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Project Proposal: Predictive AI for AC Motor Diagnostics

Project Summary

This project aims to leverage machine learning techniques to accurately classify and predict the type of maintenance required for motors. By providing precise recommendations on the type of corrective maintenance needed, the system can help technicians avoid unnecessary troubleshooting steps and misdiagnoses, ultimately reducing downtime and operational disruptions. The project will involve data collection, preprocessing, model training, and validation to build a predictive system that categorizes maintenance needs based on motor conditions and historical patterns. The expected outcome is a smart maintenance recommendation engine that seamlessly integrates into existing workflows, enabling organizations to optimize their maintenance schedules, allocate resources efficiently, and reduce unexpected motor failures.

Problem Statement

Maintaining AC motors in optimal working conditions is essential for ensuring the smooth operation of industrial processes. Unexpected motor failures can lead to significant downtime, increased operational costs, and safety hazards. Traditional maintenance approaches—such as reactive maintenance (repairing motors after failure) and preventive maintenance (scheduled servicing regardless of condition)—can be inefficient and costly. One key challenge is not only predicting when a motor will require maintenance but also identifying the specific type of maintenance needed to prevent misdiagnoses and avoid unnecessary troubleshooting. This requires analyzing large volumes of motor performance data to uncover patterns and indicators of potential issues. By developing an AI-powered predictive maintenance system, we aim to classify and forecast maintenance needs accurately, enabling timely interventions that reduce downtime, optimize resources, and enhance motor reliability.

Data Description & Evaluation

The data set consists of 10,000 data points stored as rows with 8 features, 1 target and 1 column with failure type, providing a robust number of samples for training and testing. The project will evaluate the predictive maintenance model using accuracy, precision, recall, and F1 score to comprehensively measure its performance in identifying equipment maintenance needs.

Dataset:

UDI	Product ID	Type	Air temperature [K]	Process temperature [K]	Rotational speed [rpm]	Torque [Nm]	Tool wear [min]	Target	Failure Type
1	M14860	M	298.1	308.6	1551	42.8	0	0	No Failure
2	L47181	L	298.2	308.7	1408	46.3	3	0	No Failure
3	L47182	L	298.1	308.5	1498	49.4	5	0	No Failure

Expected Outcome and Impact

The development of a machine learning model capable of accurately predicting the type of maintenance required for AC motors. This model will analyze motor performance data from various sensors to identify patterns and indicators of potential issues, ensuring that maintenance teams receive precise recommendations on the type of corrective service required. By implementing this AI-driven maintenance system, organizations can avoid unnecessary troubleshooting, reduce downtime, and optimize maintenance schedules. The solution will lead to greater operational efficiency and cost savings, minimizing unexpected failures and ensuring smooth industrial processes.