A Comparative Analysis of Various Machine Learning Classifiers for Contextual Emotion Detection

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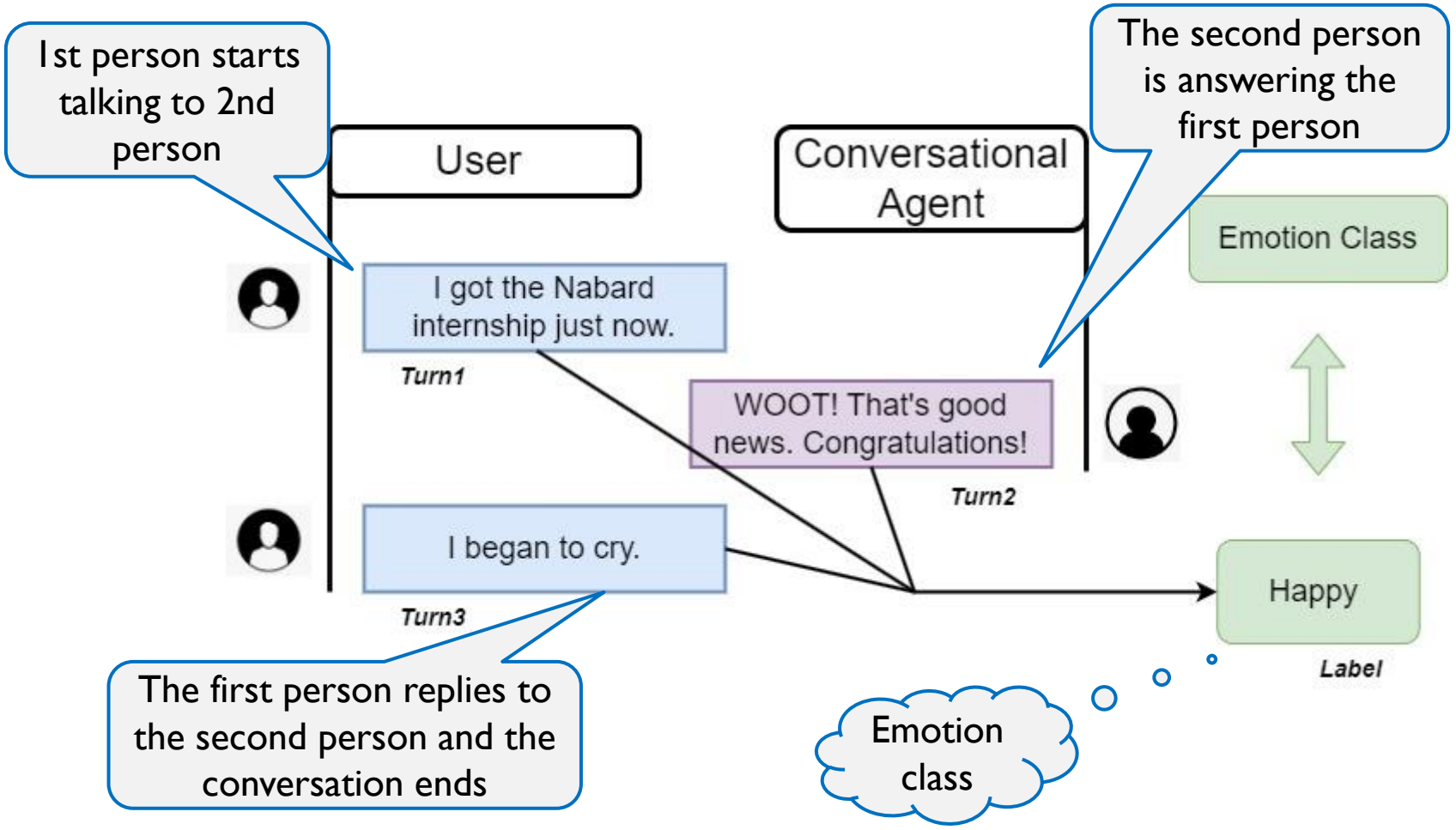
Problem Statement

Contextual emotion detection having two people in conversation



Motivation

Things that are motivating about this task.

