

# TATA STEEL – SUMMER INTERNSHIP PROJECT REPORT

## Web-Based Maintenance Management System

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**VT Number:** VT20253937

**Internship Duration:** 03-June to 15-July

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### 1. Project Title

**Web-Based Maintenance Management System for Tata Steel**

– Maintenance Request Tracking & Role-Based Access Portal

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### 2. Project Overview

This internship project focused on the end-to-end development of a **full-stack, role-based web application** aimed at digitizing and streamlining the maintenance request process within a **Tata Steel plant**. The core objective was to **eliminate manual tracking practices** by introducing a **centralized, real-time digital platform** that facilitates seamless communication between plant staff and the management team. Additionally, the system improves **operational efficiency**, ensures **better traceability of requests**, and delivers **data-driven insights** through an integrated analytics dashboard.

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### 3. Objectives

- **Digitize Maintenance Workflow:** Replace manual processes with a centralized web-based system for request handling.
  - **Implement Role-Based Access:** To provide distinct interfaces and permissions for Factory Staff (Users) and Managers.
  - **Enable Real-Time Tracking:** To allow all stakeholders to monitor the status of maintenance requests (Pending, In Progress, Resolved) in real-time.
  - **Provide Data-Driven Insights:** To develop an analytics dashboard for managers to visualize trends in request types, priorities, and resolution times.
  - **Ensure Data Integrity:** To create a robust backend and database system for secure and persistent storage of all maintenance data.
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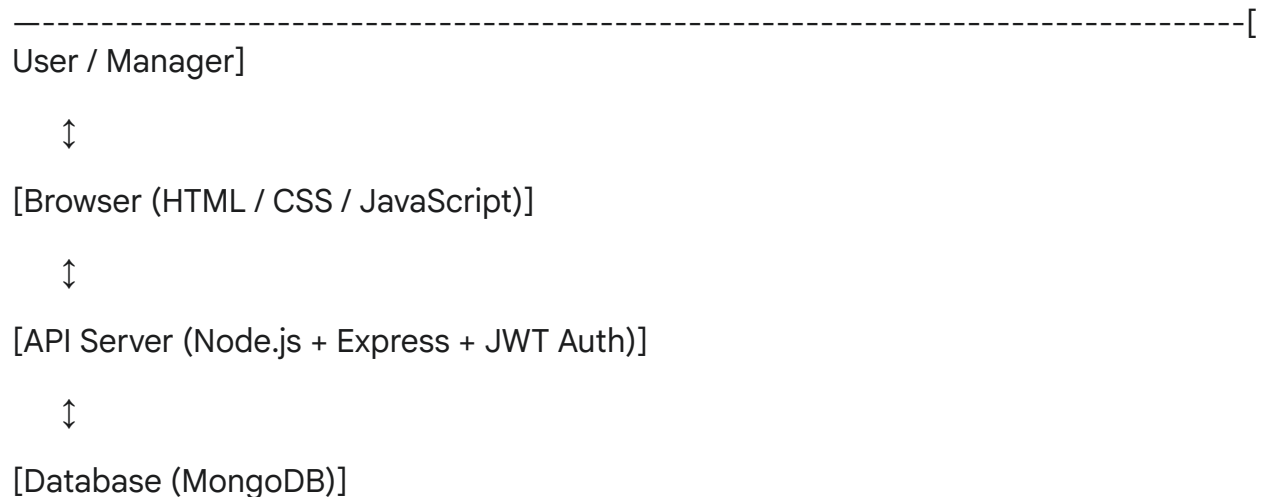
## 4. Technology Stack

Category	Tools / Technologies Used
Frontend	HTML5, CSS3, Vanilla JavaScript
Backend	Node.js, Express.js
Database	MongoDB
Data Visualization	Chart.js
Development Tools	Visual Studio Code, Git/GitHub, Postman

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## 5. System Architecture

The application follows a **client-server architecture** with a clear separation of concerns between the frontend interface and backend logic.



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### **Frontend:**

- Renders the user interface using HTML, CSS, and vanilla JavaScript.
- Handles user interactions such as login, form submission, request updates, and dashboard filters.
- Sends authenticated API calls by attaching **JWT tokens** received during login.
- Provides real-time **toast feedback** (e.g., green for success, red for errors) for user actions like login, request submission, and updates.

### API Server:

- Built with **Node.js** and **Express.js**, acts as the central controller for business logic.
- Implements **JWT-based role authentication**, allowing secure, role-specific access to APIs.
- Handles all **CRUD operations** on maintenance requests.
- Ensures role-based permissions (e.g., only managers can resolve/edit all requests; users can only edit/delete their own).

