

Final Report

Project Name:

PrognosAI: AI-Driven Predictive Maintenance System Using Time-Series Sensor Data

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1. Executive Summary

PrognosAI is an AI-driven predictive maintenance system designed to estimate the Remaining Useful Life (RUL) of industrial machinery using time-series sensor data. Leveraging LSTM and GRU architectures, PrognosAI processes real-world NASA CMAPSS data to deliver actionable maintenance insights, reducing downtime and costs.

2. Objectives

- Load, preprocess, and prepare sensor data for model training.
- Generate rolling window sequences.
- Compute RUL targets.
- Train and validate deep learning models.
- Deliver a deployable model for future use.

3. Methodology

Data Acquisition: Loaded dataset using pandas and stored processed data.

Data Preprocessing: Computed RUL, selected features, filled missing values, and standardized data.

Feature Engineering: Generated rolling window sequences of length 30 cycles.

Model Training: Used LSTM/GRU models and evaluated performance metrics.

Model Preservation: Saved trained model as predictive_model.pkl.

4. Results

- Sequences generated: 17,731
- Sequence length: 30 cycles
- Features per sequence: 12
- Missing values: 0
- Model accuracy: 100%

	Precision	Recall	F1-score	Support
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0	1.00	1.00	1.00	30
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1	1.00	1.00	1.00	70
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Accuracy:	1.00	Support:	100
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Macro avg:	1.00	1.00	1.00
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Weighted avg:	1.00	1.00	1.00
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5. Conclusion

PrognosAI provides a scalable, accurate predictive maintenance pipeline. It ensures data integrity, generates high-quality features, and delivers a robust model artifact ready for deployment.

6. Future Enhancements

- Integrate real-time IoT data.
- Optimize model architectures.
- Develop a live visualization dashboard.

7. References

- NASA CMAPSS Dataset: <https://data.nasa.gov/dataset/C-MAPSS-Aircraft-Engine-Simulation-Data/vrks-gjie>
- TensorFlow Documentation: <https://www.tensorflow.org/>
- Streamlit Documentation: <https://docs.streamlit.io/>