# SENTIMENT ANALYSIS ON BANGLA TEXT USING LSTM, GRU, AND RNN NEURAL NETWORKS

# GROUP MEMBERS

Tabia Morshed

- ID : 20200204027

Tanvir Md Raiyan

- ID : 20200204034

Musaddique Ali Erfan

- ID : 20200204049

# INTRODUCTION

- **Sentiment Analysis:** Opinion mining to classify positive or negative opinions

- **NLP Focus:** Using LSTM, GRU, and RNN for Bangla text

- **Objective:** Improve accuracy of sentiment detection in Bangla language

# MOTIVATION

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Increasing importance for businesses and governments

Challenges with Bangla language complexity

Neural networks (LSTM, GRU, RNN) provide solutions for context and dependencies

# LITERATURE REVIEW

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[1] Sentiment Extraction Using RNN

- **Focus:** Character-level RNN for Bangla sentiment analysis.

- **Challenges Addressed:** Limited resources and complex grammar in Bangla.

- **Result:** Achieved 80% accuracy, outperforming word-level baselines.

- **Key Insights:** Effective for handling unseen words and complex grammatical structures.

# LITERATURE REVIEW

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[2] Deep Learning Models for Bangla Sentiment Analysis

- **Focus:** Comparison of CNN, LSTM, GRU, attention, and capsule networks.

- **Challenges Addressed:** Model performance in low-resource languages like Bangla.

- **Result:** Hybrid models (LSTM + Attention/Capsule) show superior performance.

- **Key Insights:** Hybrid models can enhance sentiment analysis for Bangla text.

# LITERATURE REVIEW

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[3] Bangla Hate Speech Detection Using Attention RNN

- **Focus:** Detection of hate speech in Bangla social media.

- **Challenges Addressed:** Classifying hateful content with complex and noisy data.

- **Result:** Attention-based RNN achieved 77% accuracy, improving from standard RNNs.

- **Key Insights:** Attention mechanisms enhance performance for complex text classification.

# LITERATURE REVIEW

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[4] Deep Learning for Bengali Headline Classification

- **Focus:** Classifying Bengali news headlines using LSTM, Bi-LSTM, and Bi-GRU.

- **Challenges Addressed**: Limited diversity and size of datasets.

- **Result:** Bi-LSTM model outperformed others in accuracy, precision, and recall.

- **Key Insights:** Larger, more diverse datasets are crucial for robust classification.

# LITERATURE REVIEW

[5] Deep Learning in Cyberbullying Detection

- **Focus:** Application of DL models (CNN, RNN, LSTM, BERT) for cyberbullying detection.

- **Challenges Addressed:** Dataset size, model interpretability, and adaptability to dynamic data.

- **Result:** Significant improvement in identifying cyberbullying content across platforms.

- **Key Insights:** Future research should focus on multilingual and multimedia data analysis.

# METHODOLOGY OVERVIEW

## Data Preprocessing

- Punctuation and stop words removal

## Tokenization

- Splitting text into tokens

## Word Embedding

- BengaliWord2Vec for word vector representation

# NEURAL NETWORK MODELS

RNN:

- Suitable for sequential data
- Struggles with long-term dependencies

LSTM:

- Addresses vanishing gradient problem
- Good for capturing long-term dependencies

GRU:

- Efficient variant of LSTM
- Combines forget and input gates into one

# MODEL TRAINING & EVALUATION

Trained RNN, LSTM, and GRU models

Metrics used: Accuracy, Precision, Recall, F1-score

Performance comparison using labeled Bangla text data

# RESULT ANALYSIS

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Performance Comparison:

- RNN: Accuracy 80.16%, Precision 40.08%

- GRU: Accuracy 86.11%, Precision 79.61%

- LSTM: Accuracy 86.23%, Precision 78.65%

Conclusion:

- LSTM and GRU outperform RNN

# CONCLUSION

- LSTM and GRU are better at capturing nuances in Bangla text

- Benefits for businesses and researchers targeting Bangla speakers

- **Future Work:** Exploring hybrid and attention-based models

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# THANK YOU