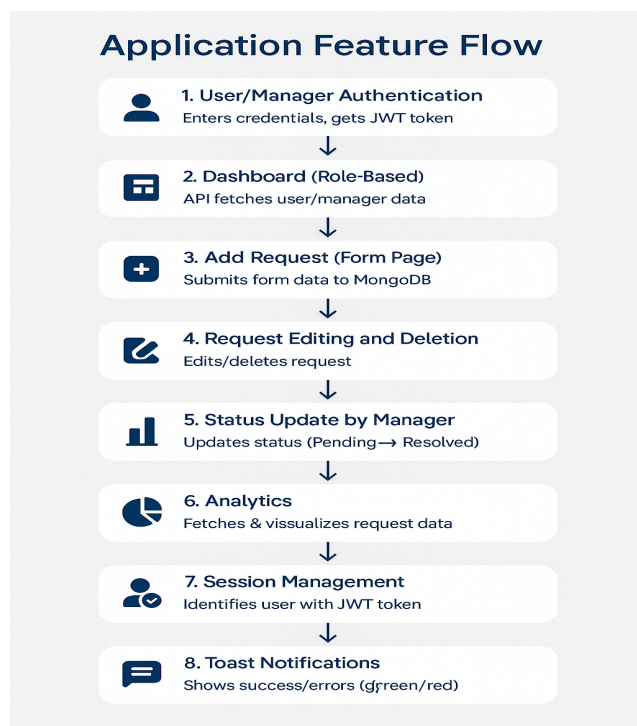
### Database:

Uses **MongoDB** to store:

- User credentials and roles (with hashed passwords).
- Maintenance request details.
- Request statuses (Pending, In Progress, Resolved).
- Data for analytics visualizations (if implemented).

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## 6. Application Feature Flow



## 7. Key Features Implemented

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### **Dual-Role Authentication**

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- Separate and secure login pages for:
    - **Factory Staff** (`login-user.html`)
    - **Managers** (`login-manager.html`)
  - Session-based role management ensures users see only the appropriate dashboard functionalities.
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### **User Dashboard (Factory Staff)**

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- **Submit Maintenance Requests** with:
    - Department
    - Machine name
    - Priority level
    - Problem description
    - File attachment (images/documents)
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  - **Track Request Status:**
    - View a table of all personally submitted maintenance requests.
    - Monitor real-time status updates: **Pending, In Progress, Resolved.**
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### **Manager Dashboard**

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- **All-Request Overview:**
  - Access all requests from all users across departments.
- **Summary Cards:**
  - Show key stats: **Total Requests, Pending, In Progress, Resolved.**
- **Full Request Management:**

- Create new entries (for testing or management logging)
  - Edit or delete any request
  - Update status using dropdowns beside each request
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### **Advanced Filtering & Search**

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- **Dynamic Search Bar:**
    - Search requests using keywords in description, department, or machine.
  - **Dropdown Filters:**
    - Filter based on **Status** (Pending, Resolved, etc.)
    - Filter based on **Priority** (Low, Medium, High)
  - **Reset Button** to clear filters and view all entries
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### **File Attachment Support**

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- Upload visual files (images/documents) with requests for better issue explanation.
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### **Analytics Dashboard (Data Visualization)**

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- **Request Status Pie Chart:**
    - Displays proportional breakdown of all requests by status.
  - **Priority Bar Chart:**
    - Compares volume of requests for **High**, **Medium**, and **Low** priorities.
  - **Request Trend Area Chart:**
    - Visualizes time-series data of requests raised over days/weeks.
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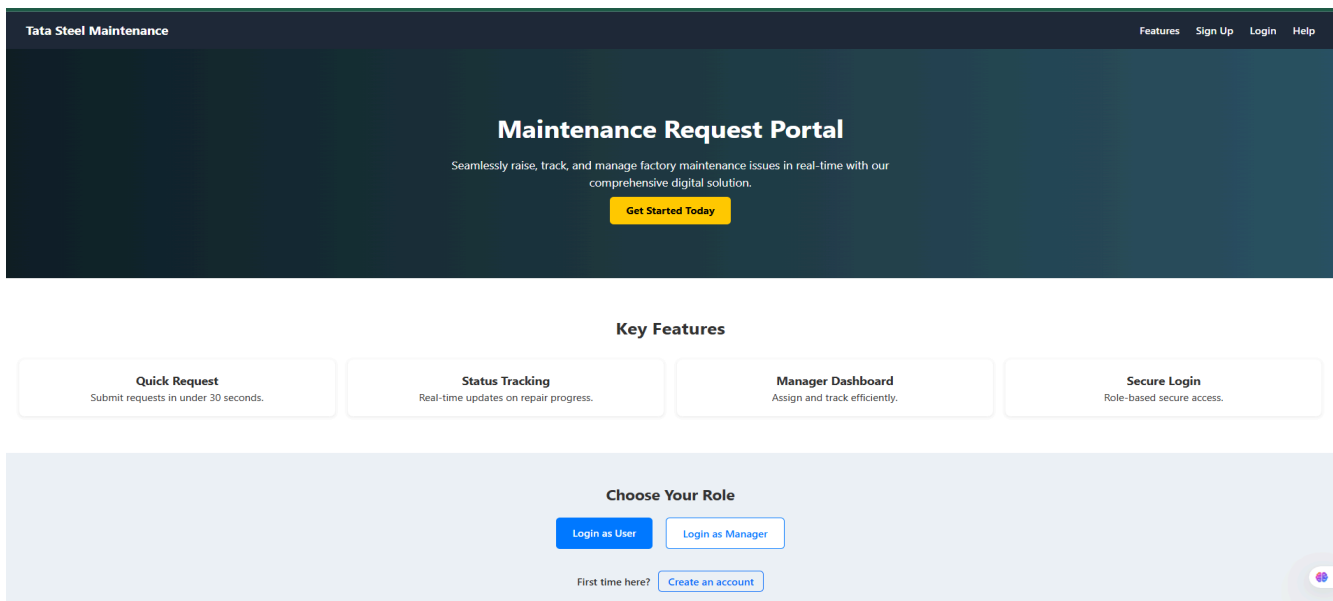
## 8. UI/UX Design Highlights

