# PrognosAI : AI-Driven Predictive Maintenance System Using Time-Series Sensor Data(Milestone-1)

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## Objective

Prepare the NASA CMAPSS dataset for model training by loading, preprocessing, and feature engineering. Tasks include generating rolling window sequences, computing Remaining Useful Life (RUL) targets, and verifying data integrity.

## Dataset Overview

| Subset | Training Sequences | Test Sequences | Features per Sequence |
|--------|--------------------|----------------|-----------------------|
| FD001 | 17,731 | 10,196 | 24 |
| FD002 | 46,219 | 26,505 | 24 |
| FD003 | 21,820 | 13,696 | 24 |
| FD004 | 54,028 | 34,081 | 24 |

## Preprocessing Steps

1. Loaded CSV files for train and test sets.
2. Cleaned data (no missing values found).
3. Normalized sensor readings.
4. Computed RUL targets for each engine cycle.

## Feature Engineering

- Rolling window sequences created with window size of 30 cycles.
- Each input sample has shape (30, 24).
- RUL target corresponds to the last cycle in each window.

## Data Integrity Check

- Verified shapes of training and testing arrays.
- No missing values detected.
- Sensor values within reasonable range (min ~ -0.04, max ~ 100).
- Example:
 X_train: (17731, 30, 24)
 y_train: (17731,)
 X_test: (10196, 30, 24)
 y_test: (10196,)

## Milestone 1 Completion

 Cleaned & preprocessed CMAPSS data
 ✔ Generated rolling window sequences
 ✔ Computed RUL targets
 ✔ Verified data integrity & absence of missing values
 ✔ Documented feature engineering steps