

## Team Name: EmotiNet

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## Research Plan: Implementing BERT Models for Emotion Classification

For our project, we will examine emotion classification using the GoEmotions dataset available on [Kaggle](#). The dataset on Kaggle comprises more than 58,000 Reddit comments, each classified with 27 different emotions, plus neutral. The GoEmotions dataset differs from more straightforward emotion datasets in some respects. For instance, it contains multi-label outputs and significant class imbalances. Because of this, it provides a good starting point for investigating how transformer-based models. We focus more on encoder-only such as BERT (Bidirectional Encoder Representations from Transformers), can identify subtler emotions in text. Throughout this project, we aim to classify different emotions, also to document the steps taken, consider some problems, and evaluate different techniques used for the project.

To begin with, we will work on several models using the given dataset. In these models, the BERT model, DistilBERT, RoBERTa, XLM-RoBERTa, and ModernBERT will be implemented and both single-label and multi-label setups will be integrated to understand how the models interpret multiple emotions from the same text. For task preparation, we plan to use model-specific tokenizers and check the multi-label classifications. We also intend to split the dataset into different training, validation, and testing sets. To fine-tune the models, we will utilize Hugging Face's Transformers library by setting the learning rate, batch size, and fine-tune both frozen and unfrozen layers as my hyperparameters.

For evaluation, we will move beyond accuracy, which is insufficient for addressing the multi-label challenges. We will analyze metrics such as precision, recall, F1-score, and subset accuracy. We will also apply confusion matrices to analyze the patterns of misclassification. Particular attention will be paid to how models perform on rare emotion categories in comparison to frequent ones. Also, we are going to assess the methodologies of data imbalance, computational efficiency, model complexity, and model performance interact. This project will be a comparative study. BERT and its variations on a real-world multi-label emotion based dataset will be explored. It will provide an understanding of the steps to work with transformers in affective computing. The result will highlight real world problems encountered when pre-processing data and models analysis.

### Expected Timeline

| Date                                                          | 23-Sep-25 | 30-Sep-25 | 1-Oct-25 | 7-Oct-25 | 8-Oct-25 | 14-Oct-25 | 15-Oct-25 | 21-Oct-25 |
|---------------------------------------------------------------|-----------|-----------|----------|----------|----------|-----------|-----------|-----------|
| Objective/Time                                                | Week 1    |           | Week 2   |          | Week 3   |           | Week 4    |           |
| Dataset exploration, preprocessing, and initial experiments   |           |           |          |          |          |           |           |           |
| Fine-tune BERT large model (uncased), DistilBERT, and RoBERTa |           |           |          |          |          |           |           |           |
| Fine-tune XLM-RoBERTa, and ModernBERT                         |           |           |          |          |          |           |           |           |
| Compare results, analyze errors, finalize report              |           |           |          |          |          |           |           |           |