❑ Challenges in Emotion Recognition

- The emotion of a dialogue keeps changing over utterances.
- Dataset contains emoticons, short forms, and slang words

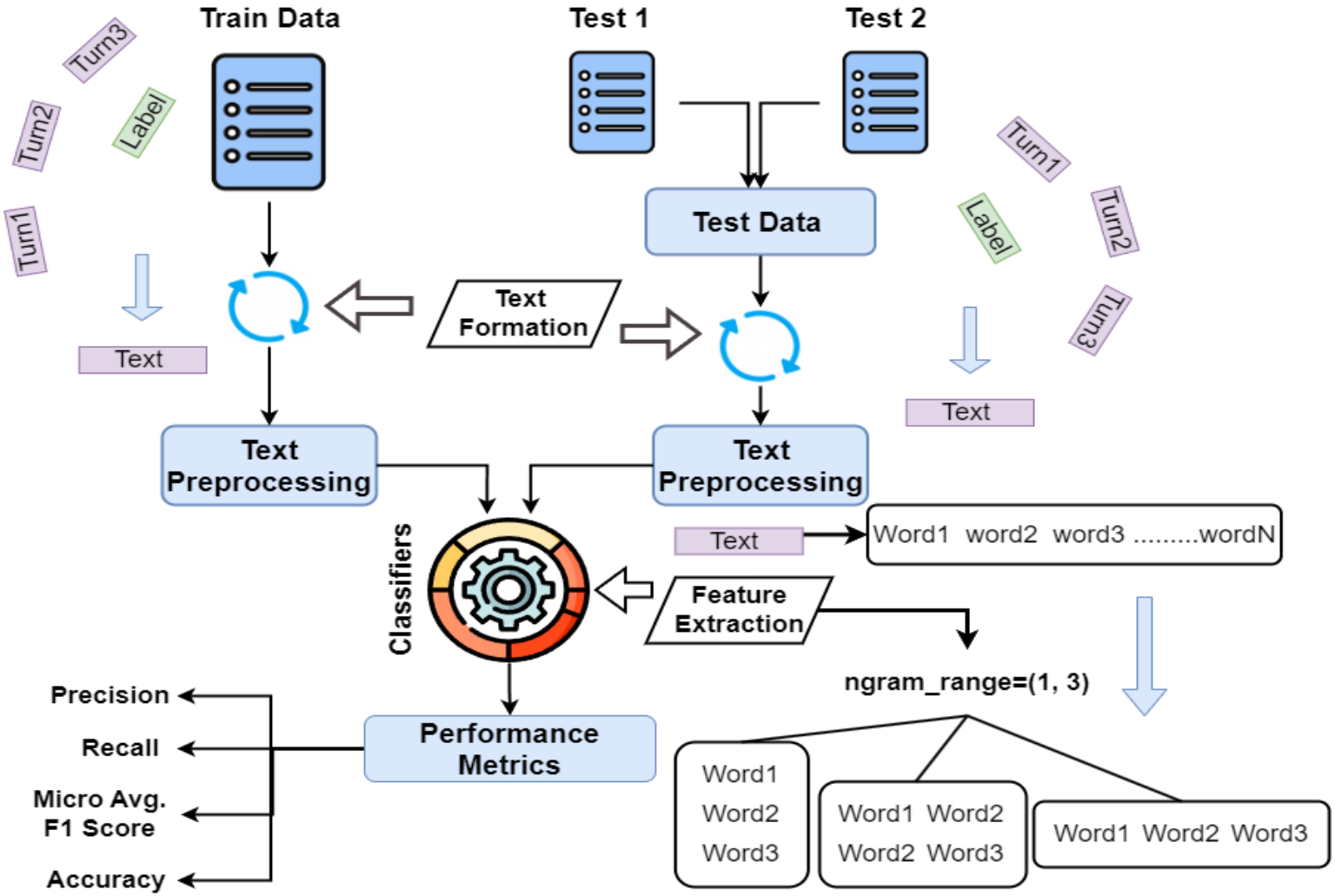
❑ Technological Advancements and Opportunities

- Chatbots like chatgpt and google bard
- Customer review analysis
- Mental health assessment

