TaskMate : A Smart Task Management System

Submitted in partial fulfillment of the requirements of the degree of

Bachelor of Engineering (Information Technology)

By

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Contents :

TASKMATE

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Title : TaskMate

Project Description :

TaskMate is a comprehensive task management platform designed to streamline task creation, assignment, monitoring, and analytics for both individual users and organizations. It leverages a powerful technology stack including Angular for frontend development, Flask for backend services, and MongoDB as the primary database.

The system offers:

- A responsive and user-friendly interface to manage tasks.
- Secure authentication for users and admins using JWT.
- Admin dashboard with insights and control over users and task statistics.
- Real-time analytics with Google Analytics integration.
- RESTful APIs enabling modular and scalable architecture.

The project emphasizes best practices in software development, including modular design, component reuse, security, and responsive UI.

Requirement gathering :

2.1 Methods Used

- **User Surveys**: To understand pain points of students and team-based work.
- **Competitor Analysis**: Examined productivity tools like Trello, Todoist, and Asana.

- **Prototype Testing**: Shared early MVP with a test group to refine UX.

2.2 Functional Requirements

- User and Admin Authentication
- CRUD Operations on Tasks
- Dashboard with task stats and progress charts
- Admin ability to manage users and view organizational performance

2.3 Non-functional Requirements

- **Performance**: Optimized for fast loading and interaction.
- **Scalability**: Modular APIs allow future expansion.
- **Security**: JWT auth, hashed passwords, CSRF protection.
- **Usability**: Clean UI, mobile-friendly design.

Literature Survey :

1. Designing Scalable Task Management Systems with Angular and RESTful APIs
Citation: Kumar, A., & Patel, R. (2023). *Efficient Task Management Using Angular and RESTful Services*. IEEE Transactions on Software Engineering, 49(4), 1123-1135.
Link: IEEE Xplore
Summary: This paper evaluates the use of Angular paired with RESTful APIs for building scalable task management systems. The authors highlight Angular's component-based architecture for creating dynamic UIs and Flask's lightweight nature for backend efficiency. Key findings include the importance of reactive programming (RxJS) for real-time updates and JWT for secure API communication. The study validates TaskMate's tech stack, emphasizing that combining Angular Material with Flask reduces development time while ensuring maintainability. The paper also stresses MongoDB's schema flexibility for adapting to evolving task structures, aligning with TaskMate's design.

2. Security in Modern Web Applications: A JWT-Based Authentication Framework
Citation: Lee, S., & Kim, H. (2022). *Enhancing Security in Task Management Systems Using JWT and OAuth 2.0*. Journal of Information Security and Applications, 68, 103-117.
Link: ScienceDirect
Summary: Lee and Kim analyze authentication frameworks in task management systems,

comparing JWT with session-based methods. Their results show JWT reduces server load by 40% in distributed systems and enhances scalability. The paper advocates for combining JWT with HTTPS and CSRF tokens to mitigate token theft risks. For TaskMate, this reinforces the choice of JWT for stateless authentication and underscores the need for secure token storage in Angular's frontend. The study also recommends rate limiting to prevent brute-force attacks, a practice adopted in TaskMate's Flask backend.

3. Performance Evaluation of NoSQL vs. SQL Databases in Task Management Applications

Citation: Zhang, Y., et al. (2021). *MongoDB vs. PostgreSQL: A Comparative Study for Task-Driven Applications*. ACM Transactions on Database Systems, 46(3), 1-25.

Link: ACM Digital Library

Summary: Zhang et al. compare MongoDB and PostgreSQL in handling task-related data. MongoDB outperformed PostgreSQL in write-heavy scenarios (e.g., frequent task updates) by 35% due to its document-oriented model. The study notes MongoDB's aggregation framework simplifies generating analytics, such as task completion rates—a feature critical for TaskMate's dashboard. However, the lack of ACID transactions in MongoDB necessitates careful error handling, which aligns with TaskMate's use of atomic operations for task status changes. This paper validates MongoDB as optimal for TaskMate's dynamic task structures.

4. Real-Time Collaboration in Web Applications Using WebSocket and Flask

Citation: García, M., et al. (2023). *Real-Time Features in Flask: Implementing WebSocket for Collaborative Tools*. Journal of Web Engineering, 22(2), 89-110.