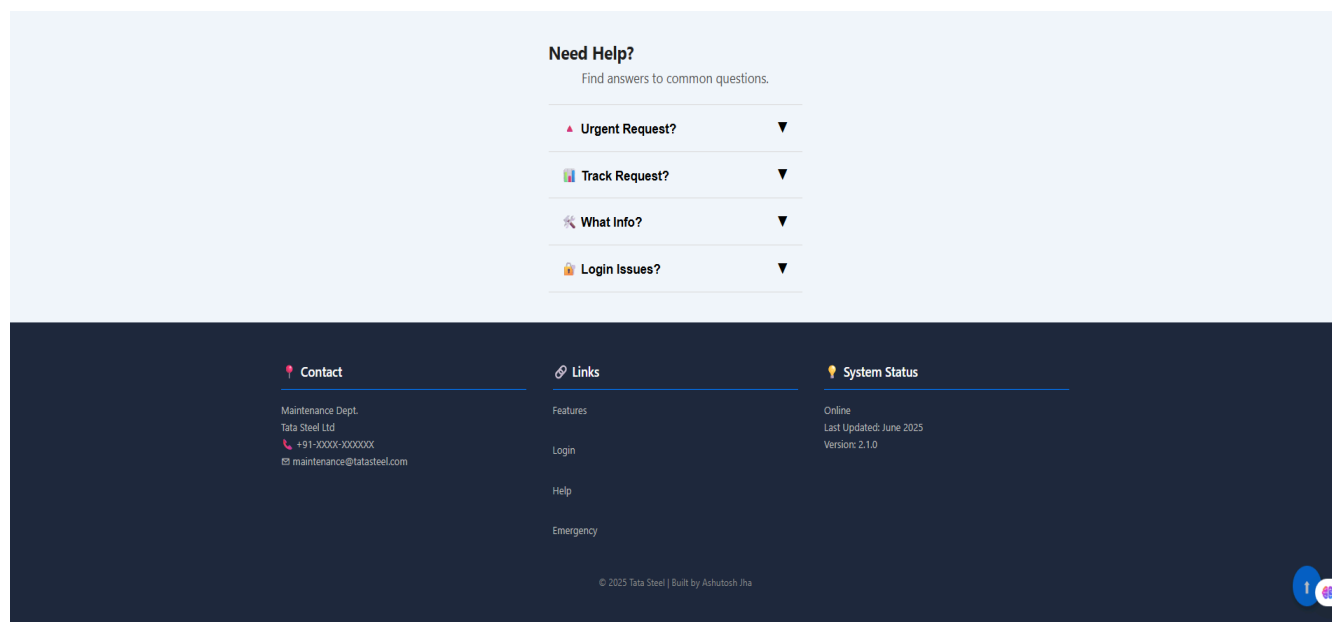
- **Clean & Intuitive Interface:** A modern dashboard layout with structured sections, color-coded cards, and modals for streamlined navigation and clarity in industrial workflows.
- **Responsive Design:** Optimized for seamless access across desktops and tablets, ensuring consistent user experience in varied factory environments.
- **Data-Rich Visuals:** Effective use of clear typography, color indicators, and interactive charts (bar, pie, area) to present complex information in a digestible format.
- **Role-Specific Experience:** The interface adapts based on user roles—displaying relevant tools and actions only to enhance usability and reduce on-screen clutter.

## 9. Screenshots & Visual Evidence

### 1. Main Landing Page & Role Selection

(Caption: The portal's entry point, allowing users to select their role.)





## 2. Login and Signup Pages

(Caption: Secure entry point for both users and managers, featuring separate login routes and a clean, user-friendly form layout.)

