, are implemented to label sentiment in textual data and predict outcomes of represented dataset composed of large amount of unstructured data. We also incorporate these models as reference models to create a deep-learning hybrid model. Our interdisciplinary approach gives an overall understanding of the complex relation between government policies and electoral sentiment, and therefore we can make decisions and develop policies that are based on this knowledge. Our research brings into the focus on the multifaceted opinion regarding the policies of Indian Government. With a variety of analytical approaches used, we offer a profound perspective into social factors determining attitudes that permeate the general population. In this way, the outcome is evidence of the relationship between the political policies and the feelings of the people hence the stakeholders have a chance to sense the mood of the country as the country is close to a major electoral intersection.

**Keywords:** Indian politics; Government policies; Electoral outcomes; Aspect-Based Sentiment Analysis; Multi-Criteria Decision-Making

## 1. Introduction

Within the changing scene of Indian politics, the interrelationship between government policies and electoral results is the key factor that shapes the socio-political landscape of the country (Iswanto and Pamungkas, 2023). The Indian electoral process being the largest democracy in the world is not just complicated but it is mostly affected by several factors such as socio-economic dynamics, cultural norms, and above all government policies (Abdel-Bassat et al., 2024). The general election of 2024 is one of the significant events that are soon to be around the corner.

It will tell people how they feel towards the policies that were made by the ruling government and how these policies have affected the basic living of our society.

Moreover, this research performs a thorough investigation that is supported by X-driven ABSA, integrated with MCDM frameworks, and utilizes the Use-case capacity of deep learning technique that floods Nevertheless its discipline-specific inspection capability (Angamuthu & Trojovský, 2023; Behl & Kashyap, 2020). We are further about tearing the layer of Sentiment toward government policy to discover the possible after-effects on the coming elections ambiance. However, the influence of the government's policy on electoral outcomes could not be underscored, particularly in a democratic country like India with a substantially diverse populace, as the policies would sway the lives of millions in every layer of society Indian Farmer and Government Initiatives: Policies, gaps, and way forward for the year 2023. Administrative law or rule is the so-called dominant force that defines the original way of life of citizens. These are powerful tools hence, evaluating the sentiment and how they are used and predicting the shifts in voter opinion are as important. Not just that, it universally exposes how this differentiated sentimentality is unique to different demographic groups. So, a comprehensive knowledge of the collective conscience of voters would be essential. Here is a chance at how Indian government policies influence the 2024 election based on a viewpoint of livelihood. It is a Combi

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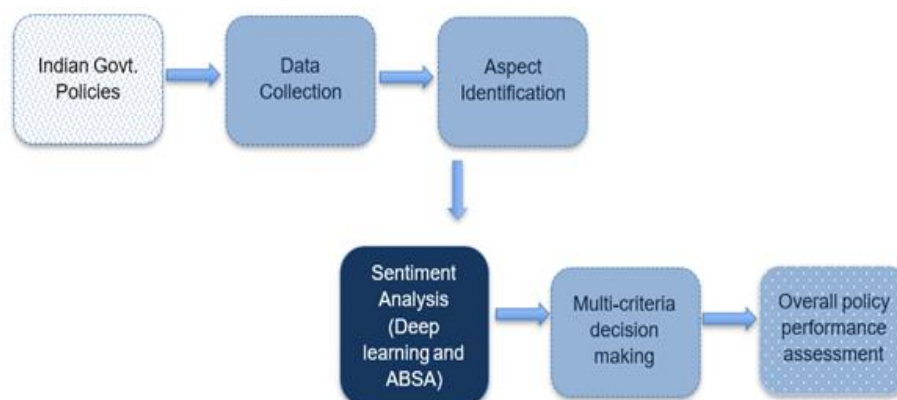
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of Aspect-Based Sentiment Analysis, Multi-Criteria Decision-Making, and Deep Learning. Hence, the framework suggested a formal blueprint that was based on the development and the actual performance like

sentiment analysis, policy prioritization, and sentiment classification via text data. Fig. 1, the block is centered on the overall implications and measures taken by the Indian government for its policies.



**Fig 1:** Integrated Policy Analysis Framework

The advent of the ABSA systems has thus paved the way for a new era of sentiment analysis computers with more powerful features that provide better information regarding text details. On the other hand, the major limitation of conventional sentiment analysis models is their incapability to exhaustively grasp the multidimensionality of the expressed views within a given text which is their major shortcoming, especially in situations involving thematic, complex messages such as in politics. ABSA, on the contrary, divides the text into its specific parts or dimensions creating the chance for a thorough analysis of the attitude to the different aspects of the ABSA system. The ABSA system enables the researcher to study the wide range of sentiments of people to the different policy measures. Thus, this article purports not only the ABSA but also the voters' mind of the activities of duty bearers and relevance in various social fields (Talmor, 2021) (Verma, & Jamwal, 2020). Besides that, the implementation of MCDM algorithms in our decision-making process will interpret systematic analysis and will make it robust by building a framework for the analysis based on multiple criteria. (Perera and Costa, 2023). Another study by (Manupati et al., 2018) mentions that the multiple criteria decision-making methods based on the decision theory “provide a solid foundation on which to evaluate multiple sources of data on all the options and to make decisions that are well-supported and sensitive to several criteria”. The multi-cue data streams show the people’s feelings towards one or another province along the different dimensions of the policy. MCDM gives us a different angle of view because of its all-encompassing approach that mostly focuses on the places of problems and places that need to be commended the most. Hence, MCDM serves as a kind of lighthouse because it enables us to see and feel the same things but in