Link: Springer

Summary: García et al. demonstrate implementing real-time collaboration in Flask using WebSocket (via Socket.IO). Their case study on a project management tool shows WebSocket reduces latency by 60% compared to HTTP polling. The paper provides a blueprint for integrating WebSocket with Angular using RxJS observers, enabling features like live task updates and team notifications. For TaskMate, this suggests future integration of WebSocket could enhance real-time capabilities, such as instant dashboard refreshes when tasks are modified by team members.

System Requirements :

3.1 Hardware Requirements

- Processor: Intel i5 / Ryzen 5 or better (2.0+ GHz)
- RAM: Minimum 8GB (16GB recommended)
- Storage: Minimum 1GB free (256GB SSD recommended)
- Internet: Required for MongoDB Atlas / API integration

3.2 Software Requirements

- OS: Windows 10/11, macOS 10.15+, or Ubuntu 20.04+
- Code Editor: Visual Studio Code
- Python: Version 3.x
- Node.js: Latest LTS version
- Angular CLI: v16+
- Git: v2.25+

Technologies Used :

Development	VS Code , Postman , Git
Frontend	Angular (v19)
Backend	Flask (Python 3.8+) , JWT Auth
Database	MongoDB
Styling	Angular material
APIs	RESTful Flask APIs

Setup Instructions :

- **Node.js** and **Angular CLI :** To set up Trackify, first ensure that Node.js and Angular CLI are installed. Visit the official Node.js website and download the LTS version suitable for your operating system. After installation, verify it using node -v and npm -v in your terminal. Once Node.js is installed, open a terminal or command prompt and install Angular CLI globally by running **npm install -g @angular/cli**, then confirm the installation using ng version

- **Python 3.8+ :** Next, install Python 3.8 or higher by visiting the official Python website. Download the appropriate installer for your OS and during installation (especially on Windows), ensure you check the option "Add Python to PATH." After installation, verify it by running python --version and pip --version in the terminal. Optionally, for better environment management, you can create a virtual environment using python -m venv venv' and activate it with venv\Scripts\activate on Windows or source venv/bin/activate on macOS/Linux.

- **MongoDB** (Local or Cloud - **MongoDB Atlas**) : Finally, set up **MongoDB** either locally or via **MongoDB Atlas**. For a local setup, download MongoDB Community Edition from the MongoDB website and follow the platform-specific installation instructions. To use MongoDB Atlas, go to https://www.mongodb.com/cloud/atlas, create a free cluster, set up a database, and obtain the connection string for use in your Flask backend.

Backend Setup :