### Sign-Up Page:

The screenshot shows the 'Sign-Up' page for the 'Tata Steel Maintenance' system. The page has a dark blue header with the title 'Tata Steel Maintenance' and a 'Home' link. The main content area is light blue and features a white card titled 'Create Your Account'. The card contains three input fields: 'Choose Username', 'Create Password', and 'Select Role' (a dropdown menu). Below these fields is a blue 'Sign Up' button. At the bottom of the card, there is a link: 'Already have an account? [Login here](#)'. The footer of the page is dark blue and contains the copyright notice: '© 2025 Tata Steel Internship | Maintenance Management System' and a small logo.

For Manager:

Tata Steel Maintenance

Home

Manager Login

Enter Username

Enter Password

Login

© 2025 Tata Steel Internship | Maintenance Management System

For User:

Tata Steel Maintenance

Home

Factory Staff Login

Enter Username

Enter Password

Login

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3. Manager Dashboard with Filters

(Caption: The main dashboard for managers, showing summary cards, a detailed request list, and filtering options.)

Normal View:

HomeAnalytics

Maintenance Dashboard

Total: 18

Pending: 17

In Progress: 0

Resolved: 1

Search: Search by machine, dept, c

Filter by Status: All

Filter by Priority: All

ID	Department	Machine	Machine ID	Status	Priority	Reported At	Attachment	Issue Details	Actions	Status Update
687b5c53c343cc7fd7752a6f	Manufacturing	furnace	12345	PENDING	LOW	7/19/2025, 2:20:27 PM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">🔧</a> <a href="#">🗑️</a>	<a href="#">RESOLVE</a> <a href="#">⋮</a>
686d7748dbac99ef2775fb0b	—	Hydraulic Press #3	—	PENDING	LOW	7/9/2025, 1:23:44 AM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">🔧</a> <a href="#">🗑️</a>	<a href="#">RESOLVE</a> <a href="#">⋮</a>
686d75fbb45a803907535cec	Manufacturing	Hydraulic Press #3	12345	PENDING	MEDIUM	7/9/2025, 1:18:11 AM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">🔧</a> <a href="#">🗑️</a>	<a href="#">RESOLVE</a> <a href="#">⋮</a>
686d732c1b3ceca394a7001a	Utility	crusher	35674	PENDING	HIGH	7/9/2025, 1:06:12 AM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">🔧</a> <a href="#">🗑️</a>	<a href="#">RESOLVE</a> <a href="#">⋮</a>
686d72f51b3ceca394a70015	Production	furnace	12345	PENDING	HIGH	7/9/2025, 1:05:17 AM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">🔧</a> <a href="#">🗑️</a>	<a href="#">RESOLVE</a> <a href="#">⋮</a>

Filter by Status Application:

HomeAnalytics

Maintenance Dashboard

Total: 18

Pending: 15

In Progress: 2

Resolved: 1

Search: Search by machine, dept, c

Filter by Status: In Progress

Filter by Priority: All

ID	Department	Machine	Machine ID	Status	Priority	Reported At	Attachment	Issue Details	Actions	Status Update
686d7748dbac99ef2775fb0b	—	Hydraulic Press #3	—	IN PROGRESS	LOW	7/9/2025, 1:23:44 AM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">🔧</a> <a href="#">🗑️</a>	<a href="#">RESOLVE</a> <a href="#">⋮</a>
686d72f51b3ceca394a70015	Production	furnace	12345	IN PROGRESS	HIGH	7/9/2025, 1:05:17 AM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">🔧</a> <a href="#">🗑️</a>	<a href="#">RESOLVE</a> <a href="#">⋮</a>

Filter by Priority Application:

Home

Analytics

Maintenance Dashboard

Total: 18

Pending: 15

In Progress: 2

Resolved: 1

Search: Search by machine, dept, c

Filter by Status: All

Filter by Priority: Medium

ID	Department	Machine	Machine ID	Status	Priority	Reported At	Attachment	Issue Details	Actions	Status Update
686d75fb45a803907535cec	Manufacturing	Hydraulic Press #3	12345	PENDING	MEDIUM	7/9/2025, 1:18:11 AM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">✎</a> <a href="#">🗑</a>	<a href="#">RESOLVE</a> <span>---</span>
686d6ed783cf1548a6d145	Production	furnace	56789	PENDING	MEDIUM	7/9/2025, 12:47:51 AM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">✎</a> <a href="#">🗑</a>	<a href="#">RESOLVE</a> <span>---</span>
686d00c6d2a66530492f96c	Manufacturing	furnace	56789	PENDING	MEDIUM	7/8/2025, 4:58:00 PM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">✎</a> <a href="#">🗑</a>	<a href="#">RESOLVE</a> <span>---</span>
686cfbe16d2a66530492f931	Production	Hydraulic Press #3	78906	PENDING	MEDIUM	7/8/2025, 4:37:13 PM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">✎</a> <a href="#">🗑</a>	<a href="#">RESOLVE</a> <span>---</span>
686ce6c8734c767776c30f2	Manufacturing	furnace	12345	PENDING	MEDIUM	7/8/2025, 3:05:40 PM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">✎</a> <a href="#">🗑</a>	<a href="#">RESOLVE</a> <span>---</span>

