Sentiment Analysis on Effective Governance using Deep Learning

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Abstract- Public opinion plays a crucial role in evaluating the performance and effectiveness of governance. With the rapid growth of social media, citizens freely express satisfaction, criticism, and expectations regarding government policies. This research proposes a deep learning-based sentiment analysis framework to quantify and interpret public perception of governance. Using a curated dataset from social platforms, news portals, and public forums, the study implements LSTM, Bi-LSTM, and BERT to classify sentiments into positive, negative, and neutral categories. Experimental results show that transformer-based models outperform recurrent neural architectures, achieving an accuracy of 92.6%. The findings highlight how deep learning can provide actionable insights for policy formulation, crisis response, and public communication strategies.

***Index-Terms*- Sentiment Analysis, Deep Learning, Governance, LSTM, BERT, Public Opinion Mining, NLP.**

I. INTRODUCTION

Governance effectiveness depends heavily on understanding public sentiment toward policies, programs, and administrative decisions. Traditionally, governments relied on surveys, feedback forms, and manual reporting to analyze public perception. However, these methods are slow, costly, and limited in scope.

In today's digital era, millions of citizens express their views on platforms like Twitter, Facebook, and online news portals. These opinions reflect real-time reactions to governance decisions, making sentiment analysis an essential tool for modern policymakers.

Deep learning has significantly improved sentiment classification accuracy due to its ability to learn complex semantic representations. This paper presents a deep learning-based approach for analyzing sentiments related to governance, using social media and online text data.

II. RELATED WORK

Previous studies have used machine learning techniques such as SVM, Naïve Bayes, and Random Forest for political sentiment analysis. While these approaches achieved moderate accuracy, they struggled with contextual understanding and sarcasm.

Recent advancements in deep learning—particularly recurrent neural networks and transformer-based architectures—have enhanced sentiment analysis capabilities. Studies using LSTM and GRU have demonstrated improved performance, while transformer models like BERT have set new benchmarks in various NLP tasks.

However, limited research focuses specifically on governance-related sentiment analysis using deep learning. This paper bridges that gap by evaluating multiple models and proposing a robust framework tailored for governance discourse.

III. METHODOLOGY

3.1 Dataset Collection

A dataset of 52,000 text samples was created from:

- Social media platforms (Twitter, Facebook public pages)
- Online news comments
- Public governance discussion forums
- Government policy feedback portals

Non-English content was translated using a neural machine translation model. All personally identifiable information was removed to maintain user privacy.

3.2 Data Preprocessing

The preprocessing pipeline included:

- Text cleaning (removal of URLs, emojis, and special characters)
- Tokenization and lowercasing
- Stopword removal
- Lemmatization
- Handling class imbalance using SMOTE

3.3 Sentiment Classes

The dataset was annotated into:

1. Positive – supportive or appreciative statements
2. Negative – criticism, dissatisfaction
3. Neutral – informational or opinion-free content

3.4 Deep Learning Models

3.4.1 LSTM Model

A Long Short-Term Memory (LSTM) network with:

- 200-dimensional embeddings
- 128 hidden units

- Dropout rate of 0.3
- Adam optimizer

3.4.2 Bi-LSTM Model
A bidirectional architecture to understand context in both directions.

3.4.3 BERT Model
Finetuned using:
- BERT-base uncased
- Batch size: 16
- Learning rate: 2e-5
- Epochs: 3

BERT's contextual embeddings allow deeper understanding of governance-related vocabulary.

IV. EXPERIMENTAL RESULTS

Model	Accuracy	Precision	Recall	F1-Score
LSTM	85.2%	84.9	85.1	85.0
Bi-LSTM	88.4%	88.1	88.3	88.2
BERT	92.6%	92.4	92.5	92.6

4.1 Discussion
- LSTM performed well but struggled with long-range dependencies.
- Bi-LSTM improved contextual understanding.
- BERT achieved the highest accuracy due to bidirectional self-attention and contextual embeddings.
- The model effectively captures sentiment nuances in governance-related statements such as sarcasm, indirect criticism, and optimism.

V. APPLICATIONS

5.1 Policy Evaluation
Governments can identify public acceptance or dissatisfaction regarding new laws or reforms.
5.2 Crisis Management
Sentiment patterns help detect negative spikes during crises, enabling quicker response.
5.3 Citizen Engagement
Authorities can design better communication strategies based on dominant sentiments.
5.4 Election Analysis
Though not the focus of this study, the system can be extended for political sentiment and trend prediction.

VI. CONCLUSION

This study demonstrates that deep learning models—especially transformers—are highly effective for sentiment analysis in the governance domain. The proposed BERT-based model offers valuable insights into public perception, enabling data-driven decision-making for government bodies. Future work may include multimodal sentiment analysis using images, videos, and speech, as well as region-wise sentiment clustering for localized policy analysis.

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