Project Presentation Script: AI-Powered Predictive Maintenance for Industrial Machines

Introduction:
Today, we are presenting our project titled **'AI-Powered Predictive Maintenance for Industrial Machines.'** This project leverages **Machine Learning and IoT sensor data** to detect potential machine failures before they occur, helping industries reduce downtime and maintenance costs."

1. Problem Statement

"Industries rely on heavy machinery, and unexpected failures can lead to huge financial losses and production delays. Traditional maintenance methods are either **reactive (fix after failure)** or **preventive (fixed schedules)**, both of which are inefficient.

Our project solves this by implementing an **AI-powered predictive maintenance system** that continuously analyzes machine sensor data and predicts faults before they happen."

2. Technologies Used

"We have used the following technologies:
✓ **Python** for data processing and model training
✓ **Machine Learning (Random Forest Classifier)** for fault detection
✓ **Pandas, NumPy, Scikit-learn** for data processing
✓ **Streamlit** for creating an interactive dashboard
✓ **Pickle** for saving and loading trained models"

3. Dataset & Features

"We have trained our model using **sensor data from industrial machines**. The key parameters we analyze are:
✓ **Vibration (mm/s):** Identifies mechanical faults
✓ **Temperature (°C):** Detects overheating issues
✓ **Pressure (Pa):** Helps identify leaks and abnormal conditions
✓ **Running Hours:** Determines wear and tear

Each machine's health is classified into five categories:
✓ **Bearing Failure**
✓ **Motor Failure**
✓ **Overheating**

✓ **Pressure Leak**
✓ **No Fault**

We ensured **balanced training data** to improve model accuracy and avoid bias."

4. How the Model Works

"The machine learning model we implemented is a **Random Forest Classifier**. It works as follows:
1. Takes live sensor readings as input.
2. Normalizes the data using **StandardScaler**.
3. Predicts the fault type using **trained ML models**.
4. Provides a **probability distribution** for each fault type, increasing transparency.

The model achieves an accuracy of **[mention accuracy]%** on test data."

5. Demo of the AI Dashboard

"Now, we will demonstrate our **AI-powered dashboard**, where users can:
✓ Enter real-time machine sensor values.
✓ Get an instant **fault prediction with probability scores**.
✓ View a **history of previous predictions**.
✓ Analyze **fault distribution trends** using visual graphs."

[Run **streamlit run dashboard.py** and explain the UI]

6. Comparison with IEEE Research Papers

"We referred to IEEE research papers on **Predictive Maintenance using AI**. Unlike conventional models that focus only on **time-series forecasting**, our system provides **multi-factor fault classification** based on real-time sensor data.

Feature	**IEEE Papers**	**Our Project**
Algorithm Used	ARIMA, LSTM	Random Forest (more robust)
Fault Types	Generic Failures	Specific Failures (Overheating, Bearing, Motor, etc.)

Feature	IEEE Papers	Our Project
Prediction	Only Failure Forecasting	Fault Type + Probability
Deployment	Cloud-Based	Works Locally & Online

Thus, our model is **more practical for real-world industrial applications**."

7. Deployment & Future Scope

"Our system can be deployed in industries as:
✓ A **local application** for factory engineers.
✓ A **cloud-based API** for remote monitoring.
✓ Integrated with **IoT devices** for automated fault alerts.

Future enhancements include:
✓ **Deep Learning models** for higher accuracy.
✓ **Integration with real-time sensor networks.**
✓ **Self-learning AI models** that improve over time."

8. Conclusion

"In conclusion, our **AI-Powered Predictive Maintenance System** provides a **cost-effective, real-time solution** for machine fault detection, reducing maintenance costs and preventing failures.

We thank our project guide and faculty for their support, and we welcome any questions."