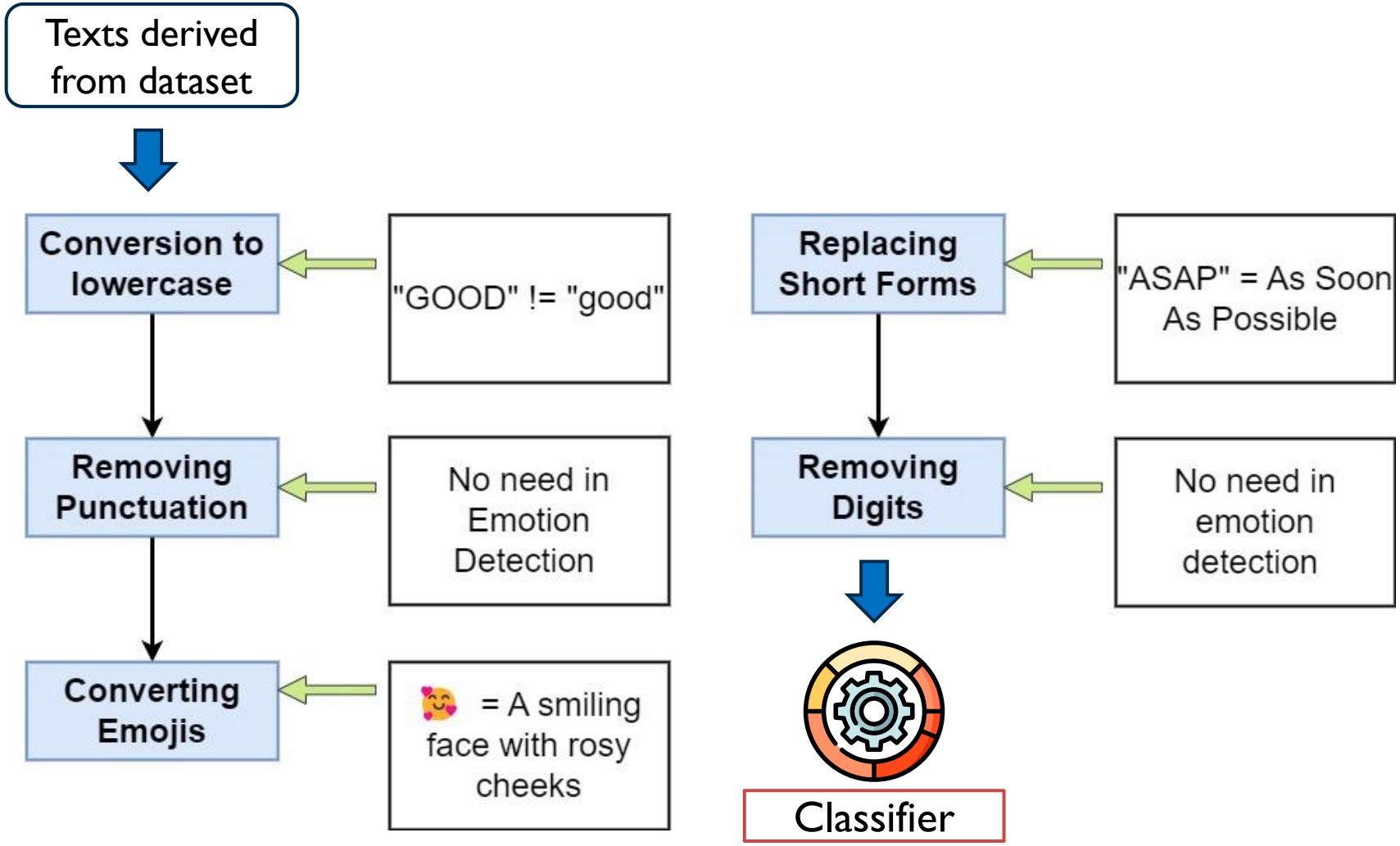
Related Work

- Chenyang et al. used a model that combines hierarchical LSTMs and BERT – 2019
- Sergey Smetanin introduced a deep learning model based on BiLSTM - 2019
- B. Senthil Kumar el al. proposed a Seq2Seq deep neural network to identify the emotions present in the text sequences - 2019
- Lixing el al. introduced a Transformer based approach to detect the emotion from a dialogue - 2021
- Jaehyeok Lee, DongJin Jeong, and JinYeong Bak proposed a Cause Pair Extraction (CPE) in Conversation With Contextual Information – 2023

