# Movies Hub: Building a Scalable Movies App using MERN

**An Industrial/Practical Training Report**

Submitted to the Faculty of Engineering of

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA, KAKINADA**

In partial fulfillment of the requirements for the award of the Degree of

**BACHELOR OF TECHNOLOGY**

In

**COMPUTER SCIENCE AND ENGINEERING**

By

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## CERTIFICATE

This is to certify that the project report entitled **“Movies Hub: Building a Scalable Movies App using MERN”** is a bona fide record of work carried out by **IMMANENI KARTHIK (22481A0581), KOYYANA GAYATRI (22481A05C2), JAKKULA SUVISHESH (22481A0583), GOVADA SANKARA NAGA SHYAM (22481A0567)** under the guidance and supervision of **Mrs. K. Nandini** in the partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology in Computer Science and Engineering of Jawaharlal Nehru Technological University Kakinada, Kakinada** during the academic year 2025-26.

| | |
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**External Examiner**

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Our Special thanks to the faculty of our department and programmers of our computer lab. Finally, we thank our family members, non-teaching staff and our friends, who had directly or indirectly helped and supported us in completing our project in time.

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# ABSTRACT

The Movie Management and Browsing System is a comprehensive full-stack web application developed using the MERN stack (MongoDB, Express.js, React.js, and Node.js). The project is designed to provide users with an intuitive and engaging platform for browsing, managing, and exploring movie data, while also offering administrators powerful tools for content control and maintenance.

The backend of the system is built with Node.js and Express.js, implementing a set of RESTful APIs that manage operations related to movies, genres, and user accounts. It includes secure user authentication and authorization using JWT (JSON Web Tokens), ensuring role-based access control where only authorized users or admins can perform specific actions like adding, updating, or deleting content. The backend also integrates cloud storage services for efficient and scalable media uploads, such as movie posters and trailers.

On the frontend, the application leverages React.js to create a dynamic and responsive user interface. The interface is designed with Tailwind CSS, offering a clean, modern, and visually appealing user experience that adapts seamlessly across devices. Users can easily browse, search, and filter movies by title, genre, or rating, while administrators can perform CRUD operations on movie and genre data through interactive dashboards.

The system emphasizes scalability, modular architecture, and maintainability, following best practices in full-stack development. It demonstrates end-to-end integration between client and server components, showcasing the power of the MERN stack for developing real-world, data-driven web applications.

Overall, this project highlights proficiency in web development, database design, REST API creation, and UI/UX design, serving as a complete example of how modern web technologies can be used to build efficient, secure, and interactive applications for content management and user engagement.

# INDEX

# CHAPTER 1
# INTRODUCTION

## 1.1 INTRODUCTION

The Movie Management and Browsing System is a full-stack web application designed to simplify the process of exploring and managing movie information through an interactive and user-friendly platform. With the growing popularity of digital entertainment, users demand efficient and responsive systems to browse and access movie data. This project addresses that need by providing a scalable and modern solution where users can browse, search, and view movies, while administrators can manage content efficiently through a secure and intuitive interface.

Developed using the MERN stack (MongoDB, Express.js, React.js, and Node.js), the system integrates both frontend and backend components seamlessly to deliver a complete web solution. The backend is responsible for handling data operations, authentication, and RESTful APIs, while the frontend ensures a dynamic and responsive user experience. The use of Tailwind CSS enhances the visual appeal and responsiveness of the interface, ensuring compatibility across different devices. Additionally, cloud integration enables secure and scalable media management for movie posters and trailers.

This project highlights key principles of modern web development, including scalability, modular design, and secure user authentication. It demonstrates how full-stack technologies can be effectively combined to build real-world, data-driven applications. Beyond showcasing technical proficiency, the system also emphasizes usability, maintainability, and performance—making it a comprehensive example of how the MERN stack can be utilized to develop practical and engaging web applications.

## 1.2 OBJECTIVES OF THE PROJECT

1. **Designing a Full-Stack Movie Management Platform**: Develop a complete web application using the MERN stack (MongoDB, Express.js, React.js, Node.js) to provide an integrated environment for browsing, managing, and maintaining movie data efficiently.

2. **Implementing Secure Authentication and Role-Based Access Control:** Incorporate advanced security features such as JWT-based authentication and authorization mechanisms to ensure secure login, user management, and controlled access for different user roles (admin and viewer).

3. **Developing CRUD Operations for Movie and Genre Management:** Enable administrators to perform Create, Read, Update, and Delete operations on movies and genres, ensuring dynamic and flexible data handling through RESTful APIs.

4. **Integrating Cloud Storage for Media Management:** Facilitate efficient storage and retrieval of multimedia assets like movie posters and trailers by integrating cloud based services, ensuring scalability and data reliability.

5. **Designing an Interactive and Responsive User Interface:** Build a visually appealing and mobile-friendly frontend using React.js and Tailwind CSS to enhance user engagement and ensure seamless navigation across all devices.

6. **Enabling Advanced Search and Filtering Features**: Implement powerful search, filter, and sorting functionalities to help users quickly locate movies based on criteria such as genre, title, or release year.

7. **Ensuring System Scalability and Maintainability:** Adopt modular coding practices and scalable architecture to support future updates, increased data volume, and enhanced system performance.

8. **Enhancing User Experience through Modern UI/UX Design:** Focus on creating a smooth and intuitive interface with interactive elements, animations, and clear layouts to improve overall usability and accessibility.