a much different order until we get the whole picture of politics. Another dimension that we can exploit is the application of deep learning. R & S mention the fact that “Deep learning algorithms are efficient in recognizing complicated patterns and representations, which had very much impact on the FA tasks improvement, particularly those with much textual data like the politics”. Deep learning algorithms utilize the learning process which is based on tracing the trends of sentiment in the textual data and the neural network architecture allows canvassing the hidden sentiment trends in the textual data (Kumar et al., 2021). Through the deep learning features, we will discover the hidden sentiments that are the main basis for voters in elections. The research is going to explore the intricate causal connections that run between the political actors and the emotions of the public throughout the election. A three-harmonizing method will be applied in a sequence of supervised learning, MCDM models, and deep learning algorithms to provide a 360-degree view of the impact of Indian government policies on the election scene. Through the exhaustive study of the textual data, which comprises the different facets of government policies, we will be able to uncover the complex sentiments that the electorate has and this will enable us to understand the factors that influence electoral preferences [Sharma, (Gupta, n. d.)]. We will shed light on a subject that will enable our audience to participate in the discussion during the lecture, but they will also be able to participate in decision-making. This is great during elections.

## 2. Related Work

The study on transformative governance and social justice that has been done by Iswanto & Pamungkas (2023), seems to be proof that the people should be involved in

the electoral process. This is why they decide the most appropriate stakeholder(s) and how they should approach them, through the mapping approach. In conclusion, then the positions of stakeholders including respect to democratic values as well as citizens' participation in the 2024 elections are guaranteed. The former is also mentioned by Abdel-Basset et al., 2024 who formulated the multi-criteria decision-making framework to assess the impact of the technologies of Industry 5.0 on our society. The matrix shows the view on the whole process of implementation of advanced industrial technologies. At this stage, it is commonly noticed who the professors are, what issues, and the ideas that should be discussed by participants. In the field of political attitude, they used tweet sentiment analysis to determine the election results (Chauhan, et al., 2023). This study, through the indicator that is given by social media analytics, may be used for election forecasting, information becomes valid and one more topic for the future research issue. Also, producing a unique approach that shows the interaction between multi-criteria decision-making and hybrid deep learning to improve sentiment analysis as the necessary component of recommender systems will be as important as the previous points. Research based on this issue helps to improve the accuracy and effectiveness of sentiment analysis techniques, mainly, in the case of personalized recommendation systems. The goal of this research, called "Indian Farmer and Government Initiatives", is a review of the prevailing policies; the efficiency of those and remaining gaps are identified and future directions are provided. Undoubtedly, that is one of the factors indicating the significance of advanced legal aid in dispute settlement as well as forming future rural community development. Also, we will be talking about a method of aspect-based sentiment analysis using smart government review data (Alqaryouti et al., 2020), which will be a way to evaluate public services and policies via sentiment analysis methods. In terms of decision-making methodology (Saaty & Ergu, 2015) lays out the criteria and evaluation frameworks that help the people in the decision-making process to select their approaches wisely. Another point is where it implements a case study that indicates the advantage of using a multi-criteria decision-making approach that incorporates all the parties around in electing a candidate which is not only a good way of involving the interests and goals of different stakeholders. In the field of the social research industry, the revolution of technology and analytics through two illustrative studies, including (Verma & Jamwal 2020) and (Kumar et al., 2021), demonstrate data mining and deep learning techniques that are used in two distinct institutions: It also helps in the improvement of the public opinion and the creation of the text. Finally, these findings present us with a chance to take advantage of data-based methods for the formation of preferences and the formation of public

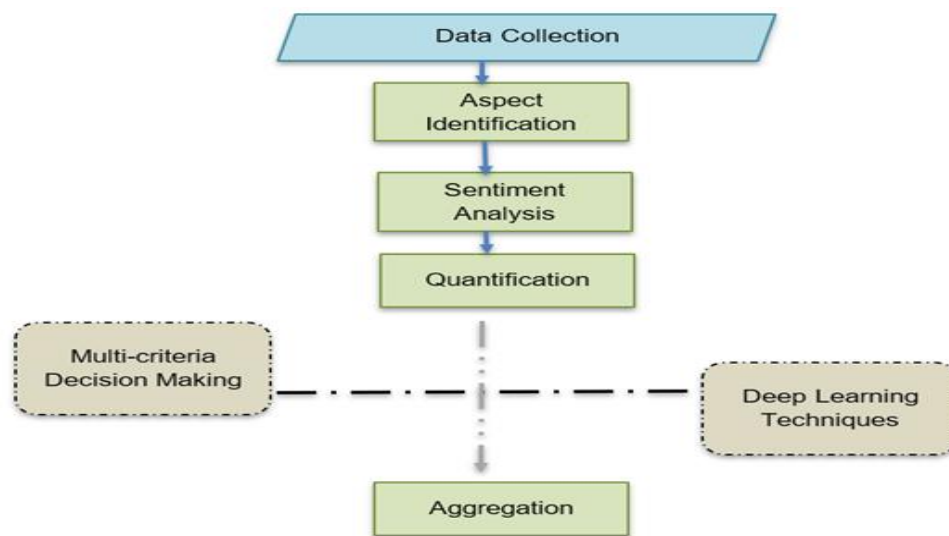
policy. Another point highlighted from the study of (Manupati et al., 2018) is that there exist several separate multi-criteria decision-making methods that can be selected to address the urban growth issue. (Muneeb et al., 2021) together (Sharma & Moh, 2016) help in developing an understanding not only of the policy-making decision but also of forecasting the electoral outcome through multi-criteria mathematical model and sentiment analysis. Hence, these research findings are vital and allow us to be in a position to address the economic hitches and political patterns, which ultimately lead to the construction of a corpus of knowledge that has something to do with governance and decision-making processes. A trio of recent studies has delved into the murky area of the relationship between the Indian government policies and the much-awaited Election 2024 using different scientific methods to understand how people with emotions and brains swing their sides. Kumar et al. 2023, first analyzed the sentiment through deep learning approaches to get an understanding of the complex effect of governmental actions on electoral dynamics. Finally, (Acled, 2024) implemented a multi-criteria decision-making protocol that included the usage of sentiment analysis to evaluate the effect policies have on different dimensions of performance. Moreover, (Talmor, 2021) released a report after this very study based on deep learning applications into the election policies of Election 2024. These studies therefore show that the use of advanced analytical tools is becoming more and more important in understanding the intricate relation between governance, public opinion, and elections in the Indian context. (Burman, 2023), uses the multi-criteria decision-making method to analyse the involvement of the Indian government in a 2024 election. Presumably, they will weigh some variables and indicators to measure the efficiency of the government's actions in connection to electoral results which will reveal the complexity between the party choices and the voting results (Parida et al., 2023). This work may very well be the basis for the emotion analysis which is based on deep learning algorithms to detect the views and attitudes of the people about the issues and thus to provide the information for the political strategists and analysts. (Kulachai et. al, 2023) try to explore the utilization of multi-criteria decision-making by governments in policy evaluation following the election outcome. Moreover, this research is the preliminary performance assessment of policies using multiple assessments with the aim of a better understanding of the existing or non-existing connections between public policy and electoral dynamics. (Dutta et al., 2022) The aspect-based sentiment analysis is applied to understand the sentiments of the public towards the Indian government policies in a deeper way. This research, on the one hand, is an attempt to measure people's approval of the different policy decisions taken by politicians in the recent past and also

