Milestone 2 Report: LSTM-Based Remaining Useful Life (RUL) Prediction

Project: Predictive Maintenance using LSTM

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1. Objective

Train and evaluate LSTM models for predicting the Remaining Useful Life (RUL) of engines from the NASA C-MAPSS datasets (FD001–FD004).

2. Model Architecture

Stacked LSTM model with dropout and dense layers: LSTM(64) → Dropout(0.2) → LSTM(32) → Dropout(0.2) → Dense(16, ReLU) → Dense(1) Loss: MSE | Metric: MAE | Optimizer: Adam

3. Training Details

Epochs: 50 | Batch Size: 64 Separate models trained for FD001–FD004 using preprocessed sequences.

4. Results

Training and validation loss curves and predicted vs actual RUL plots were generated for each dataset.

5. Implementation Notes

Scripts: model_definition.py, train_model_all.py, evaluate_model_all.py Saved Models: outputs/ | Graphs: graphs/ Keras metrics issue handled with compile=False during evaluation.

6. Key Achievements

• Successfully trained LSTM models for FD001–FD004 • Generated loss curves and RUL prediction plots • Reusable pipeline for future datasets

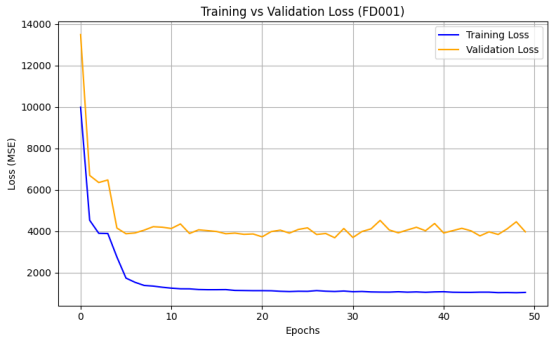
7. Next Steps

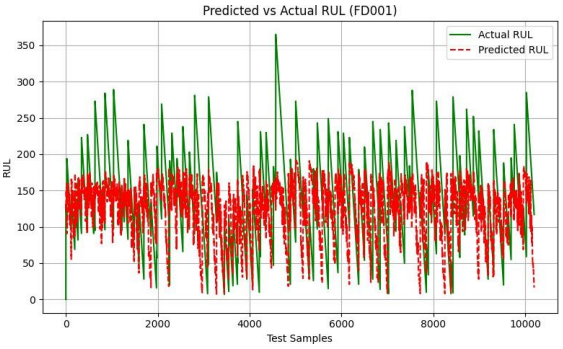
• Hyperparameter tuning • Explore advanced LSTM (BiLSTM, attention) • Implement early stopping • Integrate with Milestone 3

8. References

1. NASA C-MAPSS Dataset: https://ti.arc.nasa.gov/tech/dash/pcoe/prognostic-data-repository/ 2. TensorFlow & Keras Documentation: https://www.tensorflow.org/

Graphs for FD001

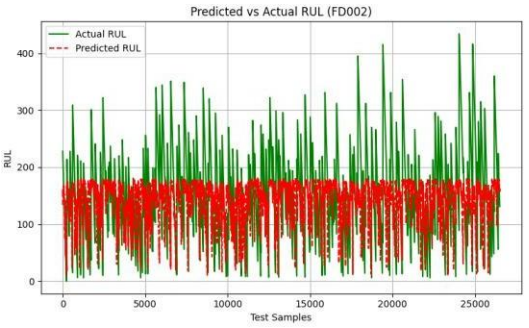




Loss curve image

Predicted vs Actual RUL image

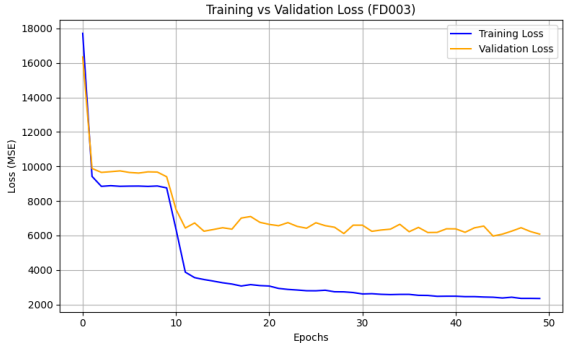
Graphs for FD002

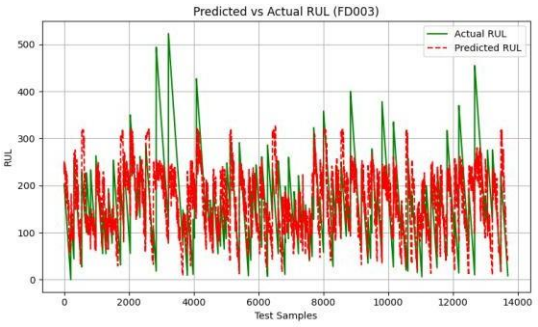


Loss curve image

Predicted vs Actual RUL image

Graphs for FD003

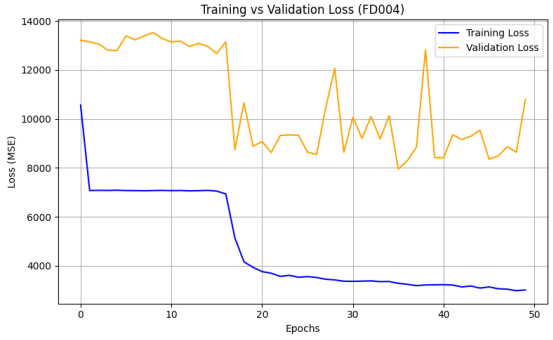




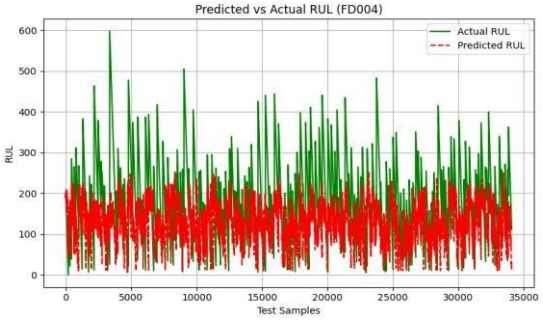
Loss curve image

Predicted vs Actual RUL image

Graphs for FD004



Loss curve image



Predicted vs Actual RUL image