

MSc. in Computing Practicum Approval Form

Section 1: Student Details

Project Title:	Fine-tuning Aspect Based Sentiment Analysis with Transformer based models
Student ID:	23261806 & 23266483
Student name:	Dev Anand Jayakumar & Rahul Shankar
Student email	dev.jayakumar2@mail.dcu.ie & rahul.shankar3@mail.dcu.ie
Chosen major:	Data Analytics
Supervisor	Dr. Yalemisew Abgaz
Date of Submission	24/11/2023

Section 2: About your Practicum

Please answer all questions below. Please pay special attention to the word counts in all cases.

What is the topic of your proposed practicum? (100 words)

The practicum focuses on analysing and predicting the sentiment in the reviews given for a local business through the Aspect based sentiment analysis approach. Utilizing advanced transformer-based models like GPT (may include BERT or RoBERTa for comparison), the practicum focuses on Aspect-Based Sentiment Analysis (ABSA) in textual data. The study explores innovative approaches to predict the sentiment and to enhance sentiment analysis precision, incorporating techniques such as domain-specific lexicons and using pre-trained models. By leveraging these strategies, the research aims to develop a robust ABSA model capable of discerning nuanced sentiments related to diverse aspects in reviews. This exploration represents a novel application of machine learning techniques to address challenges in sentiment analysis and contribute to more accurate and context-aware understanding of user opinions.

Please provide details of the papers you have read on this topic (details of 5 papers expected).

1. Piyush Kumar Soni; RadhaKrishna Rambola; Deep Learning, WordNet, and spaCy based Hybrid Method for Detection of Implicit Aspects for Sentiment Analysis, DOI: 10.1109/CONIT51480.2021.9498372, IEEE 2021
2. Wenxuan Zhang; Xin Li; Yang Deng; Lidong Bing; Wai Lam; A Survey on Aspect-Based Sentiment Analysis: Tasks, Methods, and Challenges, (Volume: 35, Issue: 11, 01 November 2023), DOI: 10.1109/TKDE.2022.3230975, IEEE 2016

3. Zixi Wei; Xiaofei Xu; Lijian Li; Kaixin Qin; Li Li; Transformer-based Relation Detect Model for Aspect-based Sentiment Analysis, DOI: 10.1109/IJCNN52387.2021.9533453, IEEE 2023
4. Amira Samy Talaat; Sentiment analysis classification system using hybrid BERT models, Article number: 110 (2023) , [SpringerOpen](#)
5. Prathamesh Gaikar; Improving the Performance of Aspect Based Sentiment Analysis Using Transformer Based Techniques, 2021, [Google scholar](#)

How does your proposal relate to existing work on this topic described in these papers?
(200 words)

Our Aspect-Based Sentiment Analysis (ABSA) research builds on existing studies by incorporating advanced transformer-based models primarily like GPT and also BERT could be used. Unlike previous work, we focus on these models known for their ability to understand context, allowing our ABSA model to grasp nuanced sentiments related to specific aspects in reviews.

In contrast to traditional sentiment analysis, which looks at overall feelings, we go a step further. Using pre-trained transformer embeddings, our model can detect sentiment variations for different local business reviews which may include Restaurants, shopping, etc, providing a more detailed analysis.

Furthermore, we assess how well our ABSA model works across different industries. While past studies often concentrate on extracting sentiments, our research aims for a comprehensive understanding of sentiment analysis across various aspects in different contexts. This broader perspective contributes to the ongoing improvement of sentiment analysis techniques.

What are the research questions that you will attempt to answer? (200 words)

1. How does the performance of our proposed Aspect-Based Sentiment Analysis (ABSA) model compared to conventional sentiment analysis models concerning its ability to accurately identify and analyse sentiments associated with specific aspects in movie reviews or product or service reviews?
2. Is there significant variability in the ABSA model's efficacy across different industry domains? Specifically, does the model demonstrate varying performance in discerning and analysing sentiments related to distinct aspects within product reviews, service feedback, or other specific domains?

How will you explore these questions? (Please address the following points. Note that three or four sentences on each will suffice.)

- What software and programming environment will you use?

We would use Python as the primary programming language. Jupyter Notebooks or IDEs such as PyCharm will be used as the programming environment.

- What coding/development will you do?

For ABSA, we'll develop Python code using spaCy and NLTK for text processing. We'll use the Transformers library to fine-tune pre-trained models (like GPT) for sentiment analysis. Coding tasks include data preprocessing, model training, and integrating aspect extraction. The goal is to enhance the model's ability to identify and analyse sentiments related to specific aspects in reviews.

- What data will be used for your investigations?

[Yelp review Sentiment dataset](#), Dataset, Kaggle 2019.

- Is this data currently available, if not, where will it come from?

This is an open dataset which is available in Kaggle.

- What experiments do you expect to run?

First, we will fine-tune pre-trained transformer models, such as GPT, on annotated ABSA datasets using the Transformers library. We will explore different transformer architectures that are available in the pre-defined libraries to optimize model performance. Additionally, we will evaluate the impact of varying hyperparameters and training strategies. Comparative experiments will assess the effectiveness of traditional machine learning models, like Support Vector Machines or Random Forests, against transformer-based approaches. Through rigorous experimentation, we aim to identify the most effective model configurations for accurate aspect-based sentiment analysis, considering both pre-trained and custom models.

- What output do you expect to gather?

In the analysis of aspect-based sentiment analysis (ABSA), we will focus on examining sentiment predictions related to identified aspects. We'll examine how the model judges different aspects in a review, such as the product or food in the local business. This helps us understand how well the model grasps specific details and sentiments in the review across different vertices in the local business. The goal is to enhance the model's ability to recognize if people express positive or negative or neutral feelings about various aspects, ultimately improving its accuracy in interpreting user opinions.

- How will the results be evaluated?

We use and run different models to evaluate accuracy, precision, recall and F1 score.