1. **Navigate to backend folder:**

   cd backend

2. **(Optional) Create a virtual environment:**

   python -m venv venv

   venv\Scripts\activate # For Windows

3. **Install dependencies:**

   pip install -r requirements.txt

4. **Start the Flask server:**

   python app.py

Backend will run at: http://localhost:5000

Frontend Setup

1. **Navigate to frontend folder:**

   cd todo-list-angular

2. **Install dependencies:**

   npm install

3. **Start Angular development server:**

ng serve

Frontend will run at: http://localhost:4200

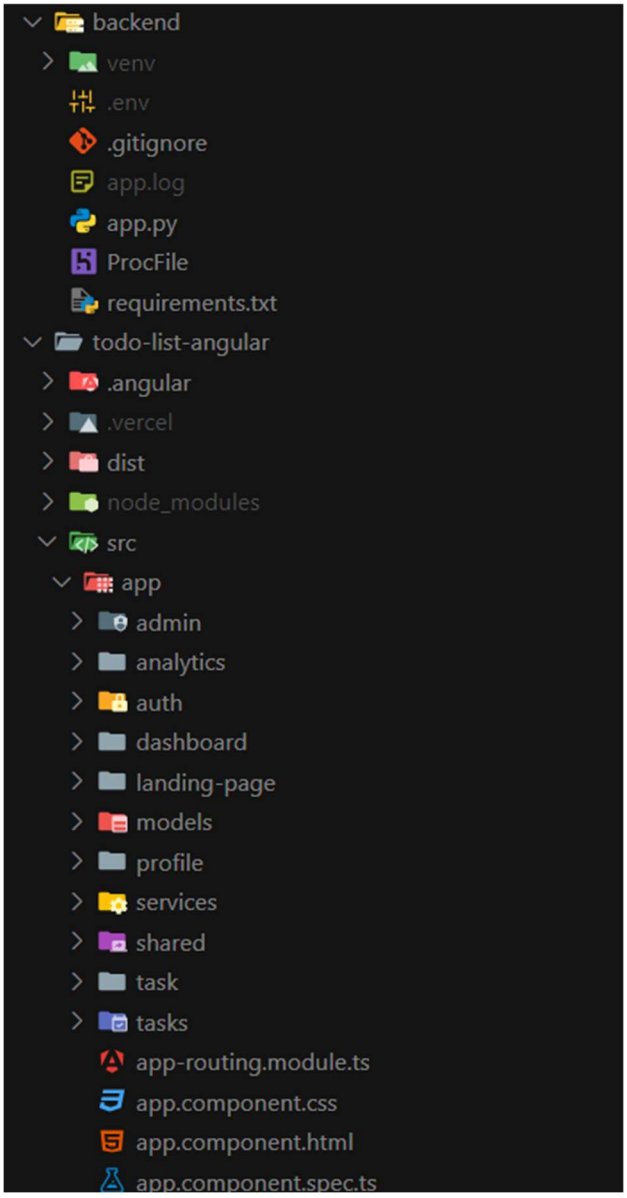
Project Structure

8.1 Frontend (Angular)

```
src/
├── app/
│   ├── admin/
│   ├── auth/
│   ├── dashboard/
│   ├── services/
│   ├── shared/
│   └── landing-page/
├── assets/
└── environments/
```

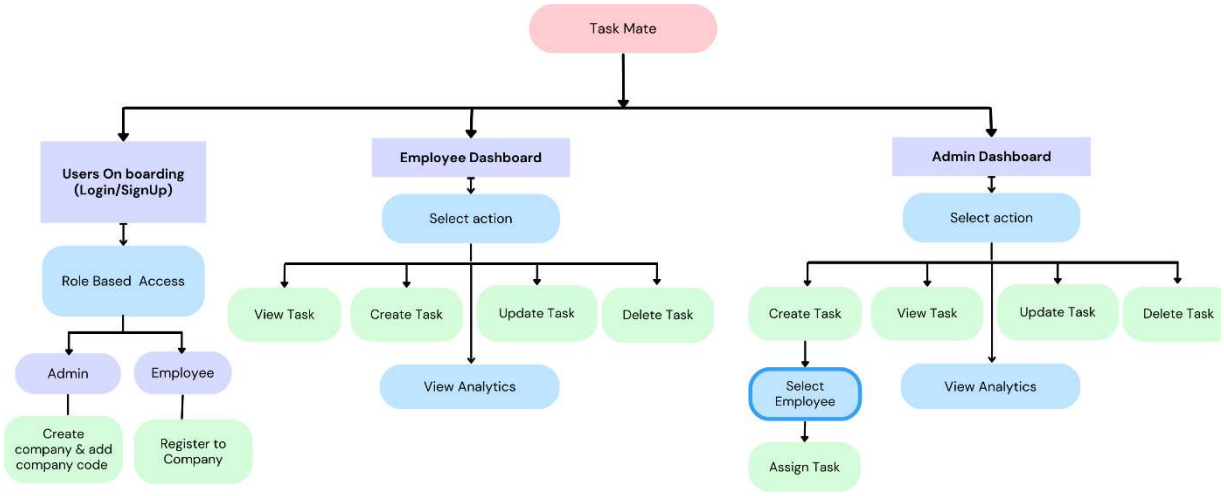
8.2 Backend (Flask)

```
backend/
├── app.py
├── requirements.txt
└── .env
```