Current Methodology



Current Methodology (Preprocessing)



Current Methodology (Classification Models)

- **Text classifiers are from scikit-learn library in Python**

- ❑ Multinomial Naive Bayes
- ❑ Linear Support Vector
- ❑ Stochastic Gradient Descent
- ❑ Decision Tree
- ❑ OneVsRestClassifier

Common Steps

ngram_ range(1,3)

- Vectorization of text data
- Preprocessing and Feature Extraction
- Sparse Data Representation
- Classification Algorithms
- Evaluation Metrics and Cross-Validation

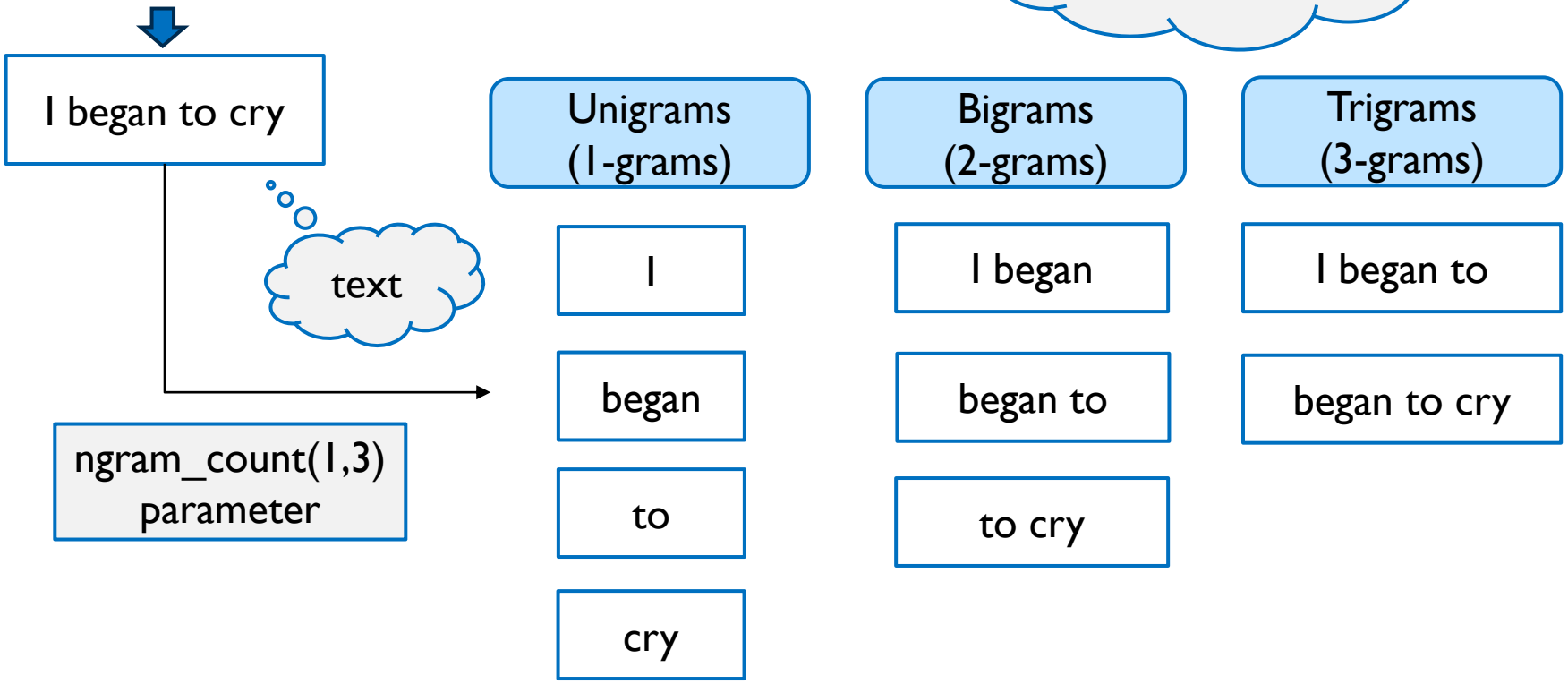
Micro-averaged F1 score

Current Methodology (Feature Extraction)

