An IoT-Enabled Smart System for Real-Time Motor Health Monitoring

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Abstract: *In modern industrial environments, electric motors play a critical role in ensuring uninterrupted production processes. However, unforeseen motor failures often result in costly downtime, reduced productivity, and higher costs for upkeep. This project offers an IoT-enabled Motor Health Condition Monitoring System to deal with these problems. The system will be able to keep track on motor operating conditions all the time and find possible problems early on. The system uses several sensors to keep an eye on important factors like electrical current, voltage, vibration levels, temperature, and rotational speed. Together, they give a full picture of the motor's health. The main processing unit is an ESP32 microcontroller, which makes it possible to collect and analyse data in real time. Lightweight TinyML models add edge intelligence, which lets devices find anomalies on their own and cuts down on the need for constant cloud connectivity. Collected data is transmitted wirelessly to IoT platforms such as Blynk or ThingsBoard, where it is visualized through interactive dashboards for remote monitoring and decision-making. To enhance system reliability, an LCD display provides immediate on-site feedback, while an SD card module ensures secure data logging during communication failures or network interruptions.*

Keywords: IoT, Motor Health Condition Monitoring, ESP32, TinyML, Predictive Maintenance, Vibration Analysis, Edge Computing, Industrial Automation, Real- Time Monitoring, Fault Detection