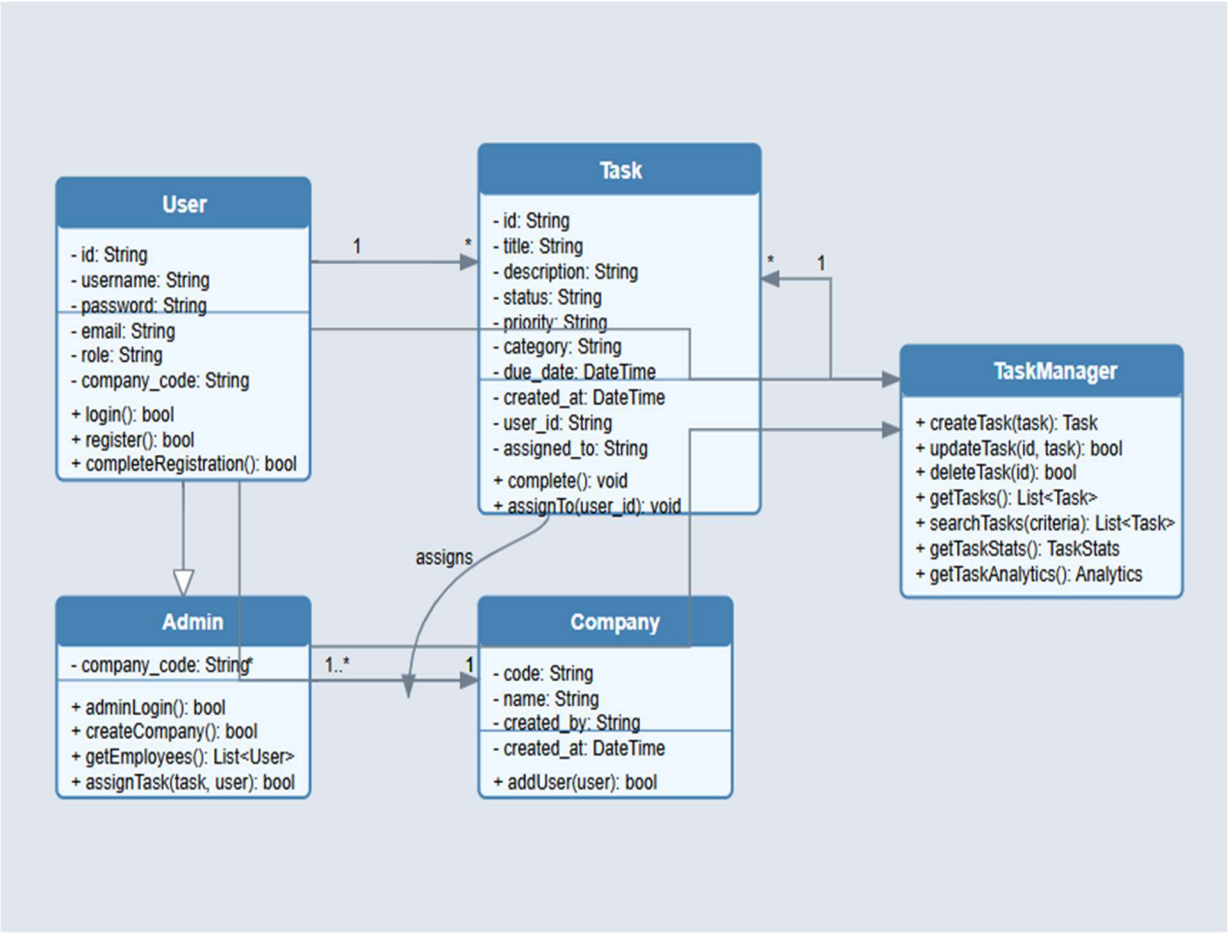


Architectural Diagrams :

