

Submit Literature Review Section in your Project Report (Chapter 2)

The inspiration for this research stemmed from a fundamental question I repeatedly asked myself: What truly interests me? The answer was very clear—aviation. For this reason, I wanted to carry out a meaningful project that could provide benefits related to aircraft. The dataset used in this project consists of sensor readings collected from aircraft engines, recording various parameters over time. These data include measurements that provide critical information about engine performance, such as temperature, pressure, and vibration levels (Saxena & Goebel, 2008). Using machine learning techniques—particularly deep learning algorithms—dependencies will be modeled to identify patterns indicating engine degradation (Zhao et al., 2019).

My goal is to contribute to predictive maintenance practices in aircraft engines by increasing the accuracy of remaining useful life (RUL) estimations through data-driven models based on these patterns. In line with this objective, I set several goals: to analyze embedded sensor data and model engine performance over time; to compare algorithms and identify the best-performing model for accurate predictions; and to support real-time maintenance decision-making. I began researching these goals because they have the potential to positively impact others. For example, reducing maintenance costs and increasing safety levels in the aviation sector is possible. Therefore, this project could influence professionals in the defense industry—including engineers, airline operators, engine manufacturers, airline companies, and passengers.

While exploring how to achieve these objectives, I utilized the skills I learned in Action Learning courses, particularly the ability to “ask more questions” and “engage in effective dialogue through active listening,” to ask targeted questions and examine the topic in greater depth. For instance, during the project process, I asked myself questions such as: “How can I ensure my credibility as a researcher?”, “Who can I contact in the industry?”, “Which machine learning algorithms perform better in RUL prediction?”, “To what extent do features obtained from sensor data represent engine life?”, and “How do data preprocessing techniques affect model performance?”

Such action research questions not only guided my research but also helped me ground my ideas more concretely and led to a new question: “How can I do this?” I decided to conduct sectoral research, believing it would provide the fastest and most accurate answers. The most challenging aspect of this process was convincing defense industry experts to share information due to confidentiality concerns. My biggest bias was assuming they would not share any information on this subject. However, by effectively using my communication skills, I was able to collect direct information from individuals in the aviation sector while excluding any data covered by data protection laws. During this process, I asked them which sensor data were critical and which actions were necessary.

One key discovery was that the F001 engine dataset yielded more consistent results in prediction tasks. While working with this dataset, I realized that I could not sufficiently capture the linearity between the life ratio and unit number values. To better illustrate this issue, I conducted more experiments and compared different results. Through this process, I also learned how to better explain a transformation.

References

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