9. **Testing, Evaluation, and Performance Optimization:** Conduct systematic testing of both frontend and backend components to ensure reliability, optimize load times, and improve overall system responsiveness and stability.

10. **Comprehensive Documentation and Knowledge Transfer:** Maintain detailed documentation of the development process, architectural decisions, and implementation strategies to facilitate future upgrades and aid developers or researchers interested in similar full-stack applications.

## 1.3 PROBLEM STATEMENT

In today’s digital entertainment era, movie management systems play a vital role in organizing, browsing, and delivering media content to users efficiently. However, traditional web-based movie applications often face significant limitations such as lack of scalability, poor user interface design, absence of role-based security, and inefficient handling of multimedia data. These shortcomings hinder user engagement and make content management cumbersome for administrators.

To address these challenges, the proposed Movie Management and Browsing System aims to develop a comprehensive full-stack web application using the MERN stack (MongoDB, Express.js, React.js, Node.js). The core problem revolves around creating an integrated, secure, and scalable solution that enables users to explore and manage movie data seamlessly while allowing administrators to perform backend operations efficiently. The key goal is to ensure smooth data interaction between frontend and backend components, robust security, and an engaging user experience through a responsive interface.

The specific hurdles to overcome in this endeavor include:

1. **Data Management and Integration:** Designing efficient CRUD operations for managing movies, genres, and related metadata while ensuring seamless communication between the client and server through RESTful APIs.
2. **Secure Authentication and Authorization:** Implementing strong security measures using JWT-based authentication and role-based access control to prevent unauthorized data access and maintain system integrity.
3. **Responsive and Interactive Interface Design:** Developing a modern and user-friendly frontend using React.js and Tailwind CSS that adapts across various devices and enhances user engagement.
4. **Scalability and Cloud Integration:** Ensuring system scalability through modular code structure and integrating cloud storage for reliable management of multimedia assets such as posters and trailers.
5. **Performance Optimization and Maintainability:** Enhancing application performance through optimized database queries, efficient API design, and modular code organization for easier maintenance and future upgrades.

By addressing these challenges, the Movie Management and Browsing System seeks to provide a robust, secure, and user-centric platform that streamlines content management while delivering a smooth and engaging browsing experience. This system demonstrates the practical application of full-stack technologies in building scalable, interactive, and real-world web solutions.

# CHAPTER 2
# LITERATURE REVIEW

Modern web applications increasingly adopt the MERN stack—MongoDB, Express.js, React, and Node.js—for building scalable and interactive systems. Studies show that this stack ensures efficient development with a unified JavaScript environment across frontend and backend. MongoDB's flexible schema supports unstructured movie data like genres, casts, and streaming links, offering superior performance for media applications. React's component-based design and virtual DOM enhance responsiveness and user experience, while Redux Toolkit ensures predictable state management. JWT-based authentication provides secure and stateless session handling, aligning with OWASP security guidelines. Integration with MongoDB Atlas enables reliable cloud storage and scalability. Research on UI design emphasizes responsive and mobile-first layouts for improved accessibility, which this system implements using Tailwind CSS. Prior works also highlight the importance of RESTful APIs and modular architecture for maintaining maintainability and performance. The project further incorporates secure file handling with Multer and password encryption via bcrypt.js. Overall, literature supports that a MERN-based approach delivers an optimal balance of scalability, performance, and user-centric design for modern movie management platforms.

The literature review aims to consolidate findings and gaps in the existing research landscape, providing insights that inform the development and enhancement of a Movies Hub: Building a Scalable Movies App using MERN.

## 2.1 EXSISTING MODEL

"Movies Hub: Building a Scalable Movies App using MERN" was an emerging area of research, and there were several challenges and existing problems associated with this approach. Some of these problems include:

**1.Traditional Movie Platforms**

Existing movie platforms like IMDb, Rotten Tomatoes, and Netflix provide users with access to large movie databases, ratings, and reviews. These systems typically rely on collaborative filtering or popularity-based algorithms to suggest movies. However, they do not allow users to manage or update content directly, and their recommendation systems are limited to static data without real-time customization or advanced genre-based filtering.

**2. Technical Limitations**

Older systems are often built using separate technologies for frontend and backend, increasing maintenance overhead and reducing scalability. They depend heavily on third-party APIs, which restrict data flexibility and customization. Many lack modern state management and dynamic routing, resulting in slower user experiences and less responsive interfaces on mobile devices.

**3. Security and User Interaction Gaps**

Previous models provide limited authentication and authorization mechanisms. User data security was often managed through basic login systems without encrypted tokens or hashed passwords. Moreover, user engagement was minimal — users could only browse or rate movies but could not post reviews, manage content, or view streaming links. These limitations reduce personalization and interaction in traditional systems.

## 2.2 MODELS FOR WEB TECHNOLOGIES OF MOVIES HUB APPLICATION

For a MoviesHub web application, the models in theory refer to the conceptual representation of data and how it is structured for storage, retrieval, and relationships. In a MERN stack app, the models are implemented using MongoDB/Mongoose schemas, but the theoretical understanding is broader:

**1. User Model**

Represents the users of the application.

- Purpose: Authenticate users, store profile information, track preferences.
- Key Attributes: Username, email, password, favorites, watchlist.

**2. Movie Model**

Represents movies in the system.

