COMP4602 - Natural Language Processing - Project Proposal

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Research Question: How can we improve the recognition of rare emotions in multi label emotion based datasets by addressing class imbalance, and why is this important for creating more fair and inclusive emotion recognition systems?

Description: Most emotion recognition systems suffer from class imbalance, where frequent emotions such as “joy” or “admiration” dominate model learning while rarer ones like “grief” or “realization” remain poorly represented.

I plan to use both GoEmotions[1] (~58k Reddit comments which contain 27 emotions + neutral, multi-label) and dair-ai/emotion[3] (Twitter: 6 emotions, single-label) classification databases. The previously mentioned problem is particularly visible in large scale datasets like GoEmotions[1] [2] and dair-ai/emotion[3] classification datasets, where unbalanced distribution of emotional labels causes models to overfit on common classes and underperform on rare ones.

After reviewing the literature, I found that the academic papers [A Review on Multi-Label Learning Algorithms][4], [Improving Multi-Label Emotion Classification on Imbalanced Social Media Data with BERT and Clipped Asymmetric Loss][5] and [Asymmetric Loss For Multi-Label Classification][6] emphasize how uneven label distributions can significantly affect generalization performance and fairness in classification tasks. These studies further highlight that addressing imbalance is not only crucial for accuracy, but also for developing models that represent rare cases with more fairness.

The goal of this project is to explore how different techniques for handling class imbalance (like class-weighted loss, focal loss[6]) and trying different models (such as CNN and BERT) can help models recognize rare emotions more effectively. By improving how these underrepresented emotions are detected, the project aims to create systems that understand human emotion in a fairer and more balanced way.

Sources:

[1]GoEmotions (Kaggle) - https://www.kaggle.com/datasets/debarshichanda/goemotions
[2]GoEmotions: A Dataset of Fine-Grained Emotions - https://arxiv.org/pdf/2005.00547
[3]dair-ai/emotion - https://huggingface.co/datasets/dair-ai/emotion
[4]A Review On Multi-Label Learning Algorithms - https://www.researchgate.net/publication/263813673_A_Review_On_Multi-Label_Learning_Algorithms
[5]Improving Multi-Label Emotion Classification on Imbalanced Social Media Data with BERT and Clipped Asymmetric Loss - https://www.researchgate.net/publication/390446698_Improving_Multi-Label_Emotion_Classification_on_Imbalanced_Social_Media_Data_with_BERT_and_Clipped_Asymmetric_Loss
[6]Asymmetric Loss For Multi-Label Classification - https://arxiv.org/pdf/2009.14119