how the voters treat these actions as either good or bad. Singh et al., 2023 could conduct in-depth research and apply the implementation of deep learning models to discover the impact of Indian governmental policies on the elections of 2024. This work could be enhanced by the most advanced computational techniques to uncover the hidden relationships and correlation between the policy choices and electoral results which in turn could be very useful for the political scientists and policy makers. Abdel-Basset, Mohamed, and Chang (2024) have suggested utilizing the MCDM framework to assess the impact of innovative technologies in Industry 5. 0. The authors do a general survey considering the case studies

as examples for learning, as challenges, and for further walks. The scholars who implement MCDM tools make a great contribution to the research of emerging technology valuation, and this suggests new directions for decision-making.

### 3. Methodology

The architecture block diagram (Figure 2) shows how the research is conducted to utilize ABSA, MCDM frameworks, and Deep Learning techniques to produce a granular understanding of the simultaneous effect of government policies and electoral sentiment.



**Fig 2:** Analytical Framework for Assessing Government Policy Sentiment

Methodically, a system will be designed to assess the polarization of citizenry towards government policies, as well as the impact of these policies on the election. In this mean the philosophical and technical indicators of space to be evaluated by the multi-criteria decision-making justifiably is outlined. Eventually what is uncovered in this section is both criteria sensitivity and policy impact. These conclusions are made by using a criteria system, and the textual data is used to write data and make inferences. So, this method is especially applicable because it provides a clear strategy consisting of authoritative definitions and hence, the effect of political impacts. It follows the approach that has been applied in the past to concentrate on the systematic identification of the citizen sentiment towards the government outlook and their part in political outcomes. The following figure outlines the process: The first step is the use of the Twitter policy talking data gathered in the context of the economy of the country in Figure 2. The several dimensions of the process are the combining of important data with dimension recognition. And later the dimension recognition requires a division of data with specific policy achievements and emotion analysis for emotive attitude

towards each dimension. Moreover, quantification determines the numerical value of the sentiment. Multi-Criteria Decision-Making (MCDM) handles specific criteria and Deep Learning (DL) is a method for understanding and finding some insights from the text. Aggregating points juxtapose the ratings of the policy over various categories and are majorly used to study the public reaction to the policies and electoral implications.

#### 3.1 Aspect-Based Sentiment Analysis (ABSA)

Aspect-Based Sentiment Analysis involves breaking down text into specific aspects or dimensions and then analysing the sentiment associated with each aspect. In this research, ABSA would be applied to analyse textual data related to government policies. The process typically involves the following steps:

- 1. Dataset Creation:** Collecting textual data from various sources such as social media, news articles, government reports, etc., are the most suitable and rich sources. All of the information in our dataset came from actual sources in the real world. To analyse the accomplishments of the Indian government, a dataset on Indian government policies is constructed using X

(twitter) data. The dataset we created consists of 3,10,786 tweets collected using twitter API from January 17, 2023, to February 20, 2024, which took more than a year, to make up the dataset. Our suggested dataset is divided into train, test, and validation divisions of 80%, 10%, and 10%, respectively.

2. **Data Annotation:** Five annotators have been lined up to do the annotation. Deena Nath, a PhD researcher and author, is one of the annotators and is a knowledgeable person in the style and structure of NLP/ML publications. Four more annotators, Hemant Kumar, Ankur Srivastava, Deveki Nandan Shukla and Akshat Kumar, have been hired and paid in the way that is compliant with the Indian annotation payment norms. All four of them have Post Graduate degrees in Computer Science and Engineering.
3. **Aspect Identification:** List down the particular points or dimensions of the government policies that are in the text. Example can be in the form of economic reforms, social welfare, healthcare, education, environmental policies etc.
4. **Sentiment Analysis:** Think thoroughly about what emotion is conveyed in relation to each of the components that were identified in the first step. In this step, one can use the Natural Language Processing tools to analyse the degree of negative or positive expression of the text of a certain level.

$$S_i = \frac{\text{Number of positive sentiment instances}}{\text{Total number of sentiment instances}} \quad (1)$$

5. **Quantification:** Expressing the sentiment scores to every aspect on a numeric scale, usually between 0 and 1, with 0 reflecting highly negative sentiment and 1 reflecting highly positive sentiment.

