PREDICTIVE MAINTANENCE SYSTEM

Abstract:

The predictive maintenance system presented in this case study aims to revolutionize industrial operations by minimizing downtime, optimizing maintenance costs, and enhancing overall machinery efficiency. Traditional preventive maintenance strategies often result in scheduled downtimes that may not align with the actual health status of equipment. In contrast, predictive maintenance leverages advanced technologies, such as IoT sensors and machine learning algorithms, to monitor and analyse real-time data from industrial machinery.

Functional Components of the Project:

A predictive maintenance system comprises several functional components that work together to monitor, analyse, and predict the health of industrial machinery. The key functional components include:

1. **Data Acquisition Module:**
   * *Purpose:* Collects real-time data from sensors attached to critical components of industrial machinery.

It mainlymeasures parameters such as temperature, vibration, pressure, and fluid levels, capturing data at regular intervals.

1. **Data Processing and Storage:**
   * *Purpose:* Processes and stores the large volumes of data generated by the sensors.

It mainly Involves data pre-processing, cleaning, and transformation.

1. **Machine Learning Models:**
   * *Purpose:* Analyses historical and real-time data to identify patterns indicative of potential machinery faults or failures.

We mainly train and deploy machine learning models, such as regression, classification, or anomaly detection algorithms, to predict equipment health and anticipate maintenance needs.

1. **Predictive Analytics Engine:**
   * *Purpose:* Applies machine learning models to incoming data to generate predictions and actionable insights.

Utilizes the trained models to analyse current and historical data, providing predictions on when maintenance is likely to be required and the probability of potential failures.

1. **Alerts and Notifications System:**
   * *Purpose:* Notifies maintenance personnel or relevant stakeholders about predicted or detected issues.

It sends alerts through various channels (e.g., email, SMS, or a dashboard) when the predictive analytics engine identifies maintenance requirements or potential failures.

1. **User Interface (UI) and Dashboard:**
   * *Purpose:* Provides a user-friendly interface for maintenance personnel to visualize machinery health, predictions, and recommended actions.

It displays real-time and historical data, presents predictive analytics results.

Workflow Process:

* Real-time data from the sensors attaches to the machinery is collected.
* Storing the volumes of data generated.
* Analyse the real-time data to identify patterns which may lead to machine breakdown or overheating.
* Training the machine learning models using classifiers, regression models for analysing.
* Using the trained models to analyse the data collected to generate predictions.
* We may notify the maintenance personnel or relevant employees about predicted issues.
* We create a user interface where the maintenance personnel can view the real time data and the predictions.