

Generative AI (Fall-2025)

Assignment-4

Instructor

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Submission Guidelines:

- Submit your assignment on Google Classroom in the format "22XX.ipynb". You have to submit one report document and one code file.
- The deadline is 29 October, 2025, at 11:59 PM. No extensions will be granted.

Declarations:

- Late submissions will incur penalties: 25% deduction on the first day, 50% on the second day, and zero marks thereafter.
- Plagiarism will result in zero marks for the assignment.
- This is an individual assignment; collaboration or group work is strictly prohibited. Please ensure that you submit your own original work.

VIVA Policy:

- A VIVA (oral examination) will be conducted to assess your understanding of the assignment.
- The VIVA will be scheduled separately, and you will be notified of the date and time.
- Failure to attend the VIVA will result in zero marks for the assignment.

Academic Integrity:

- Plagiarism, collusion, and academic dishonesty will not be tolerated. Any instances of academic misconduct will be reported to the authorities and may result in severe penalties.

Deep Learning for Sentiment Analysis on Urdu Text

You are required to develop a **sentiment analysis system** for Urdu text using **deep learning architectures**. The goal is to classify Urdu text or reviews as *positive*, *negative*, or *neutral*.

Tasks

1. Data Preparation

- Preprocess the Urdu dataset (tokenization, normalization, and stopword removal).
- Use the following **word embedding techniques**:
 - Word2Vec
 - FastText
 - ELMo

2. Model Implementation

- Implement two deep learning models:
 - RNN (Recurrent Neural Network)
 - LSTM (Long Short-Term Memory Network)
- Test each model with all three embeddings (i.e., run RNN and LSTM separately with Word2Vec, FastText, and ELMo).
- Evaluate performance using Accuracy, Precision, Recall, and F1-score.

3. Visualization

- Use **Plotly** to visualize model results.
- Create comparative plots for model–embedding combinations (e.g., accuracy vs embedding type, confusion matrices, etc.).

4. Analysis

- Discuss the effect of each embedding on model performance.
- Explain challenges specific to Urdu language sentiment analysis and how embeddings help handle them.
- Finally, specify which embedding technique performed the best and which model achieved the highest overall accuracy.

Deliverables

- Python code file (.ipynb)
- Report (2–3 pages) including:
 - Dataset description
 - Model and embedding details

- Comparative performance results
- Visualizations and analysis
- Final conclusion on the best-performing embedding and model

Evaluation Tables

Table 1: RNN Performance with Different Embeddings

Metric	RNN with Word2Vec	RNN with FastText	RNN with ELMo
F1-score			
Accuracy			
Precision			
Recall			

Table 2: LSTM Performance with Different Embeddings

Metric	LSTM with Word2Vec	LSTM with FastText	LSTM with ELMo
F1-score			
Accuracy			
Precision			
Recall			

Conclusion

At the end of your report, specify:

- Which **embedding technique** performed best for Urdu sentiment analysis.
- Which **model** (RNN or LSTM) achieved the highest overall accuracy and F1-score.