Full Stack Development Documentation

Electric Motor Temperature Prediction using Machine Learning

1. Introduction

Project Title	Electric Motor Temperature Prediction using Machine Learning
Team Members	Yaswanth Hari - Lead ML Engineer & Full Stack Developer
Team Members	Archana Varthala - Backend Developer
Team Members	Avula Gurappa - Frontend Developer / Data Scientist

Technologies Used: Python, Flask, Streamlit, Scikit-learn, Pandas, NumPy

2. Project Overview

Purpose:

The purpose of this project is to develop a predictive maintenance system that forecasts electric motor temperature based on operational parameters. It helps prevent overheating, optimize maintenance schedules, improve efficiency, and enhance equipment reliability.

Key Features:

- Real-time Temperature Prediction
- Interactive Streamlit Dashboard
- RESTful API using Flask
- Multiple ML Models (Linear Regression, Random Forest, XGBoost)
- Batch Processing Support
- Command Line Interface Tool
- Warning System (Normal/Warning/Critical)
- Data Visualization with Plotly & Matplotlib

3. Architecture

The system follows a layered architecture consisting of Client Layer, API Layer, Machine Learning Layer, and Data Layer.

4. Setup Instructions

1. Clone repository using git clone
2. Create virtual environment using python -m venv
3. Install dependencies using pip install -r requirements.txt
4. Generate synthetic data and scaler
5. Run Flask API and Streamlit dashboard

5. Running the Application

Start Backend: python app.py

Start Frontend: streamlit run dashboard.py

Access API at http://localhost:5000

Access Dashboard at http://localhost:8501

6. API Documentation

- GET / - API Documentation
- GET /health - Health Check
- POST /predict - Single Prediction
- POST /batch_predict - Batch Prediction
- GET /features - Feature Information

7. Testing Summary

Test Suite	Tests	Passed	Success Rate
API Tests	15	15	100%
Model Tests	10	10	100%
Integration Tests	8	8	100%
Total	33	33	100%

8. Future Enhancements

- Mobile Responsive UI
- Async Batch Processing
- User Authentication (JWT)
- Cloud Deployment (AWS/Azure)
- IoT Sensor Integration
- Deep Learning Models (LSTM)