Search Bar Application:

Home

Analytics

Maintenance Dashboard

Total: 7

Pending: 6

In Progress: 1

Resolved: 0

Search: furnace

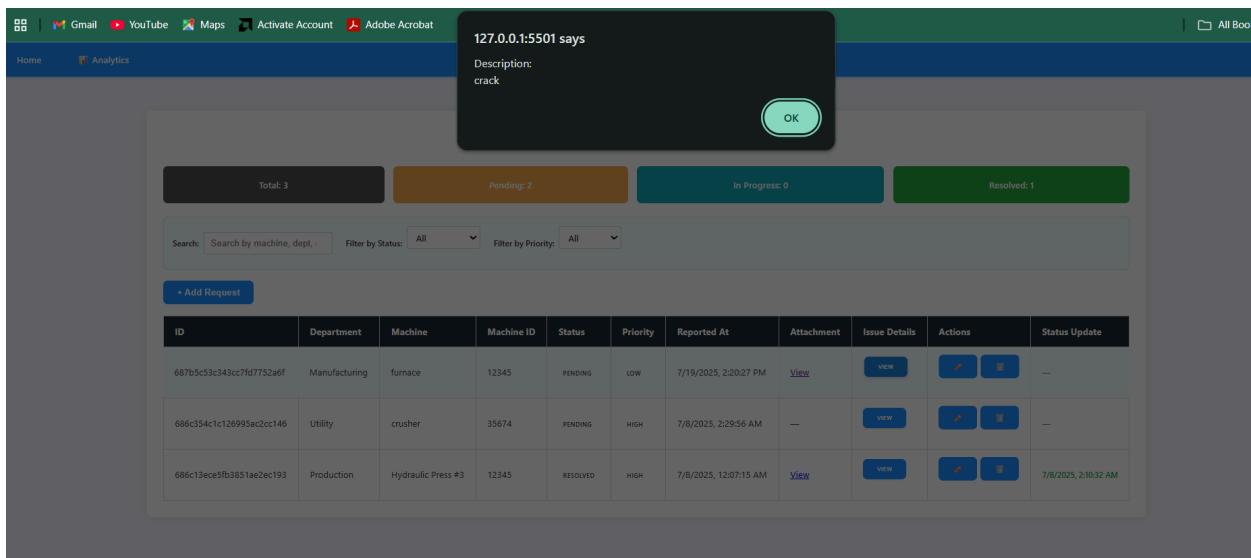
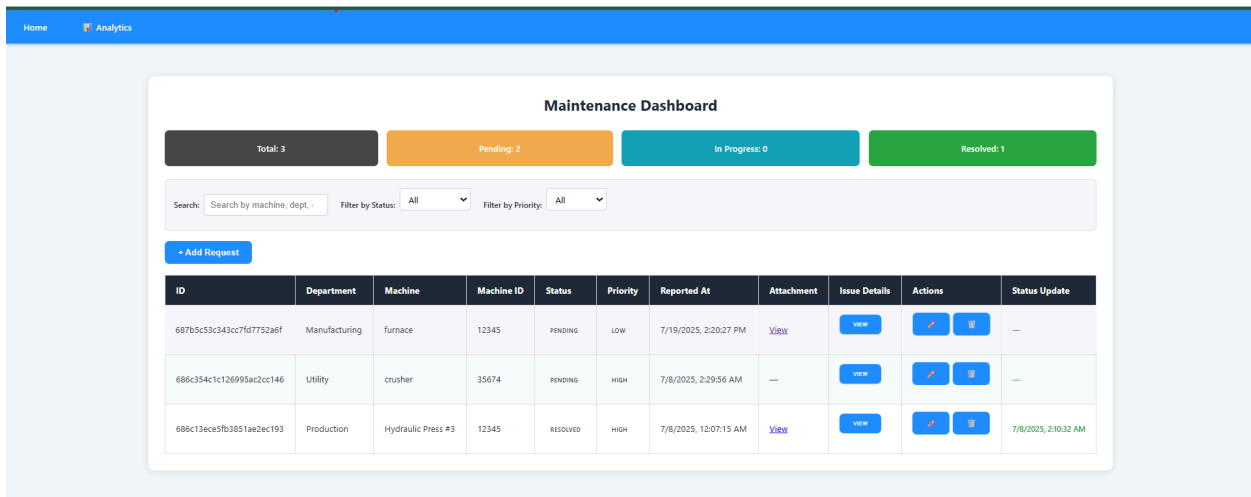
Filter by Status: All