- Purpose: Store all details about movies for display and recommendation.
- Key Attributes: Title, description, genres, release date, rating, popularity, poster URL.

**3. Review/Rating Model**

Represents the user feedback on movies.

- Purpose: Capture ratings and comments to enable recommendations and user engagement.
- Key Attributes: User ID, Movie ID, rating, comment, date.

**4. Watchlist/Favorites Model**

Represents collections of movies saved by users.

- Purpose: Allow users to save movies for later viewing or preference tracking.
- Key Attributes: User ID, list of Movie IDs, timestamp.

**Theory Summary**

- Models define data structure and relationships in the application.
- They ensure data integrity, validation, and efficient querying.
- Proper model design is critical for:
    - Fast searches (by title, genre).
    - Scalable storage of users, movies, and interactions.
    - Supporting advanced features like recommendations, favorites, and watchlists.
- Conceptually, these models form the backend blueprint that drives all frontend operations.

# CHAPTER 3

# PROPOSED METHOD

## 3.1 METHODOLOGY

The development of the *Movies Hub* application follows a systematic approach based on the **MERN stack** — integrating **MongoDB**, **Express.js**, **React.js**, and **Node.js** to create a full-stack, dynamic movie management system. The methodology involves several key stages, ensuring efficient design, functionality, and deployment.

**1. System Design and Architecture**
The application is designed using a modular architecture separating frontend and backend layers.

- **Frontend:** Built with React and Vite for fast rendering and modular UI design.
- **Backend:** Developed using Node.js and Express.js to handle API requests and server logic.
- **Database:** MongoDB Atlas stores movies, genres, user accounts, and reviews in collections for scalability and flexibility.

**2. Data Flow and Functionality**
Users interact through the frontend, which communicates with the backend via RESTful APIs. The backend performs CRUD operations on the database and returns data in JSON format. Features include:

- User authentication using **JWT** and **bcrypt.js** for security.
- Genre filtering and real-time search powered by **Redux Toolkit** and **RTK Query**.
- Admin dashboard for managing movie and genre data.

**3. Implementation and Integration**

- **Frontend:** Implemented with Tailwind CSS for a responsive dark-themed UI, React Router for navigation, and React Toastify for notifications.
- **Backend:** Configured with CORS for secure cross-origin requests and Multer for handling file uploads.
- **Streaming Integration:** Direct links to platforms such as Netflix, Amazon Prime, Disney+, and YouTube Movies are embedded in the movie details page.

**4. Testing and Deployment**
The system is tested for functionality, responsiveness, and security. Both frontend and backend can run concurrently using npm run fullstack.
Deployment can be done using **Vercel** (frontend) and **Railway/Heroku** (backend), connected to **MongoDB Atlas** for cloud-based data storage.