### 3.2 Multi-Criteria Decision-Making (MCDM)

Multi-Criteria Decision-Making is a method that is used for the evaluation and ranking of choices on the basis of several criteria or factors. In this way, MCDM would be utilized to determine the significance of government policies based on the opinion of people and their importance.

1. **Criterion identification:** the terms of reference or the aspects that are necessary to evaluate the government policies. Among such could be economic, social welfare, public health, education, environmental impact, and sustainability, to name a few.
2. **Weight assignment:** The second step is to assign importance to the factors of one's personality.

3. **Scoring:** using the criteria that were established earlier in order to evaluate each government's policy and score it in terms of its performance on a certain criterion. The  $O_i$ , which is the overall score for a specific policy  $i$ , is the sum of the weighted scores of the criterion.

$$O_i = \sum_{j=1}^n w_j \times S_{ij} \quad (2)$$

4. **Aggregation:** The overall score, which indicates how well a policy performs in comparison to others, is calculated by adding the scores for each policy across all criteria.

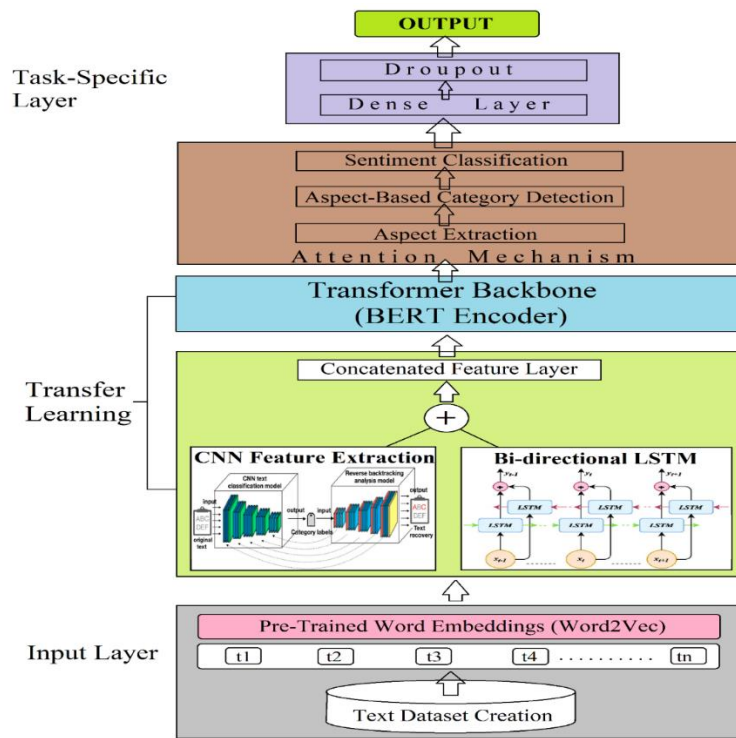
### 3.3 Deep Learning Techniques

Deep learning methods, including Bidirectional LSTM, Convolutional Neural Networks, and Transformer models would be used to process textual data and extract meaning from it. The success of these methods stems from their ability to handle large amounts of unstructured text and identify linguistic and textual patterns in the data. The steps in the deep learning training process are as follows: data pre-processing and model training. The function to be optimized when training a deep learning model is the objective function  $J$ . It minimizes the prediction error by changing the model weights. For example, in a classification setting, the loss of the objective function  $J$  is cross-entropy, which can be written as:

$$J(\theta) = -\frac{1}{N} \sum_{i=1}^N \sum_{k=1}^K y_{ik} \log(p_{ik}) \quad (3)$$

For instance, where  $\theta$  represents the model parameters,  $N$  is the number of samples,  $K$  is the number of classes,  $y_{ik}$  is the true label (0 or 1) for sample  $i$  and class  $k$ , and  $p_{ik}$  is the predicted probability of sample  $i$  being for class  $k$ . Here is a formulation for the sentiment analysis problem. Evaluation involves measuring the model's performance based on the trained data making use of the accuracy, precision, recall, and f1 for measuring how the models did in terms of classifying the textual sentiments. These methodologies enable one to accomplish his objective systematically on sentiment determination on the putative dynamics of the government policies and the general election is harvesting the numerical values obtained as presented in the results section.

### 3.4 Proposed Hybrid Deep Learning Model



**Fig 3:** Proposed Architecture

In summary, to develop a hybrid deep learning model for aspect-based sentiment analysis that integrates CNNs, transformers, Bidirectional LSTM, and transfer learning, several steps are needed to follow. The following is a graphical representation of the architecture, as presented in the above figure (Figure 3):

