EEG-Based Mental State Classification: A Responsible AI Approach

Self Reflection Essay

Name: Hamse Elmi

Student number: 2023232 - U551835

Supervisor: Silvy Collin

Completing my Bachelor thesis, "EEG-Based Mental State Classification: A Responsible AI Approach," has been a transformative journey that greatly contributed to my academic and personal growth. This thesis explored using machine learning algorithms to predict mental states from EEG data while ensuring responsible AI practices. Reflecting on this experience, I can pinpoint several key events and insights.

One of the most challenging yet rewarding aspects of this project was the extensive data preprocessing phase. Working with the test-retest resting and cognitive state EEG dataset required meticulous attention to detail to ensure the data's integrity and usability. This task not only enhanced my technical skills in data handling but also deepened my understanding of the importance of data quality in machine learning projects. Initially, I struggled with cleaning and organizing the data, which often felt overwhelming. However, by systematically breaking down the preprocessing steps I developed a robust preprocessing pipeline. This experience taught me the value of persistence and the importance of seeking support when facing complex challenges.

Another significant challenge but also in the end a milestone was implementing various machine learning models, including Random Forest, Support Vector Machines, and Neural Networks. This was mainly due to the size of the dataset and it being my first time working with a model that requires at least a day to fully run. Each model also required a different approach to parameter tuning and validation. Which sometimes meant that I'd think the model was running fine for 18 hours but it then getting stuck and losing all of the results thus far. Through this process, I learned to handle large datasets with machine learning and to also critically evaluate model performance and interpretability, balancing the trade-offs between accuracy and ethical considerations. The Random Forest model emerged as the most effective, consistently achieving the highest accuracy in predicting mental states. This outcome was gratifying and reinforced the importance of rigorous experimentation and evaluation in machine learning.

This journey all in all was a rollercoaster. There were moments of frustration, particularly when models did not perform as expected or when debugging complex code issues. However, these moments were counterbalanced by the immense satisfaction of overcoming these obstacles and achieving meaningful results.

On a personal level, this thesis project significantly improved my project management skills. Balancing the multiple facets of the project, from literature review to data analysis and writing, required effective time management and organizational skills. This was unfortunately something I had lacked in causing me to miss the first hand-in moment. However, I learned to set realistic milestones and adapt my plans when unforeseen challenges arose, which is a crucial skill I am happy to have learned and look forward to bringing into a professional setting one day.

In conclusion, completing this thesis was a significant milestone in my academic journey. It provided me with deep technical knowledge, practical skills, and a nuanced understanding of the ethical implications of AI. This experience has prepared me well for future endeavours in the field of cognitive science and artificial intelligence.