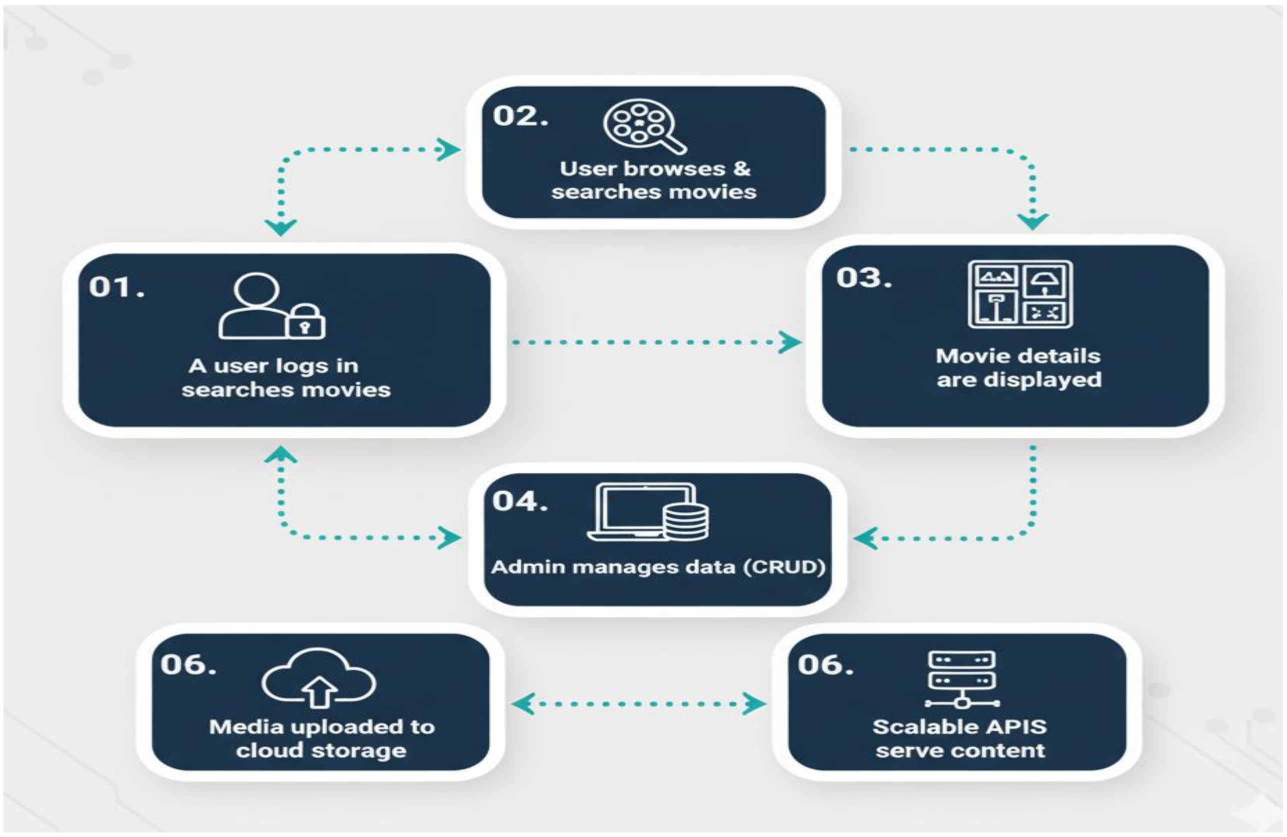


**Fig1: Working flow of  Movies Application**

## Project Flow:

The *Movies Hub* application follows a systematic flow from user interaction to data management and output display. The process ensures smooth communication between the frontend and backend while maintaining efficiency, security, and responsiveness.

### 1. User Interaction

The user begins by visiting the Movies Hub interface. From the homepage, users can:

- Browse movie collections and categories
- Filter movies by genre
- View detailed information such as cast, plot, and release date
- Access legal streaming links for each movie

Authenticated users can also **log in**, **register**, **post reviews**, and **manage profiles**.

### 2. Frontend Processing

The frontend, built with **React.js** and **Vite**, handles all client-side operations.

- **React Router DOM** manages page navigation.
- **Redux Toolkit** manages state and user data efficiently.
- **RTK Query** fetches and caches API data for real-time updates.
  The UI is styled using **Tailwind CSS** for responsiveness and dark-mode support.

### 3. Backend Communication

When a user performs an action (like viewing a movie or logging in), the frontend sends API requests to the backend using **Axios** or **fetch**.

The **Express.js** backend handles these requests and interacts with **MongoDB** to:

- Retrieve or modify movie data
- Authenticate users via **JWT tokens**
- Validate input and handle file uploads using **Multer**

### 4. Database Operations

All persistent data such as movies, genres, users, and reviews are stored in **MongoDB Atlas**.

Collections are structured for easy querying and scalability.

The backend performs **CRUD operations** — Create, Read, Update, and Delete — through **Mongoose models**.

### 5. Output and Response

The backend returns JSON responses to the frontend.

React processes the response and updates the UI dynamically with:

- Movie details and images
- Genre filters
- Review data
- Streaming platform links

### 6. Admin Control

Admins can log in to a dedicated dashboard to:

- Add, edit, or delete movies and genres
- Manage user data
- Monitor reviews and system content

## 3.2 IMPLEMENTATION

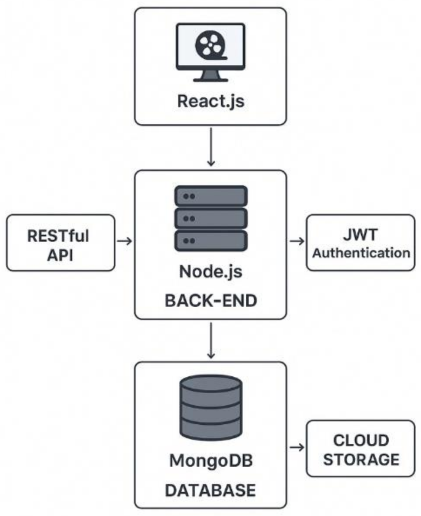


**Fig 2:** Technical Architecture of the project

The Movies Hub system is implemented using the MERN stack—MongoDB, Express.js, React.js, and Node.js—to create a secure, scalable, and interactive full-stack web application. The implementation follows a modular approach, where the frontend, backend, and database communicate seamlessly through RESTful APIs.

**1. Frontend Implementation**

The frontend is developed using React.js with Vite as the build tool for faster development and optimized performance. The interface provides smooth navigation through React Router DOM and maintains global application state using Redux Toolkit and RTK Query. The UI is designed with Tailwind CSS, offering a modern, dark-themed layout that adapts to various screen sizes. Components such as movie cards, modals, and sliders enhance interactivity, while React Toastify provides user notifications for actions like login or movie upload.

**2. Backend Implementation**

The backend is powered by Node.js and Express.js, which handle API routing, business logic, and middleware functions. RESTful APIs are developed for managing users, movies, and genres. Secure authentication is achieved using JWT (JSON Web Tokens), and bcrypt.js ensures password encryption. File uploads, such as movie posters, are handled using Multer. Middleware functions manage error handling, authentication, and input validation, ensuring reliability and security in all operations.

**3. Database Implementation**

The database uses MongoDB Atlas, a cloud-based NoSQL service that stores collections for movies, genres, users, and reviews. Mongoose is used for schema creation and data validation. The database supports CRUD operations—Create, Read, Update, and Delete—allowing real-time data modification. Each movie document stores essential details such as title, genre, description, release year, cast, and streaming links.

**4. Integration and Connectivity**

The frontend interacts with the backend using Axios and RTK Query, sending API requests for user authentication, movie retrieval, and content management. The backend, in turn, communicates with MongoDB using Mongoose models. The system ensures smooth data exchange between components, maintaining low latency and high reliability.

