

Reflective Journal – Capstone Experience

This capstone project is the toughest and most intense experience of my life as a student in AI and Robotics program. The project challenged me to apply virtually all the skills I have acquired throughout the degree, such as machine learning and deep learning, data pre-processing, Python code, and cloud solutions, documentation, and project management and teamwork concepts. The project did not only test my technical skills, but also my problem-solving, perseverance, and thinking skills as a real AI practitioner.

The initial big problem was to cope with the complexity of the NASA CMAPSS record set. The sensor data of time series is very different compared to the classification data that I am accustomed to. I had to learn how to clean and organize data in several cycles, calculate RUL per engine, make rolling features and produce sequences to an LSTM model. In this process, I have also acquired the lesson of having good preprocessing, which in my opinion, is more significant than the model. I also got to know the value of feature engineering in predictive maintenance, where rolling statistics features and rate-of-change features enhanced the performance of the models to a large extent.

Another learning milestone was modeling. The experience of using LSTMs enabled me to learn more about sequence-based deep learning. Close attention was paid to the tuning of hyperparameters, overfitting avoidance, and sequence length and limits balance.

Simultaneously, the Random Forest classifier also made an interpretable baseline and demonstrated the benefits of the traditional ML + DNN tools. Forming an ensemble made me realize how multiple models together can assist one another in their predictions with their respective predictions becoming more stable.

Streamlit deployment was a pleasant surprise. While the model is displayed on a real dashboard, it was easier to envision the project as being a professional application and not just another assignment. The incorporation of SHAP to explain the result also occurred to me that AI is not about precision alone but also about establishing the trust with the final users. The workload was overwhelming at times, particularly when debugging long LSTM sequences or when sensor values were not consistent. Nevertheless, by overcoming those difficulties, confidence and resilience were developed. I also acquired knowledge of the importance of documentation; writing the clear explanation of every step made me get deep into the methods and explain my choice.

All in all, this capstone experience has equipped me with the actual industry work. It has enhanced my technical skills, sharpened my problem-solving attitude as well as made me realize the effort required in developing an entire AI system, starting with the idea and ending with a release. I now feel better prepared, more assured, and better equipped to use such skills in the workplace.