

Project no 14

AI-POWERED MULTI-TENANT INDUSTRIAL BREAKDOWN PREDICTION & AUTOMATION PLATFORM

(Non-existent, Industry Ready, Job-oriented)

1. PROJECT TITLE

AI-Driven Industrial Machine Breakdown Prediction & Automated Maintenance Workflow System (AIOPS-MaintainX)

2. PROBLEM STATEMENT

Industries lose millions every year because machines break down unexpectedly.

Current systems:

- Detect failure only after it happens
- Have no unified system for real-time machine analytics
- Are not multi-tenant (cannot support multiple plants/companies)
- Cannot automatically generate maintenance workflows

This project solves this by using AI + IoT + Cloud + Automation.

3. OBJECTIVE

Build a scalable cloud platform that:

- Predicts machine failures before happening
- Analyzes live IoT sensor data
- Generates automatic maintenance tickets
- Assigns technicians using AI
- Supports multiple industries/factories from same platform
- Gives dashboards, anomaly alerts, and performance insights

4. KEY MODULES

1. IoT Sensor Data Collector (Edge Client)
2. Cloud Data Ingestion Layer (Kafka/MQTT)
3. Machine Learning Prediction Engine

4. Anomaly Detection Service
5. Automated Maintenance Ticketing
6. Technician Assignment Algorithm
7. Multi-Tenant Access Control System
8. Web Dashboard & Mobile App
9. Notification Engine (Email/SMS/WhatsApp)

5. SYSTEM ARCHITECTURE

- IoT sensors → Edge Gateway → Kafka/MQTT → Data Lake (S3/MinIO)
- ML Pipeline → Feature Store → Model Registry
- Microservices Backend (FastAPI / Node.js)
- Database (PostgreSQL + Redis)
- Frontend (React.js / Flutter)
- DevOps: Docker, Kubernetes, CI/CD
- Security: JWT, Role-Based Access

6. MACHINE LEARNING USED

- LSTM Time-Series Prediction
- Random Forest Failure Classification
- Isolation Forest Anomaly Detection
- AutoML for parameter tuning

7. UNIQUE NON-EXISTENT FEATURES

1. Cross-Industry Prediction Model
2. AI-Generated Maintenance SOPs
3. Automatic Technician Availability Scoring
4. Multi-Tenant ML Model Optimization
5. Voice-Controlled Incident Dashboard
6. Zero-Downtime Deployment with Adaptive Learning

8. TECH STACK

Frontend: React.js + Tailwind

Backend: FastAPI / Node.js

ML: Python, TensorFlow, PyTorch

Database: PostgreSQL, Redis

Cloud: AWS / Azure / GCP

Containers: Docker, Kubernetes

Messaging: Kafka, MQTT

Version Control: GitHub

9. INDUSTRY APPLICATIONS

- Manufacturing
- Automobile
- Aerospace
- Food Processing
- Energy & Power Plants
- Hardware Assembly Units

10. DELIVERABLES FOR FINAL YEAR PROJECT

- ✓ Abstract
- ✓ Base research paper
- ✓ ER diagram
- ✓ UML diagrams
- ✓ Architecture diagram
- ✓ Database schema
- ✓ Deployment guide
- ✓ Source code
- ✓ Testing document

11. PROJECT TIMELINE (12 WEEKS)

Week 1–2: Requirements + System Design

Week 3–4: Data Pipeline + Backend Setup

Week 5–6: ML Model Development

Week 7–8: Dashboard + Mobile App

Week 9–10: Automation Workflow

Week 11: Deployment + Cloud Setup

Week 12: Final Testing + Documentation

12. WHY THIS PROJECT GETS YOU JOBS

You will learn:

- Machine Learning
- Full-stack development
- Microservices
- DevOps (Docker, Kubernetes)
- Cloud platforms
- Real industrial IoT systems

Companies hiring for this skill:

- ✓ Siemens
- ✓ Bosch
- ✓ Tata Advanced Systems
- ✓ Tesla
- ✓ ABB
- ✓ Infosys
- ✓ IBM
- ✓ Amazon
- ✓ Google Cloud
- ✓ Jio

This is a complete, unique, industry-level, job-oriented CSE major project.