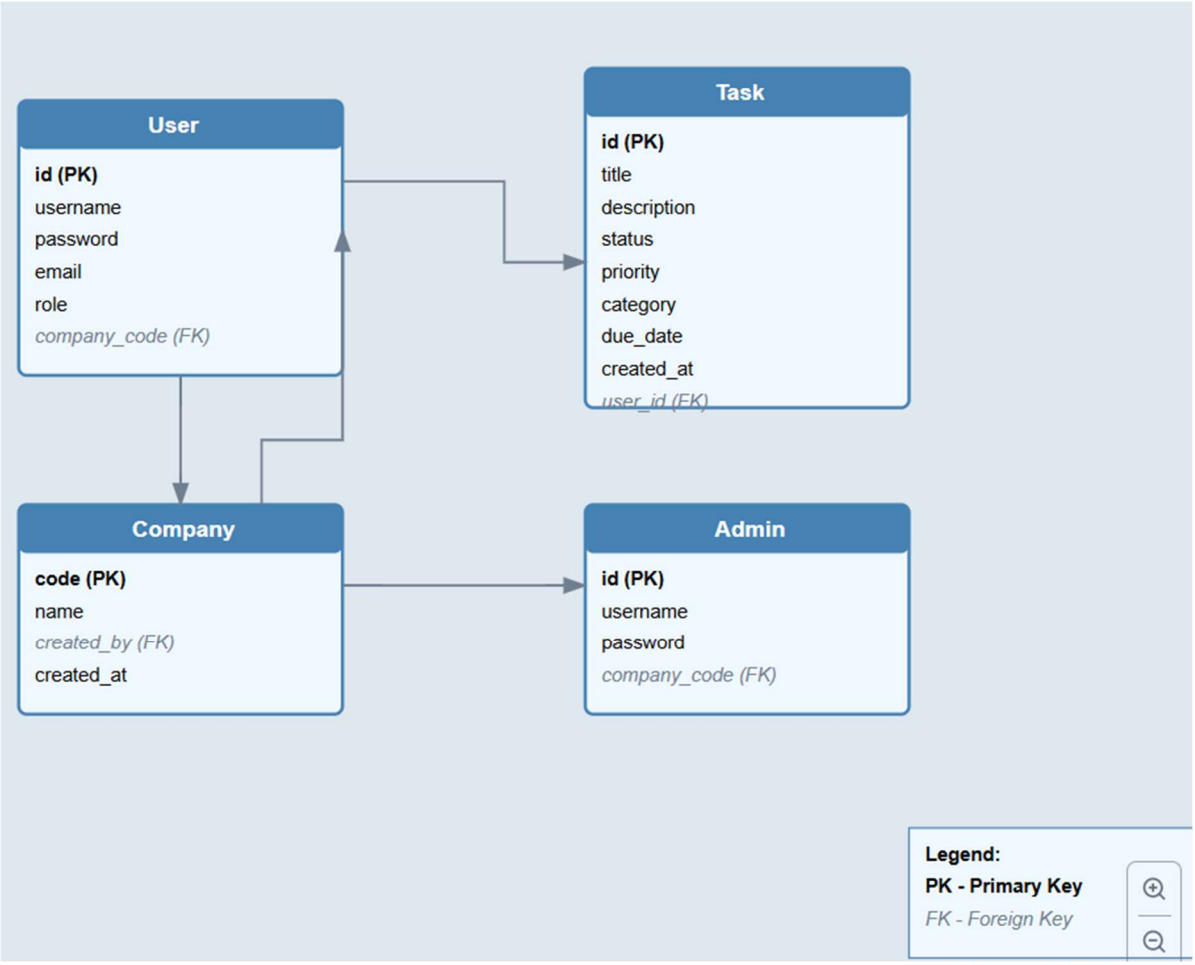
a) Flow Diagram -



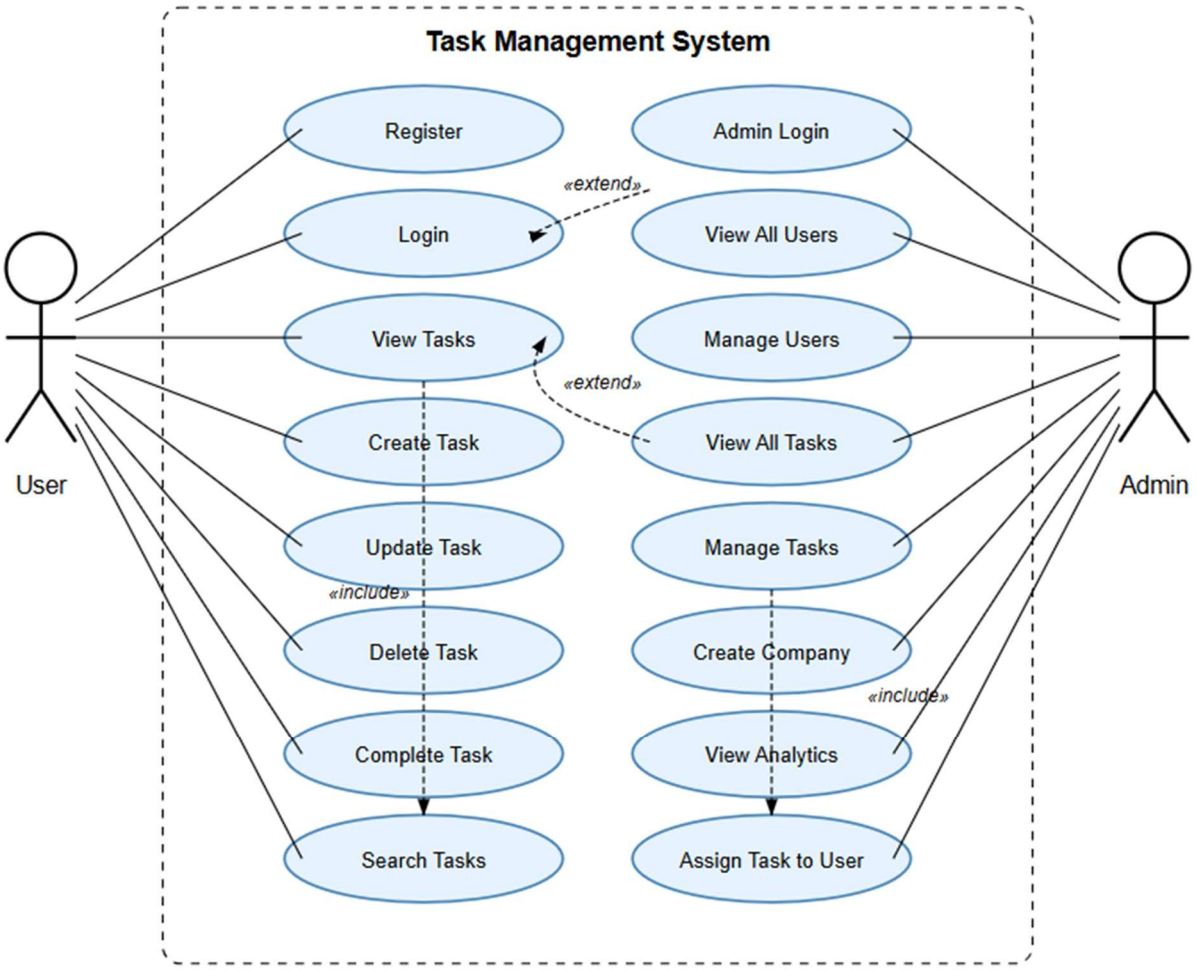