Filter by Priority: All

ID	Department	Machine	Machine ID	Status	Priority	Reported At	Attachment	Issue Details	Actions	Status Update
687b5c53c343cc7fd7752a6f	Manufacturing	furnace	12345	PENDING	LOW	7/19/2025, 2:20:27 PM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">✎</a> <a href="#">🗑</a>	<a href="#">RESOLVE</a> <span>---</span>
686d72f51b3ceca394a70015	Production	furnace	12345	IN PROGRESS	HIGH	7/9/2025, 1:05:17 AM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">✎</a> <a href="#">🗑</a>	<a href="#">RESOLVE</a> <span>---</span>
686d702126722431e4c57248	Manufacturing	furnace	m	PENDING	LOW	7/9/2025, 12:53:13 AM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">✎</a> <a href="#">🗑</a>	<a href="#">RESOLVE</a> <span>---</span>
686d6ed783cf1548a6d145	Production	furnace	56789	PENDING	MEDIUM	7/9/2025, 12:47:51 AM	<a href="#">View</a>	<a href="#">VIEW</a>	<a href="#">✎</a> <a href="#">🗑</a>	<a href="#">RESOLVE</a> <span>---</span>

4. User Dashboard View

(Caption: The simplified view for factory staff, showing their submitted requests.)



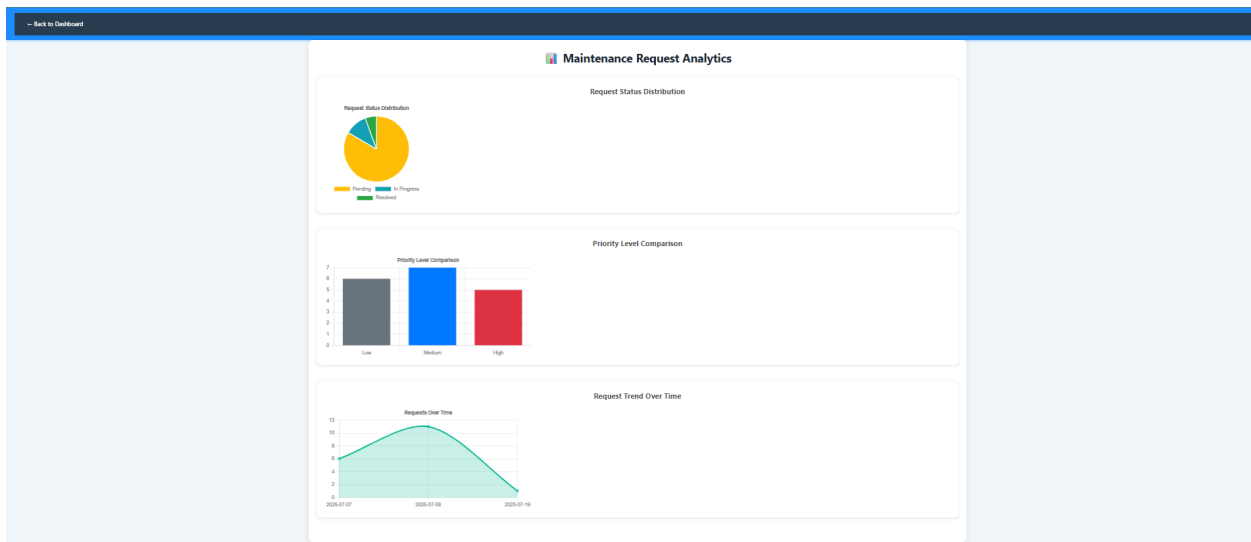
On clicking view to see the uploaded picture



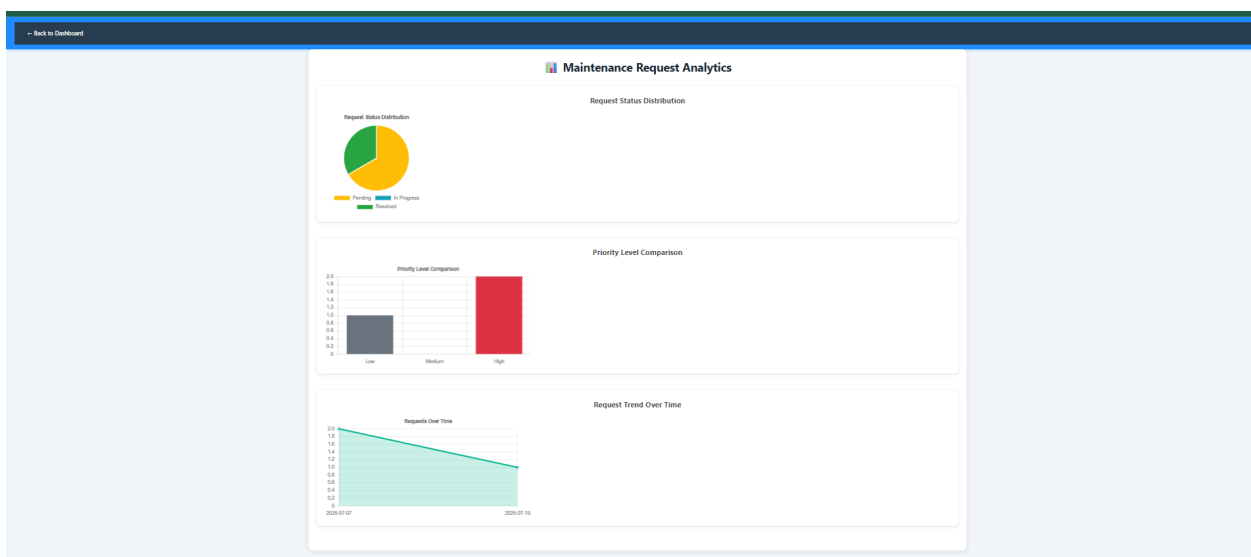
5. Analytics Page

(Caption: The data visualization dashboard with charts for status, priority, and trends.)