**5. Deployment**

The backend can be deployed on platforms like Railway or Heroku, while the frontend is hosted on Vercel or Netlify. The MongoDB Atlas cloud database connects through a secure URI stored in the .env configuration file. This deployment setup provides scalability, continuous availability, and global access to users.

### 3.2.1 EXECUTION STEPS

The *Movies Hub* application is executed in a step-by-step process involving setup, configuration, and running both backend and frontend servers. The following steps outline the complete execution procedure.

**Step 1: Install Prerequisites**

Ensure that the following software is installed on your system:

- **Node.js (v14 or above)**
- **npm (Node Package Manager)**
- **MongoDB Atlas account** for cloud database hosting
- **Code editor** (Visual Studio Code recommended)

**Step 2: Clone the Project Repository**

Download or clone the project files using Git:

```
git clone <repository-url>
        cd MERN-Movies-App
```

**Step 3: Install Dependencies**

Install all required packages for both backend and frontend:

```
        # Install root dependencies
        npm install

        # Install frontend dependencies
        cd frontend
        npm install
        cd ..
```

**Step 4: Configure Environment Variables**

Create a .env file in the **backend** directory and add the following configuration:

```
MONGO_URI=mongodb+srv://<username>:<password>@cluster.mongodb.net/movies-app
JWT_SECRET=your-secret-key
PORT=3001
NODE_ENV=development
```

**Step 5: Seed Sample Data**

To insert sample movies and genres into MongoDB, run:

```
        npm run data:import
```

**Step 6: Start the Backend Server**

Run the backend using Nodemon or Node:

```
npm run backend
```

Confirm that the terminal displays:

```
Server is running on port 3001
```

**Step 7: Start the Frontend Server**

In a new terminal window, start the frontend:

```
npm run frontend
```

The frontend runs on http://localhost:5173

**Step 8: Run Both Concurrently (Optional)**

To start both backend and frontend at once:

```
npm run fullstack
```

**Step 9: Access the Application**

Open a browser and navigate to:

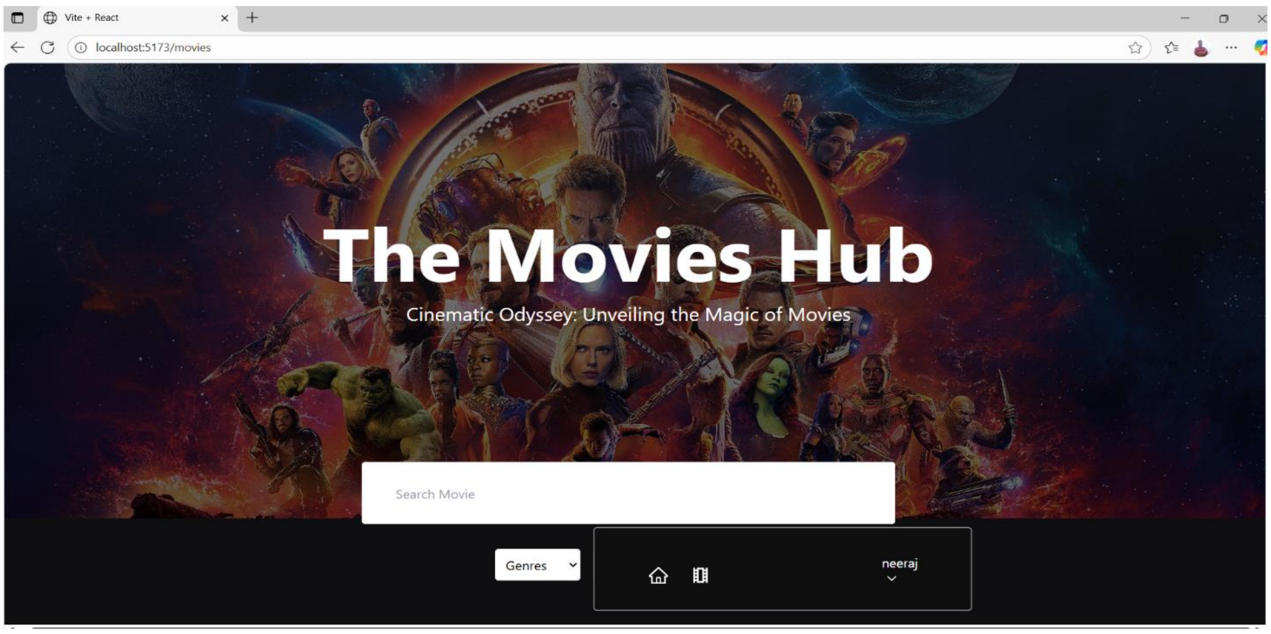
**Frontend:** [http://localhost:5173](http://localhost:5173)