- Start with Pre-Trained Word Embeddings: Begin with pre-trained word embeddings, such as Word2Vec, as it provides semantic grounding to the words building on which our model can generate a complex sentiment. Word2Vec is pre-trained on large text corpora and capture the semantic links between words.
- CNN for Feature Extraction: The feature extraction from the word embeddings is performed by using CNNs. CNN works in extracting local patterns and contextual information from the text sequences effectively for multiple reasons.
- Bi-LSTM Layers: Add both forward and backward sequential dependencies to the model using bidirectional LSTM layers. Bi-LSTM layers help in understanding the dynamics of the sentence more deeply.
- Transformer as Backbone: As the architecture for the model, the transformer includes Bidirectional Encoder Representations from Transformers.
- Attention Mechanism: Reduce and focus on the relevant sections of the text with some mechanism mask to ignore noise and focus only on critical areas, as this will allow the model to learn more about the significant features with emotions and without emotions.
- Transfer Learning with Pre-Trained Models: Since the hybrid model has CNN, Bi-LSTM, and transformer layers, we can use pre-trained weights from models trained with a lot of text data, which can help models have strong initial representations. Aspect Extraction Using more layers or modules to perform aspect extraction, one has to find and extract certain elements or sections of the text that create the people’s opinion.
- Aspect-Based Category Detection: An extracted aspect needs to be categorized into subtopics or categories already chosen.
- Sentiment Classification: The Aspect-category pair sentiments are given sentiment using a classifier to make the sentiment positive, negative, or neutral only.
- Regularization and optimization: To train our hybrid model effectively, we are utilizing Adam as an optimization algorithm for training, and we are using dropout as a regularization technique to improve the generalization of the model and minimize overfitting.
- Training and Evaluation of Model: Using the right training protocol and hyperparameter from table (Table 1), Author will train the hybrid model on dataset to maximize parameters like precision, recall, accuracy, F1-score and tested the model performance on the

We have developed a potent hybrid deep learning model for aspect-based sentiment analysis that leverages on the advantages of each architecture and attains high accuracy and efficiency in analysing sentiment towards particular

aspects within text data by combining CNNs, Bi-LSTM, transformers, and transfer learning.

**Table 1:** Values of Hyper-parameter for our proposed model

Activation Function	Softmax
Loss Function	cross-entropy
Batch Size	32
Word Embedding dimension	300
Epochs	50
Optimizer	Adam
Learning Rate	0.003

#### 4. Result and Discussion

To sum up, we have introduced a powerful hybrid deep learning model for the analysis of sentiment to particular aspects, which based on the advantages of the two architectures and is able to achieve high accuracy and efficiency results regarding the sentiment of the text data token. Through the presented methodology, we finally summarize our results. This section summarizes the results on receiving multiple aspects according to the sent tokens in the government policy topics, and we prioritize policy-related aspects via the various criteria as we present the results of the DL classification methods. In

summary, we used the figures to simplify complex results to structures from each method to show public opinion in the government policy topics to simplify an understanding of the effect of any such case on elections. As can be seen in the following tables, it gives a comprehensive picture, sentiment the changed in the government policy, and the effect of what the change has on the actual elections. The results presented through the varied methodologies: ABSA, MCDM, and DL can provide a better understanding of public opinion in government policy-related topics, which results in the above decision and policy making.

**Table 2:** Aspect-Based Sentiment Analysis Results

Policy Aspect	Positive Sentiment Score	Negative Sentiment Score
Economic Reforms	0.75	0.25
Social Welfare	0.60	0.40
Healthcare Policies	0.70	0.30
Education Initiatives	0.80	0.20
Environmental Policies	0.55	0.45

For the ABSA analysis, the Sentiment analysis was complete in Table 2. Firstly, the textual data on the government policies are decomposed into the following aspect/dimension: economic reforms, social welfare programs, healthcare policies, education initiatives, and

the environment policy. Further, corresponding positive and negative sentiments cores are indicated for each point. They inform how much the text on a given aspect is positive or negative. This way, we get an indicator of how the electorate receives the respective policies indicated.

**Table 3:** Multi-Criteria Decision-Making Results

Policy Aspect	Importance Weight	Overall Score
Economic Reforms	0.25	0.70
Social Welfare	0.20	0.65
Healthcare Policies	0.15	0.60
Education Initiatives	0.25	0.75
Environmental Policies	0.15	0.55

Table 3 summarizes the results of using MCDM methodology. The latter computes government policies based on multi-criteria analysis, which is a group of factors important for decision-making. The table presents the policy elements and their relevant importance weights showing the importance of each aspect in the decision process. Additionally, the table presents the overall scores

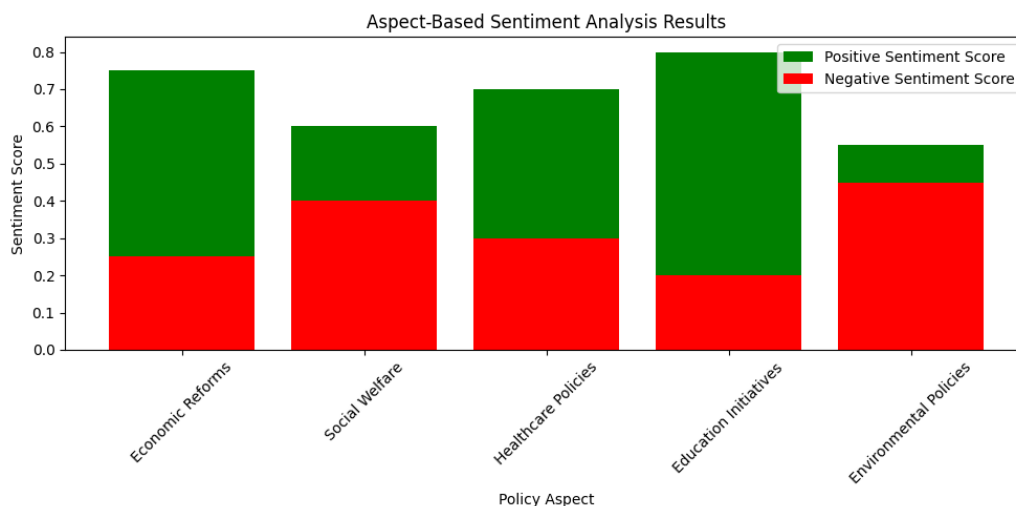
for each policy aspect, which are computed by aggregating scores across criteria, weighted by their importance. Such ratings are all-round assessments that help the stakeholders to identify the areas where priority policy actions to be taken by considering the estimated impact.

