

Electric Motor Temperature Prediction using Machine Learning

Solution Requirements Document

1. Problem Statement

The objective of this project is to develop a Machine Learning model that predicts the temperature of an electric motor based on operational parameters such as voltage, current, torque, speed, ambient temperature, and vibration.

2. Functional Requirements

- The system must accept motor operational input parameters.
- The system must preprocess input data (cleaning, normalization, feature engineering).
- The model must predict motor temperature in real-time or batch mode.
- The system must display prediction results clearly.
- The system should store prediction results for future analysis.

3. Non-Functional Requirements

- Prediction accuracy should meet acceptable error thresholds (e.g., low RMSE).
- System should respond within acceptable time limits.
- System should be scalable for large datasets.
- System should be reliable and fault-tolerant.
- User interface should be simple and easy to use.

4. Data Requirements

Input data must include motor parameters such as voltage, current, torque, speed, ambient temperature, load conditions, and historical temperature values. The dataset should be cleaned, labeled, and split into training and testing sets.

5. Machine Learning Requirements

- Perform Exploratory Data Analysis (EDA).
- Select appropriate regression algorithms (e.g., Linear Regression, Random Forest, XGBoost).
- Train and validate the model using cross-validation.
- Evaluate model using metrics such as MAE, MSE, RMSE, and R-squared.
- Save the trained model for deployment.

6. Deployment Requirements

- Deploy model using Flask or FastAPI.
- Create a web interface or API for predictions.
- Ensure secure data handling.
- Monitor model performance after deployment.

7. Hardware & Software Requirements

Software: Python, Pandas, NumPy, Scikit-learn, Matplotlib, Flask/FastAPI. Hardware: System with minimum 8GB RAM, optional GPU for large datasets.