Project Plan

TDDE09 – Natural Language Processing

Jakob Berggren - jakbe841
Hugo Björk - hugbj806
Martin Forsberg - marfo203

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1 Background

Sentiment analysis is a field of Natural Language Processing (NLP) which aims to identify and study subjective information [5]. This project will investigate possibilities of further fine-tuning existing techniques of NLP sentiment analysis through ensemble methods. Ensemble methods in NLP refers to the use of outputs from multiple models or techniques in order to improve accuracy and robustness of Natural Language Processing systems [4]. Two such existing techniques will be investigated in this paper. BERT and VADER.

Bert is a pre-train deep learning model. The model is designed to the context of words in a document or sentence. Bert is trained on a large data set of text and can then be fined tuned for specific NLP tasks such as classification [1]. Bert is able to capture complex relationships between words, which makes it a state-of-the-art tool for many NLP endeavours.

Another popular model for sentiment analysis is VADER (for Valence Aware Dictionary for sEntiment Reasoning). This model is a rule based sentiment analysis model which can interpret the sentiment of a text. VADER has a lexicon of positive and negative words to determine the sentiment of text [2].

VADER is not as good as BERT at understanding the context and relationship between words, but is a great tool for the word analysis. This paper hypothesizes that by combining the strengths of the different models, there will be a dimension of mutual benefits when applied to sentiment analysis.

This project will apply the ensembling technique introduced by Wang et al.[3] and train on the IMDb data set consisting of approximately 50 000 movie reviews labeled either positive or negative. The Baseline to which the result will be compared is a BERT model fine-tuned to the IMBd data set, but without the utilization of ensembling.

2 Literature Review

The paper "Ensemble Models with VADER and Contrastive Learning for Detecting Signs of Depression from Social Media" by Wang et al. [3] introduces a NLP pipeline consisting of 3 methods, as shown in figure 1.
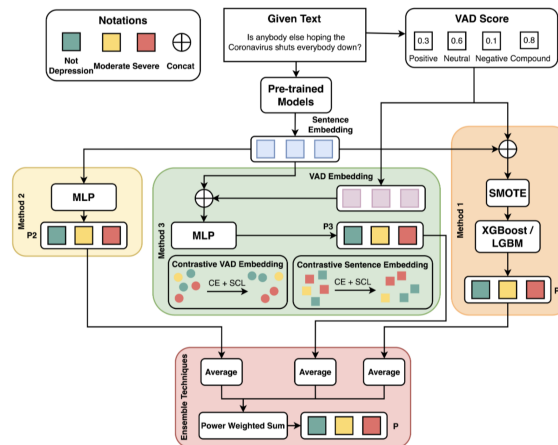

Figure 1: Proposed architecture by Wang et al.

This approach combines three different methods, including gradient boosting and fine-tuned pre-trained models combined with additional VAD sentiment scores and an ensemble technique which combines the three outputs using power weighted sum.

This project will take inspiration from the work of Wang et al. but proposes a simplified architecture which focuses on ensemble methods combining the BERT model with VAD score from the VADER model to fine tune the BERT model to the task of classifying the sentiment of IMDb reviews. In the third method proposed in the article, Wang et al. firstly generate sentiment features also known as VAD scores from the VADER model and sentiment embedding from the BERT model. This article will derive from this third proposed method.

3   Task Assignment

Embarking on this Natural Language Project, it is important to have a clear division of labor to ensure that the work will be completed efficiently. It is our shared belief that with pair programming, two people can have the output of three. Meaning that we will all be involved in all technical parts of the project in one way or another. However, it is beneficial to set different members of our group in charge of different aspects of the project.

For the task of collecting, cleaning and preprocessing the data, Hugo will be in charge. Martin will take the lead in creating the baseline, however we will all be highly involved in this task in order to contribute to its development and make suggestions for improvement. When it comes to our model, Jakob will be responsible for the overall architecture of the model.

By dividing these pillars of the project, it will ensure that our work will go on smoothly. When it comes to the implementation and fine-tuning of the model, it is a task that is to be done by all members together. It might be beneficial to divide the implementation into smaller sub-tasks. This will be put into action later in the project when a clearer picture of what these tasks are have come to the light.

In addition to these specific tasks, it is important to regularly communicate within the team and ensure that everyone is on track. Help each other out if somebody is stuck or have taken on a larger than expected workload. By dividing the work in this way, each person can focus on specific tasks and make meaningful contributions to the project. This will not only make the work more manageable, but it will also lead to a more effective and efficient outcome.

We will work dynamically with deadlines for every week, since all team-members basically reads the courses outside this course, we are aware that some weeks will be less productive and some more. We will set goals for each week dependent on current workload and what critical steps needs to be taken in the project to be on track to finish on time.

References

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[2] C. Hutto and Eric Gilbert. "VADER: A Parsimonious Rule-Based Model for Sentiment Analysis of Social Media Text". In: *Proceedings of the International AAAI Conference on Web and Social Media* 8.1 (May 2014), pp. 216–225. DOI: `10.1609/icwsm.v8i1.14550`. URL: `https://ojs.aaai.org/index.php/ICWSM/article/view/14550`.

[3] Wei-Yao Wang et al. "NYCU_TWD@LT-EDI-ACL2022: Ensemble Models with VADER and Contrastive Learning for Detecting Signs of Depression from Social Media". In: *Proceedings of the Second Workshop on Language Technology for Equality, Diversity and Inclusion*. Dublin, Ireland: Association for Computational Linguistics, May 2022, pp. 136–139. DOI: `10.18653/v1/2022.ltedi-1.15`. URL: `https://aclanthology.org/2022.ltedi-1.15`.

[4] Wikipedia. *Ensemble learning — Wikipedia, The Free Encyclopedia*. `http://en.wikipedia.org/w/index.php?title=Ensemble\%20learning&oldid=1136421283`. [Online; accessed 19-February-2023]. 2023.

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