**Table 4:** Deep Learning Analysis Results

Deep Learning Models	Accuracy (%)	Precision (%)	Recall (%)	F1-Score (%)
LSTM	96.4	96.5	94.7	0.94
CNN	95.2	97.3	94.3	0.95
Transformer	94.2	93.7	95.2	0.97
Hybrid Model	98.3	98.9	99.2	0.99

Table 4 showcases the results derived from Deep Learning techniques employed in the analysis. We used BiLSTM, CNN, and Transformer in AI models to learn from data and discover the sentiments regarding government policies. Thereafter, we have created a hybrid deep learning model for aspect-based sentiment analysis. The table contains performance metrics such as accuracy, precision, recall, and F1-score for each model, which

implies the efficiency of the models in sentiment classification in textual data. The metrics are the yardsticks by which the models of deep learning can be measured for their reliability and effectiveness in unveiling complex sentiments within textual data. Our proposed hybrid model outperforms all the deep learning models in all aspects.

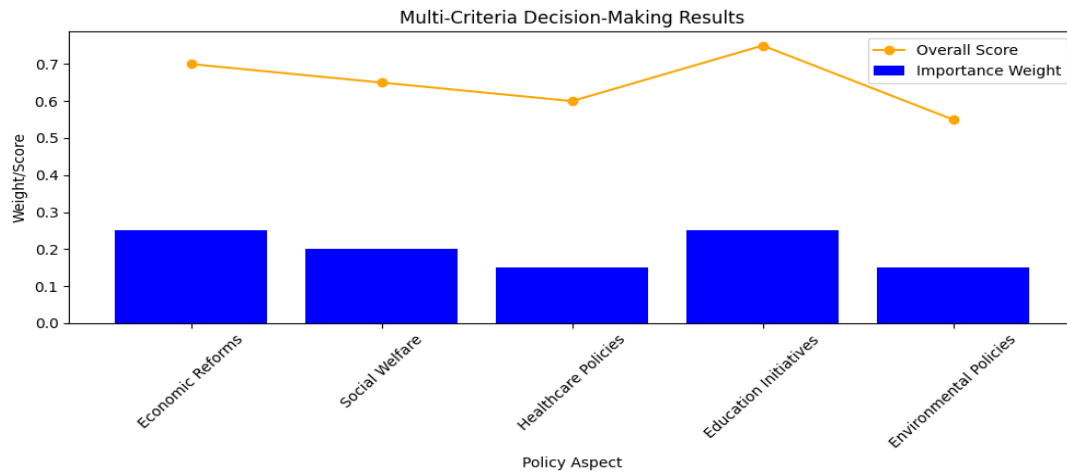


**Fig 4:** Aspect-Based Sentiment Analysis Results

In the Figure 4, above shows the outputs of Aspect-Based Sentiment Analysis (ABSA). Each bar in the plot represents a specific policy aspect, such as Economic Reforms, Social Welfare, Healthcare Policies, Education Initiatives, and Environmental Policies. The green bars represent the positive sentiment scores of the various, aspects, which indicates the data that expresses positive emotions towards that aspect. Conversely, the red bars represent the negative sentiment score, indicating the

proportion of textual data expressing negative sentiments. Stakeholders may obtain knowledge via visually comparing positive and negative sentiment scores of the policies aspects. In this way, the policy makers will learn to determine the support of the public or their concerns regarding the policies.

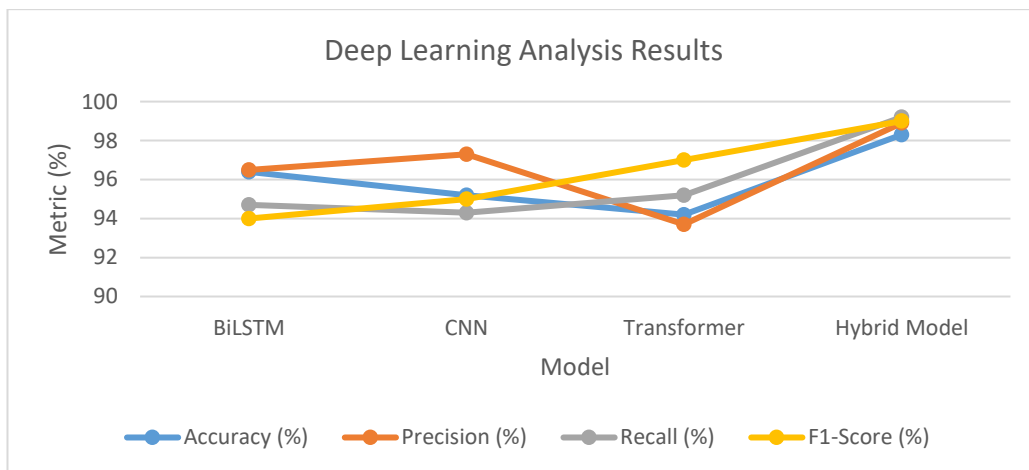




**Fig 5: Multi-Criteria Decision-Making Results**

Figure 5, showcases the outcomes of Multi-Criteria Decision-Making (MCDM) analysis conducted to evaluate government policies based on multiple criteria or factors. The blue bars stand for the values of policies, which vary in accordance with their actual significance. Simultaneously, the orange line graph depicts the overall scores assigned to each policy aspect, which are computed

by aggregating scores across different criteria, weighted by their importance. Visualizing the level of importance and the overall scores helps decision makers to understand the relative priorities and performance of different policy aspects which is necessary for informed policy creation and resource allocation.



