

Configuration Manual

MSc Research Project
Data Analytics

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Project Submission Sheet
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Configuration Manual

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1 System Requirements & Setup

All experiments in this study were executed on the personal computer with the following hardware and software configuration.

1.1 Hardware Configuration

- CPU: Intel Core i7-1185G7 @ 3.00 GHz, 4 physical cores / 8 logical threads
- RAM: 16 GB DDR4
- GPU: Intel Iris Xe Graphics
- Storage: 1 TB SSD, with approximately 71.1 GB of available space at the time of experimentation

1.2 Software Configuration

- Operating System: Windows 11 (64-bit)
- Development Environment: Jupyter Notebook
- Programming Language: Python 3.10.18
- Core Libraries Used:
 - TensorFlow 2.15.0
 - Keras 2.15.0
 - Pandas 2.3.1
 - Scikit-learn 1.5.0
 - SciPy 1.15.2
 - Matplotlib 3.10.5
 - Seaborn 0.13.2

1.3 Installation Commands

To ensure a reproducible and isolated development environment, it is recommended to create a new Python virtual environment for this project and install all required packages from the provided *requirements.txt* file.

1.3.1 Create and activate the new python environment

```
# Create a new virtual environment named 'rul_env'
python -m venv rul_env

# Activate the environment
rul_env\Scripts\activate
```

1.3.2 Install all dependencies from requirements.txt

```
pip install -r requirements.txt
```

2 Dataset Description

The dataset used in this project is the NASA Prognostics Center of Excellence (2008) - FD001 subset, obtained from the NASA Prognostics Data Repository. It contains simulated run-to-failure multivariate time-series measurements representing turbofan engine degradation under a single operational condition and a single fault mode.

The dataset can be downloaded from: NASA Prognostics Data Repository

A copy of the FD001 subset used in this study is also included in the submitted project .zip file, located in the data/CMAPSS directory.

3 How to Run the Project

The following instructions outline the procedure to replicate the experiments and results presented in this project.

3.1 Extracting Project Files

- Locate the submitted project *x23402849.zip* file.
- Extract its contents to your preferred working directory.

3.2 Setting Up the Environment

- Open a terminal or command prompt in the extracted project folder.
- Create and activate a Python 3.10 virtual environment.

```
# Create a new virtual environment named 'rul_env'
python -m venv rul_env

# Activate the environment
rul_env\Scripts\activate
```

- Install all dependencies from the included *requirements.txt* file:

```
pip install -r requirements.txt
```

3.3 Executing the Jupyter Notebook

- Open the submitted Jupyter Notebook - *x23402849_Implementation.ipynb*.
- Execute all cells in sequence from start to finish.
- The notebook will perform EDA, data transforming, model training, evaluation, and generate all output results.

3.4 Accessing the Results

- Generated plots and evaluation metrics will be available in the output cells of the notebook and/or in the relevant output directories specified in the code.

References

NASA Prognostics Center of Excellence (2008). Commercial modular aero-propulsion system simulation (cmapss) dataset, <https://www.nasa.gov/content/prognostics-center-of-excellence-data-set-repository>.