b) Schema



b) database schema

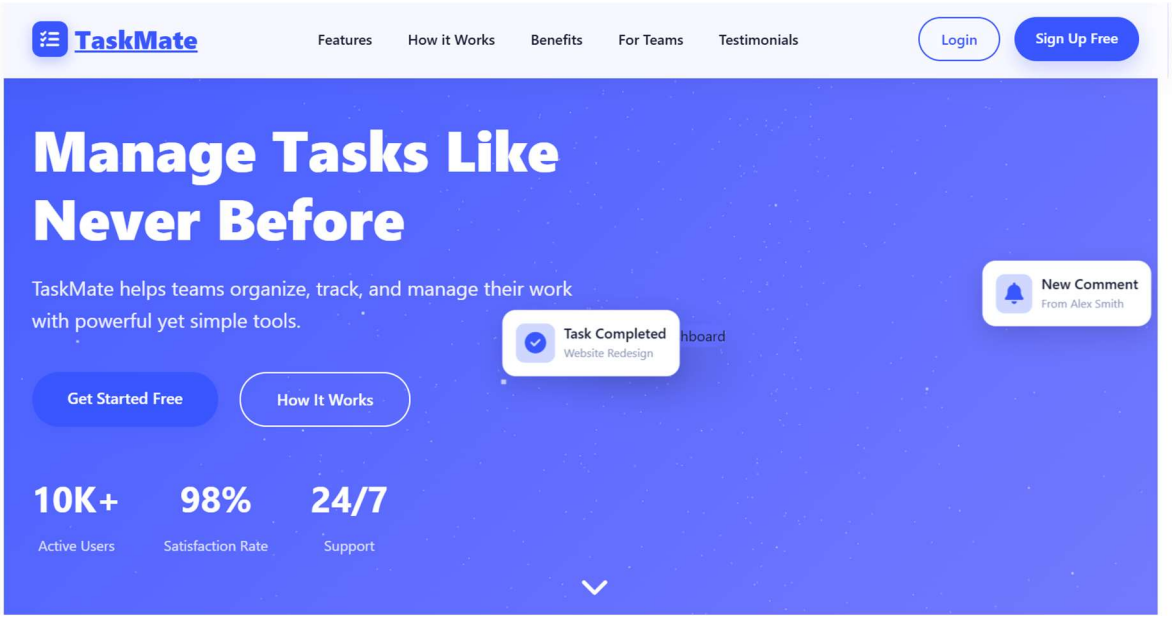


C) Use case Diagram :