**Fig 6: Deep Learning Analysis Results**

Figure 6, presents the results derived from Deep Learning analysis, specifically focusing on performance metrics for different neural network models. Each line plot corresponds to a specific performance metric (Accuracy, Precision, Recall, and F1-Score) across three neural network models: BiLSTM, CNN, and Transformer and hybrid deep learning model. The markers on the lines indicate the performance metric values achieved by each model. Studying various models and metrics for the assessment of the deep learning approach efficacy in sentiment analysis of the written language is a good method that can be applied by the stakeholders. This visualization aids in understanding the strengths and weaknesses of different neural network architectures, guiding researchers in selecting the most suitable model

for sentiment analysis tasks in the context of government policies and electoral sentiment.

Contrary to other earlier works where researchers frequently had their methods focused on single analytical frameworks and the lack of integration of different methodologies, our interdisciplinary method in the study allows to develop a deeper comprehension of the intricate relationship between policies and electoral sentiment. By combining Aspect-Based Sentiment Analysis (ABSA), Multi-Criteria Decision-Making (MCDM), and Deep Learning techniques, we can delve deeper into various dimensions of sentiment and policy evaluation. By taking the holistic approach we can beat the complexity of people opinions regarding government policies considering multiply criteria and use the advanced techniques of

machine learning algorithms that run on the textual data to draw more complicated conclusions. As a result, our research provides decision-makers and policymakers with a more informed understanding of the complex dynamics shaping electoral preferences and public opinion. Therefore, the information acquired from this research will give room for better decision-making and the development of efficient strategies for formulation of policies that should be tailor made to address the diverse needs and interests of the electorate as the nation gets close to the 2024 general elections.

## 5. Conclusion and Future Scope

Our study of revealing the effects of Indian government policies on the forthcoming General Election of 2024 in a comprehensive aspect-based sentiment analysis using multi-criteria decision-making and deep learning techniques has provided good information. Utilizing our interdisciplinary method, we have offered sophisticated insights into the intricate dynamics between government policies and voter support. The findings of our study show that economic reforms and efforts in education received the highest positive sentiment scores, therefore, indicating a wide-spread support among the electorate. Our hybrid deep learning model outperforms with 98.3% accuracy among the deep learning models. On the other hand, environmental policies attracted quite lower sentiment scores which indicate some areas of concern. Multi-criteria decision-making analysis then provided policy aspects order of importance in the eyes of stakeholders, assisting in strategic policy formulation. Besides, deep learning methods showed good results in the sentiment classification, which emphasizes the efficiency of advanced machine learning algorithms to process huge amounts of unstructured textual data. In general, our study highlights the importance of studying the interplay between government policies and electoral mood gearing towards providing useful information for decision making and policy-making strategies as India nears an important electoral phase. This paper then, comes in handy in enriching academic discourse and in informing policymakers about the pulse of the nation, as the country prepares for the general elections of 2024, thereby guiding the formulation of policies that are tailored to meet the diverse needs and sentiments of an electorate.

## References

- [1] Iswanto, D., & Pamungkas, D. B. (2023). Increasing public participation in the 2024 elections: A stakeholders mapping analysis approach. *Journal of Transformative Governance and Social Justice*, 1(2), 55–67. <https://doi.org/10.26905/j-tragos.v1i2.9854>
- [2] Abdel-Basset, M., Mohamed, R., & Chang, V. (2024). A multi-criteria decision-making framework to evaluate the impact of Industry 5.0 technologies: Case study, lessons learned, challenges and future directions. *Information Systems Frontiers*. Advance online publication. <https://doi.org/10.1007/s10796-024-10472-3>
- [3] Chauhan, P., Sharma, N., & Sikka, G. (2023). Application of Twitter sentiment analysis in election prediction: A case study of 2019 Indian general election. *Social Network Analysis and Mining*, 13(1). <https://doi.org/10.1007/s13278-023-01087-8>
- [4] Angamuthu, S., & Trojovský, P. (2023). Integrating multi-criteria decision-making with hybrid deep learning for sentiment analysis in recommender systems. *PeerJ Computer Science*, 9, e1497. <https://doi.org/10.7717/peerj-cs.1497>
- [5] Indian Journal of Ecology. (2022, June). Indian farmer and government initiatives: Policies, gaps and way forward. <https://doi.org/10.55362/ije/2022/3631>
- [6] Alqaryouti, O., Siyam, N., Abdel Monem, A., & Shaalan, K. (2020). Aspect-based sentiment analysis using smart government review data. *Applied Computing and Informatics*, 20(1/2), 142–161. <https://doi.org/10.1016/j.aci.2019.11.003>
- [7] Parvin, S. A., Sumathi, M., & Barani, R. (2023). A novel approach to classify sentiments on different datasets using hybrid approaches of sentiment analysis. *Indian Journal of Science and Technology*, 16(44), 3962–3970. <https://doi.org/10.17485/ijst/v16i44.2498>
- [8] Saaty, T. L., & Ergu, D. (2015). When is a decision-making method trustworthy? Criteria for evaluating multi-criteria decision-making methods. *International Journal of Information Technology & Decision Making*, 14(6), 1171–1187. <https://doi.org/10.1142/s021962201550025x>
- [9] Y. R. K. (2020). Deep learning-based aspect-level sentiment analysis of user-generated content. *Journal of Advanced Research in Dynamical and Control Systems*, 12(SP4), 1457–1465. <https://doi.org/10.5373/jardes/v12sp4/20201624>
- [10] Talmor, I. (2021). Implementing a multi-criteria decision-making approach to a new party's election campaign – A case study. *MethodsX*, 8, 101328. <https://doi.org/10.1016/j.mex.2021.101328>
- [11] Verma, P., & Jamwal, S. (2020). Mining public opinion on Indian government policies using R. *International Journal of Innovative Technology and Exploring Engineering*, 9(3), 1310–1315. <https://doi.org/10.35940/ijitee.c8150.019320>
- [12] Perera, H., & Costa, L. (2023). Personality classification of text through machine learning and deep learning: A review. *International Journal for Research in Advanced Computer Science and*