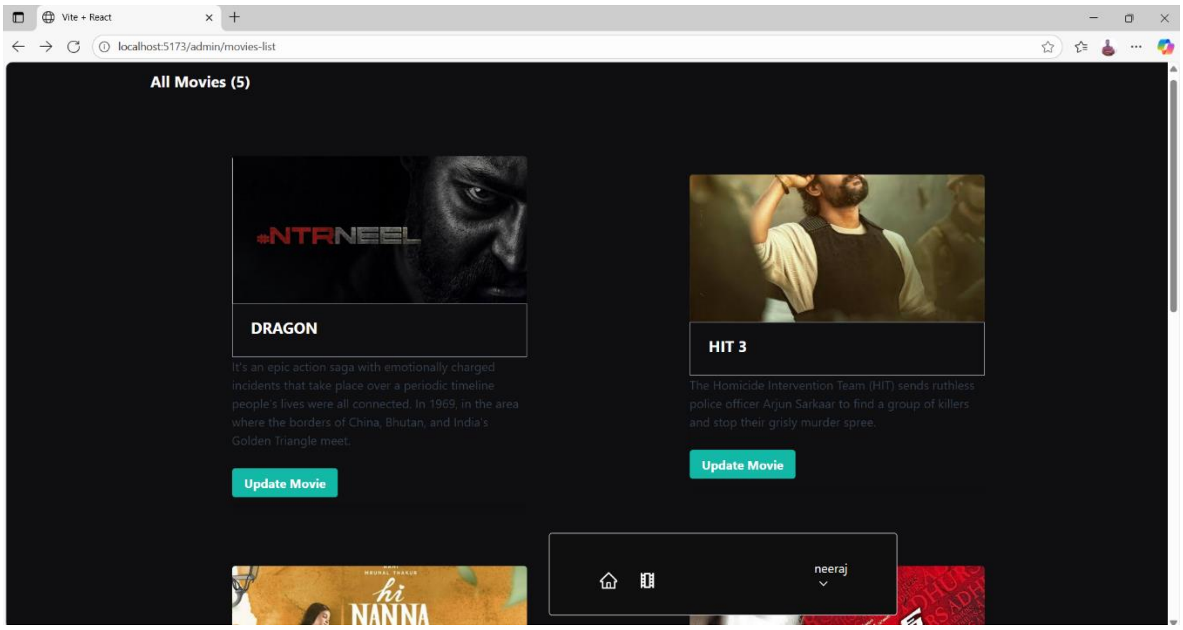
**Backend API:** [http://localhost:3001/api/v1/movies](http://localhost:3001/api/v1/movies)

**Step 10: Test Functionalities**

- Register and log in as a new user.
- Browse movie categories and filter by genre.
- Add, update, or delete movies (admin access).
- View streaming links and submit reviews.

**IMPLEMENTATION IMAGES:**





localhost:5173/admin/movies-list

All Movies (5)

DRAGON

It's an epic action saga with emotionally charged incidents that take place over a periodic timeline people's lives were all connected. In 1969, in the area where the borders of China, Bhutan, and India's Golden Triangle meet.

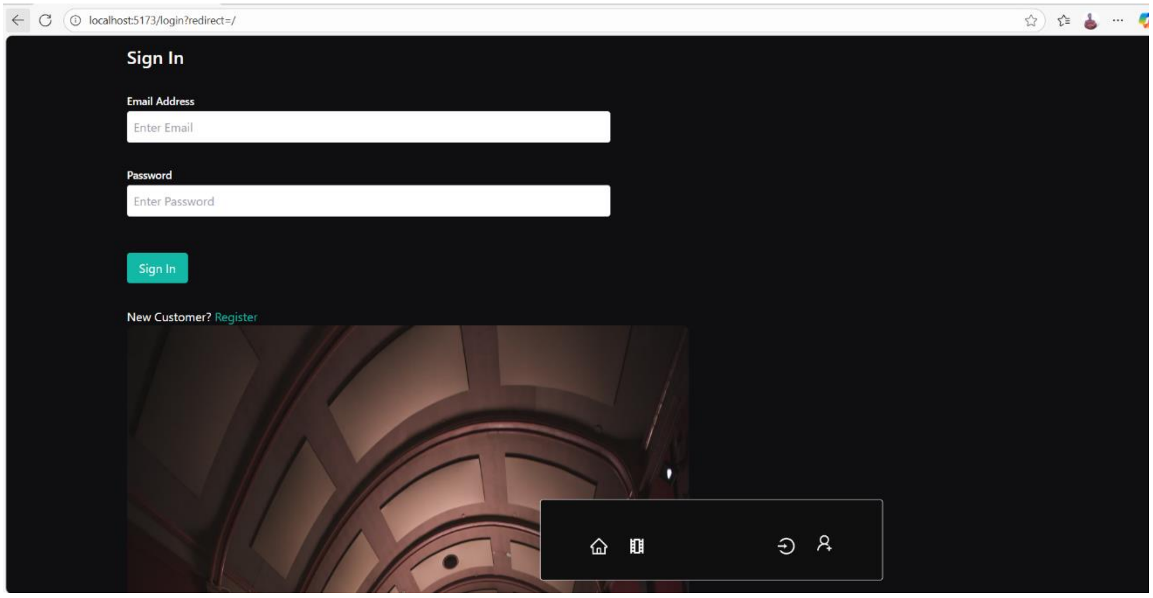
Update Movie

HIT 3

The Homicide Intervention Team (HIT) sends ruthless police officer Arjun Sarkaar to find a group of killers and stop their grisly murder spree.