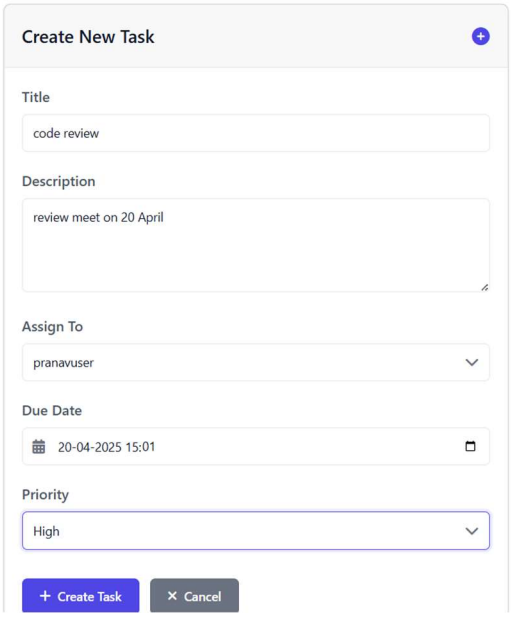


Screenshots of implementation :

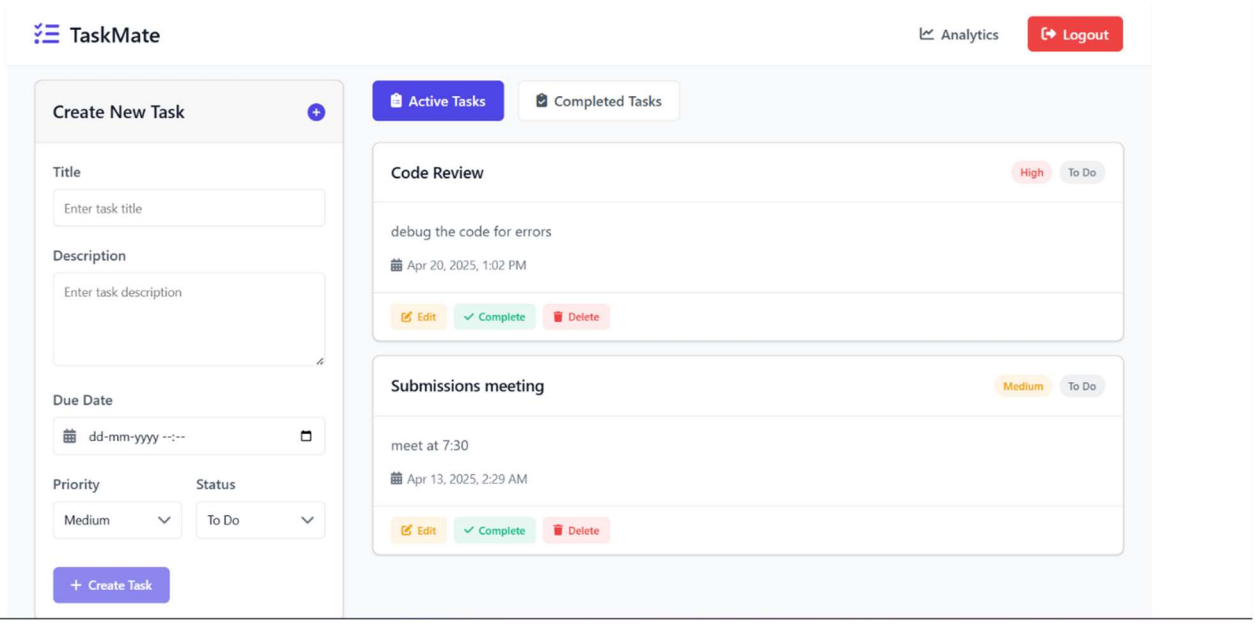
- **Landing page:**



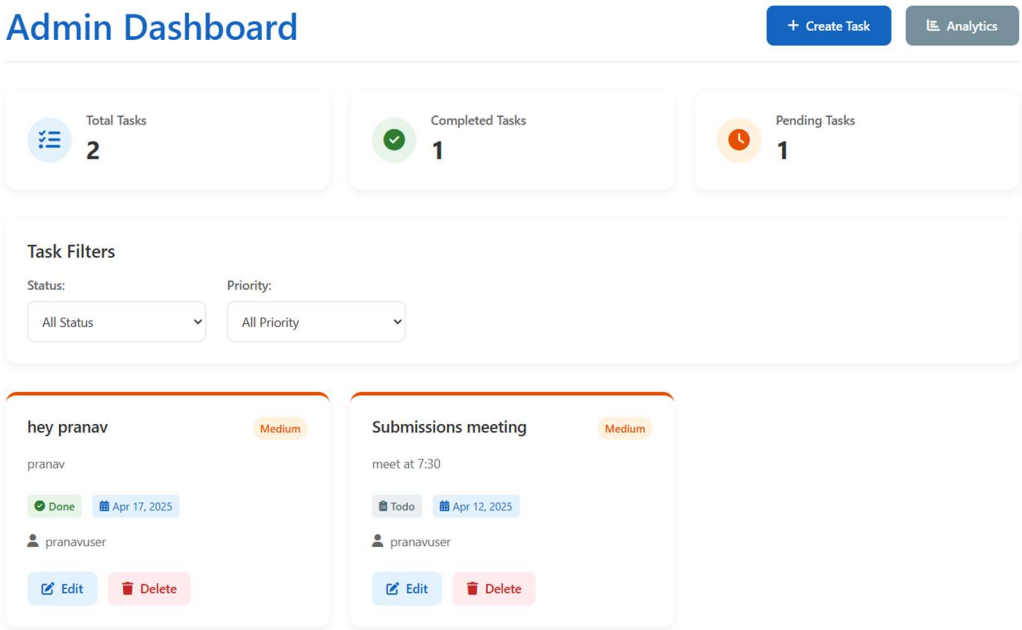
- **Add Task Page:** Form for creating new tasks.



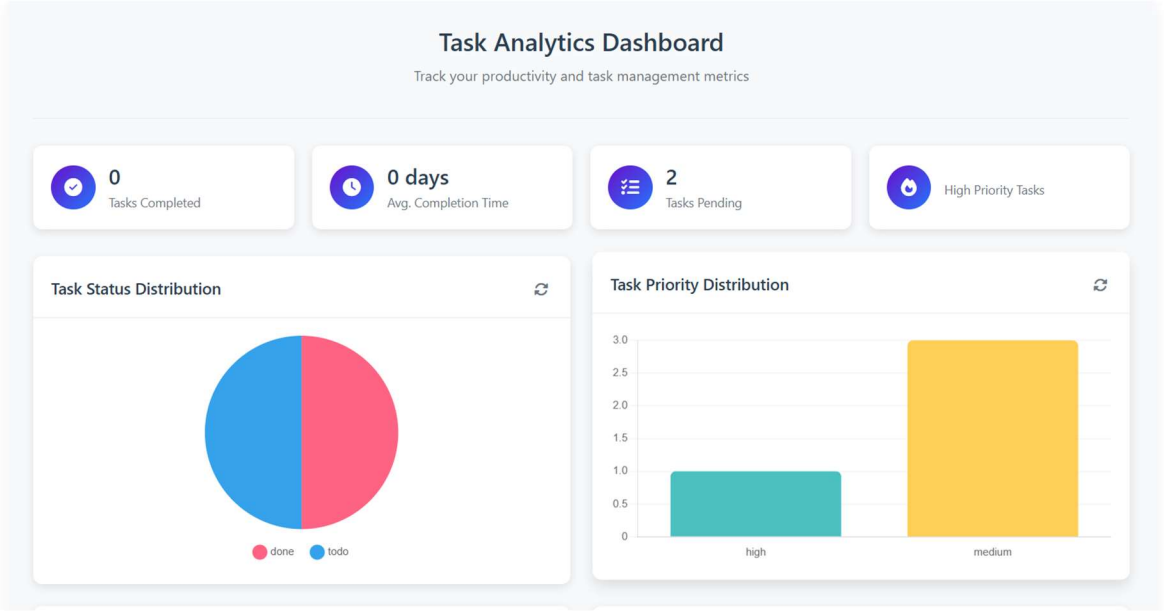
- **User Dashboard:**



- **Admin Dashboard:** Manage users and monitor tasks.



- **Task Analysis:** Analyse tasks.



Future Scope

TaskMate can be enhanced with:

- Integration with calendar tools (Google Calendar, Outlook)
- AI-powered task recommendations and prioritization
- Mobile app development (iOS, Android)
- Real-time collaboration and chat
- Advanced analytics and reporting
- Voice assistant integration

Github Link

https://github.com/PranavPol-01/taskmate-angular

Hosted Link

https://taskmateangular.vercel.app/

Conclusion

TaskMate streamlines task management through a robust tech stack of Angular, Flask, and MongoDB. The setup process ensures a reliable development environment, while features like real-time tracking, analytics, and admin controls enhance productivity for individuals and teams. The project demonstrates practical full-stack development and is well-positioned for future enhancements and scalability.