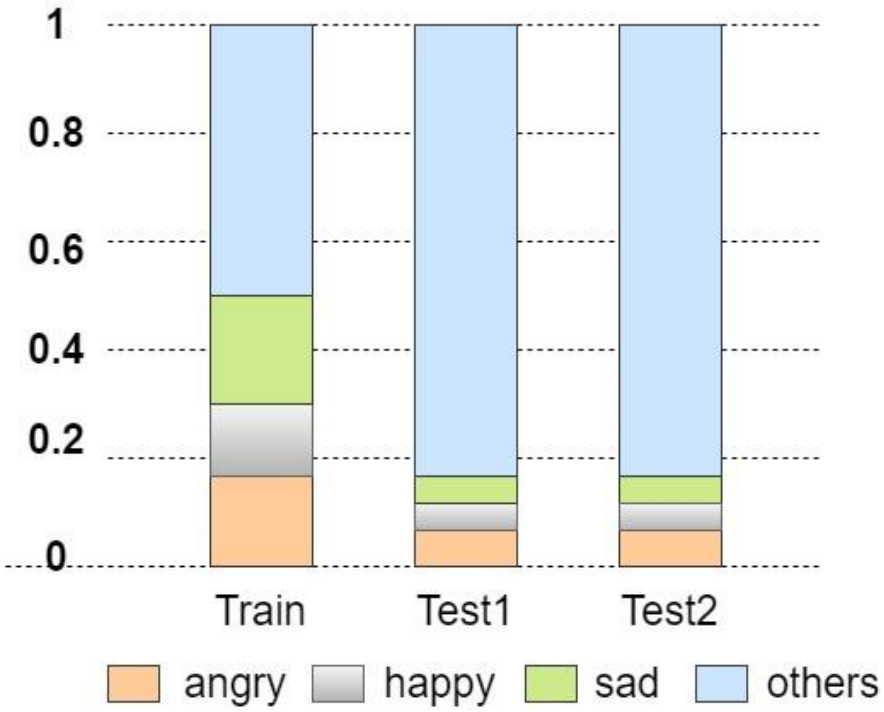
- process of transforming raw text data into a structured and numerical format

CountVectorizer + TfidfTransformer

These functions help in feature extraction



Dataset Description



Emotion	Train	Test1	Test2
Happy	4243	142	284
Sad	5463	125	250
Angry	5506	150	298
Others	14948	2338	4677
Σ	30160	2755	5509

- Class distribution in the dataset

Preliminary Evaluation Results (comparison)

Classifier	Micro Avg. F1 Score	Macro Avg. F1 Score	Accuracy
Multinomial Naive Bayes	0.87	0.47	0.87
Stochastic Gradient Descent	0.85	0.64	0.84
OneVsRestClassifier	0.85	0.58	0.84
Linear SVC	0.83	0.64	0.83
Decision Tree	0.76	0.56	0.77

- Performance comparison of the classifiers

Preliminary Evaluation Results (confusion matrix)

Target / Output	Angry	Happy	Others	Sad
Angry	355	7	75	11
Happy	14	258	147	7
Others	395	307	6083	230
Sad	27	12	86	250

- Confusion matrix for multinomial naive bayes

Conclusion

- Multinomial naive bayes classifier gives the highest micro-averaged F1 score.
- Need to apply structured models to get a better output
- Better text preprocessing method can be applied

Future Work

- Bidirectional-LSTM based approach

= sophisticated neural network architecture adept at capturing intricate patterns in sequential data by processing information both forwards and backwards

- Siamese Neural Networks based approach

= specialized architecture designed to learn similarity between pairs of inputs by sharing weights between two identical subnetworks.

- Transformers based approach

= deep learning-based architecture that uses an attention mechanism to process text sequences

Thank you