For manager:



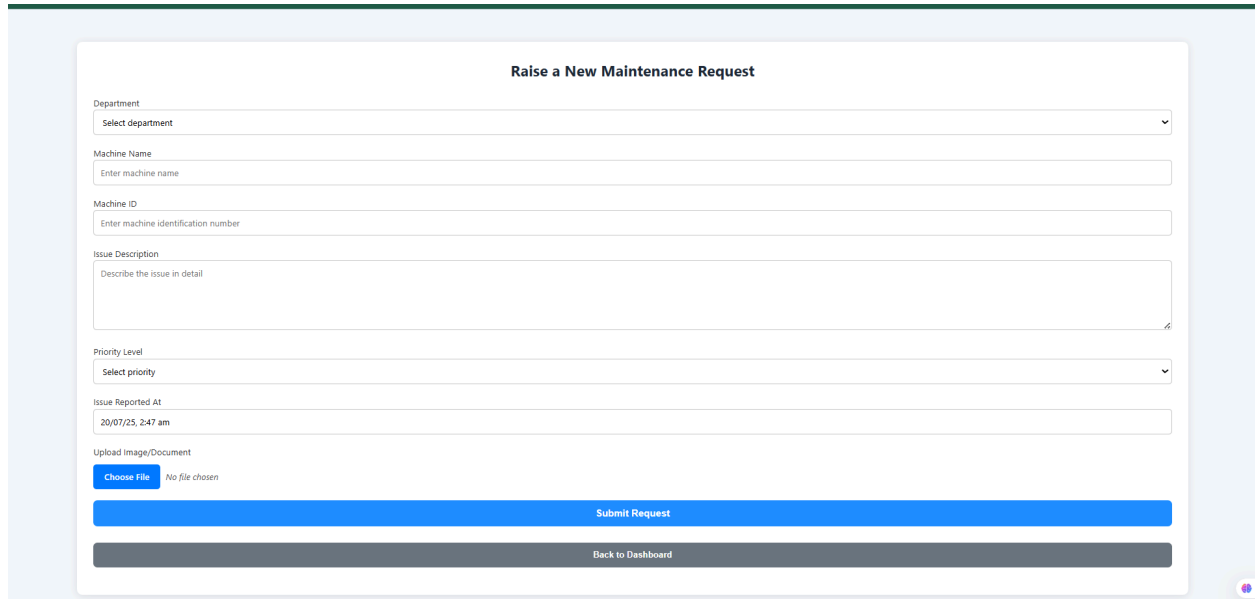
For user:



## 6. Add/Edit Request Form with Attachment

(Caption: The form for creating or editing a maintenance request.)

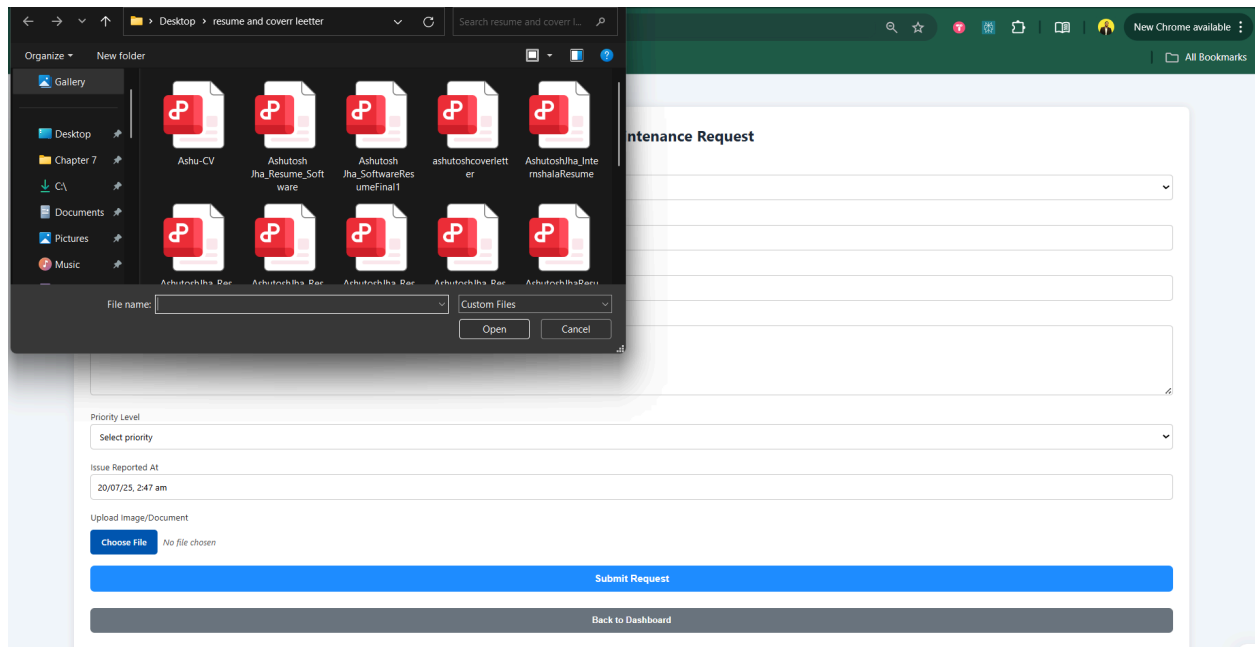
### Add Request:



The screenshot shows a web form titled "Raise a New Maintenance Request". The form contains the following fields and controls:

- Department:** A dropdown menu with the text "Select department".
- Machine Name:** A text input field with the placeholder "Enter machine name".
- Machine ID:** A text input field with the placeholder "Enter machine identification number".
- Issue Description:** A large text area with the placeholder "Describe the issue in detail".
- Priority Level:** A dropdown menu with the text "Select priority".
- Issue Reported At:** A text input field containing the date and time "20/07/25, 2:47 am".
- Upload Image/Document:** A section with a blue "Choose File" button and the text "No file chosen".
- Submit Request:** A large blue button at the bottom of the form.
- Back to Dashboard:** A grey button located below the "Submit Request" button.

### Add Picture:



This screenshot illustrates the process of adding a picture to the maintenance request form. A Windows File Explorer window is open, displaying the contents of the "Desktop > resume and cover letter" folder. The folder contains several PDF files, including "Ashu-CV", "Ashutosh Jha\_Resume\_Software", "Ashutosh Jha\_SoftwareResumeFinal1", "ashutoshcoverletter", and "AshutoshJha\_IntermshalaResume". The "File name" field at the bottom of the File Explorer is empty, and the "Open" button is visible. In the background, the "Raise a New Maintenance Request" form is partially visible, showing the "Upload Image/Document" section with the "Choose File" button and the "Submit Request" button.

## Edit Request:

Department

Manufacturing

Machine Name

furnace

Machine ID

12345

Issue Description

crack

Priority Level

Low

Issue Reported At

7/19/2025, 2:20:27 PM

Upload Image/Document

Choose File

No file chosen

Submit Request

Back to Dashboard

## 10. Impact & Learning

### Business Impact

- **Streamlined Maintenance Workflow:** Automates request tracking, significantly reducing manual errors and administrative overhead.
- **Centralized System of Record:** Maintains a unified, auditable history of all maintenance activities, enhancing accountability and compliance.
- **Data-Driven Decision-Making:** Equips managers with actionable insights to identify recurring issues and allocate resources efficiently.

### Learning Outcomes

- **Full-Stack Web Development:** Built an end-to-end solution using the MERN stack (MongoDB, Express.js, Node.js, and Vanilla JS).
- **API & State Management:** Gained hands-on experience in designing RESTful APIs and managing application state across user roles.
- **Role-Based Access Control:** Implemented secure, role-specific interfaces for users and managers with fine-grained permissions.
- **Industrial Problem Solving:** Developed a scalable solution tailored to real-world industry needs with a focus on usability and maintainability.
- **Analytics & Visualization:** Created custom dashboards using Chart.js to display performance metrics and maintenance trends.

## **11. Future Scope**

- **Email Notifications:** Integrate an email service (e.g., Nodemailer) to send automatic notifications for status changes.
  - **PDF Report Generation:** Allow managers to export dashboard views or analytics as downloadable PDF reports.
  - **Real-Time WebSocket Communication:** Use WebSockets (e.g., with Socket.IO) for instant UI updates without needing to refresh.
  - **Predictive Maintenance with AI (Long-Term):** Integrate basic **AI models** to predict potential breakdowns based on past request patterns, enabling preventive maintenance planning.
  - **Multi-language Support:** Enhance accessibility by supporting **multiple languages** for users across diverse regions.
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## **12. Acknowledgment**

I would like to express my sincere gratitude to my mentor Ajay Kumar Sir and my sponsor Kunal Sir for their invaluable guidance, support, and encouragement throughout this internship. This project provided me with a profound understanding of industrial software development and the challenges of solving real-world operational problems.

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## **13. Project Hosting & Source Code**

This project has been deployed online and its source code is publicly available for review.

- **GitHub Repository (Source Code):**  
<https://github.com/LegendarySlayer/tata-maintenance-portal>
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