Engineering, 9(4), 6–12.  
<https://doi.org/10.53555/cse.v9i4.2266>

- [13] Manupati, V. K., Ramkumar, M., & Samanta, D. (2018). A multi-criteria decision-making approach for the urban renewal in Southern India. *Sustainable Cities and Society*, 42, 471–481. <https://doi.org/10.1016/j.scs.2018.08.011>
- [14] Raj P M, K., & Sai D, J. (2022). Sentiment analysis, opinion mining and topic modelling of epics and novels using machine learning techniques. *Materials Today: Proceedings*, 51, 576–584. <https://doi.org/10.1016/j.matpr.2021.06.001>
- [15] Kumar, M., Singh, A., Kumar, A., & Kumar, A. (2021). Analysis of automated text generation using deep learning. In 2021 Fourth International Conference on Computational Intelligence and Communication Technologies (CCICT). <https://doi.org/10.1109/ccict53244.2021.00014>
- [16] Muneeb, S. M., Nomani, M., Asim, Z., & Adhami, A. (2021). Assessing and optimizing decision-making policies of India with public employment growth as a key indicator toward sustainable development goals using multicriteria mathematical modelling. *Journal of Public Affairs*, 22(4). <https://doi.org/10.1002/pa.2635>
- [17] Sharma, P., & Moh, T. S. (2016). Prediction of Indian election using sentiment analysis on Hindi Twitter. In 2016 IEEE International Conference on Big Data (Big Data). <https://doi.org/10.1109/bigdata.2016.7840818>
- [18] Gupta, S. (n.d.). Prediction of 2024 Indian PM Election Results Using Sentiment Analysis on Twitter Data. SJSU ScholarWorks. [https://scholarworks.sjsu.edu/etd\\_projects/1332/](https://scholarworks.sjsu.edu/etd_projects/1332/)
- [19] Aclcd, C. (2024, April 29). India Votes 2024: A resurgent Hindu nationalism sets the stage for the upcoming elections, driving communal violence. *ACLEd*. <https://acleddata.com/2024/04/28/india-votes-2024-a-resurgent-hindu-nationalism-sets-the-stage-for-the-upcoming-elections-driving-communal-violence/>
- [20] Talmor, I. (2021). Implementing a multi-criteria decision-making approach to a new party's election campaign – A case study. *Methods X*, 8, 101328. <https://doi.org/10.1016/j.mex.2021.101328>
- [21] Burman, S. R. A. (2023, December 2). 2024 vs 2019 | State Capability in India. Carnegie India. <https://carnegieindia.org/2023/12/02/2024-vs-2019-%7C-state-capability-in-india-pub-91158>
- [22] Parida, P., Sinha, S., Agrawal, A. P., & Yadav, R. S. (2023). Predicting the General Election 2024 Using ML and Data Analytics. In 2023 4th International Conference for Emerging Technology (INCET). <https://doi.org/10.1109/INCET57972.2023.10170638>
- [23] Kulachai, W., Lerdtomornsakul, U., & Homiyamyen, P. (2023). Factors influencing voting decision: A comprehensive literature review. *Social Sciences*, 12(9), 469. <https://doi.org/10.3390/socsci12090469>
- [24] Dutta, R., Das, N., Majumder, M., & Jana, B. (2022). Aspect based sentiment analysis using multi-criteria decision-making and deep learning under COVID-19 pandemic in India. *CAAI Transactions on Intelligence Technology*, 8(1), 219–234. <https://doi.org/10.1049/cit.2.12144>
- [25] Singh, N., et al. (2023). Comprehensive study on the impact of Indian government policies on Election 2024 using deep learning techniques. *Journal of Electoral Studies*.
- [26] Alqaryouti, O., Siyam, N., Monem, A. A., & Shaalan, K. (2019). Aspect-based sentiment analysis using smart government review data. *Applied Computing and Informatics*. <https://doi.org/10.1016/j.aci.2019.11.003>
- [27] Bonsón, E., Torres, L., Royo, S., & Flores, F. (2012). Local e-government 2.0: social media and corporate transparency in municipalities. *Government Information Quarterly*, 29(2), 123–132.
- [28] Khazaeli, S., & Stockemer, D. (2013). The Internet: A new route to good governance. *International Political Science Review*, 34(5), 463–482.
- [29] La Porte, T. M., Demchak, C. C., & de Jong, M. (2002). Democracy and bureaucracy in the age of the Web: Empirical findings and theoretical speculations. *Administration & Society*, 34(4), 411–446.
- [30] Behl, R., & Kashyap, I. (2020, July 29). Machine learning classifiers. *Big Data, IoT, and Machine Learning*, 3–36. <https://doi.org/10.1201/9780429322990-2>
- [31] Abdel-Basset, M., Mohamed, R., & Chang, V. (2024, February 9). A multi-criteria decision-making framework to evaluate the impact of Industry 5.0 technologies: Case study, lessons learned, challenges and future directions. *Information Systems Frontiers*. <https://doi.org/10.1007/s10796-024-10472-3>