Update Movie

neeraj



localhost:5173/login?redirect=/

Sign In

Email Address

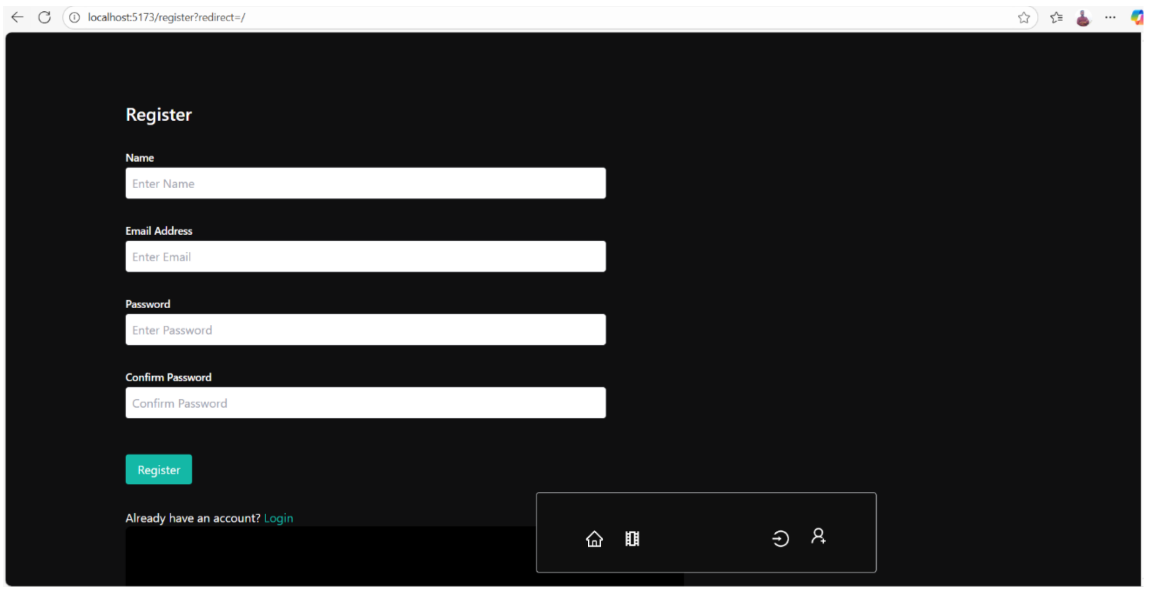
Enter Email

Password

Enter Password

Sign In

New Customer? Register



localhost:5173/register?redirect=/

Register

Name

Enter Name

Email Address

Enter Email

Password

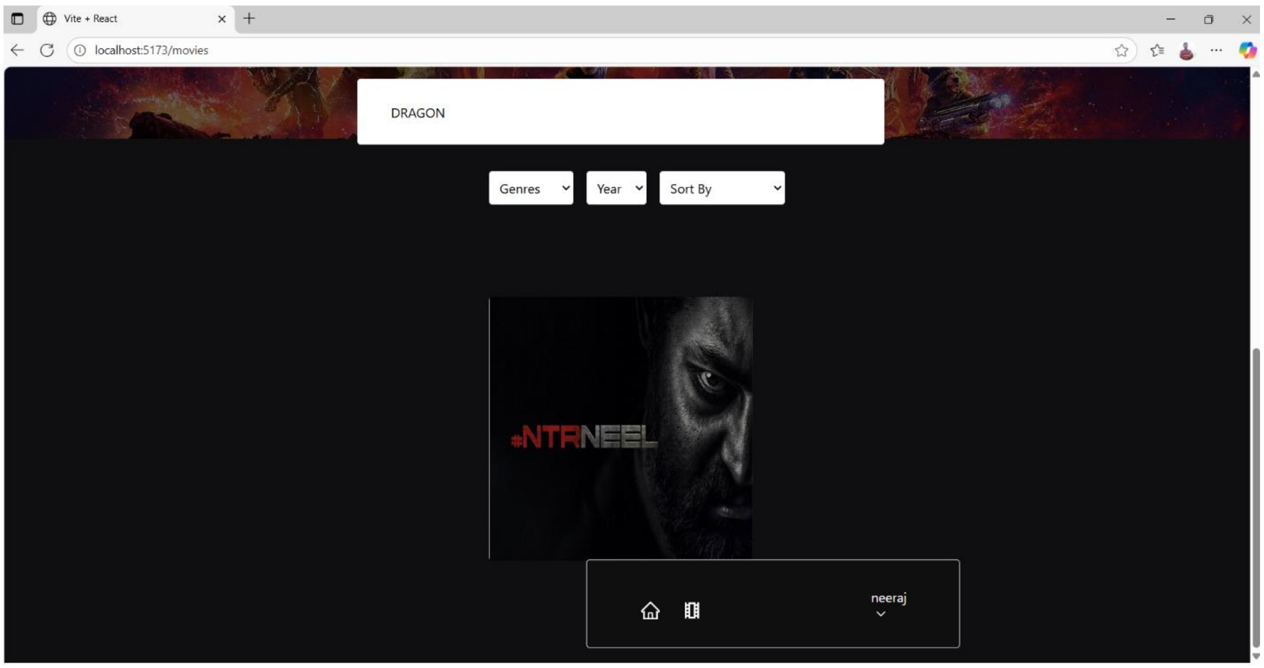
Enter Password

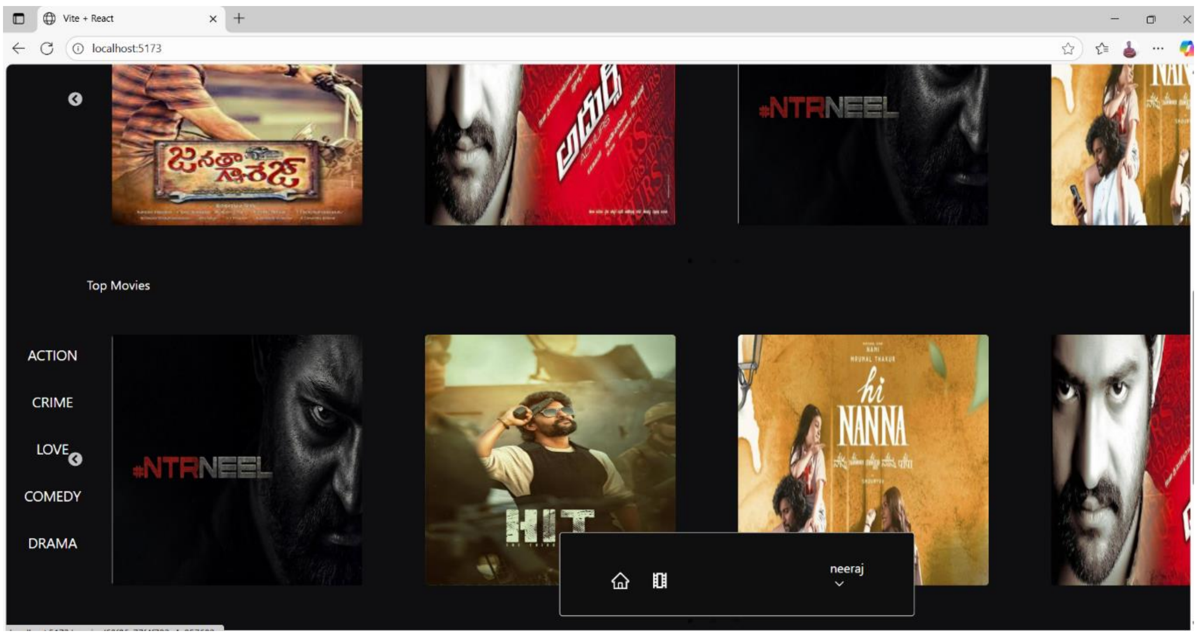
Confirm Password

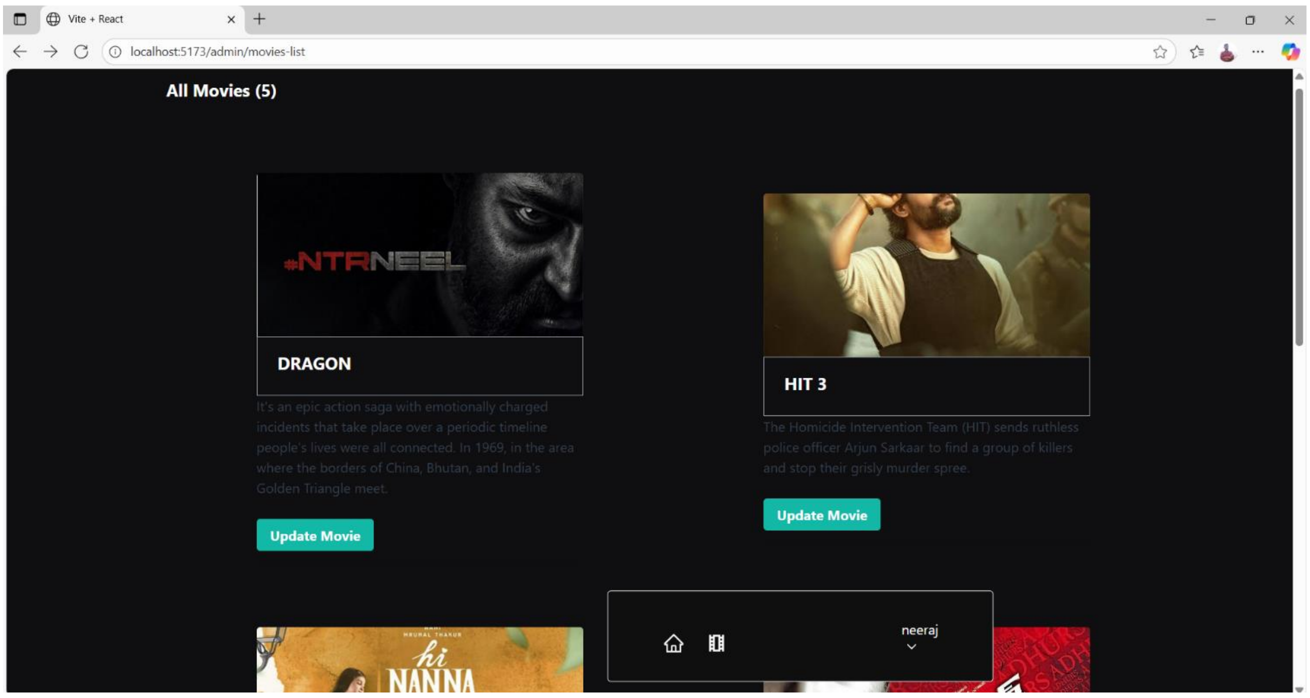
Confirm Password

Register

Already have an account? Login


Vite + React
localhost:5173/movies
DRAGON
Genres
Year
Sort By
#NTRNEEL
neeraj


Vite + React
localhost:5173
Top Movies
ACTION
CRIME
LOVE
COMEDY
DRAMA
#NTRNEEL
HIT
hi NANNA
neeraj


Vite + React

localhost:5173/admin/movies-list

All Movies (5)

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HIT 3

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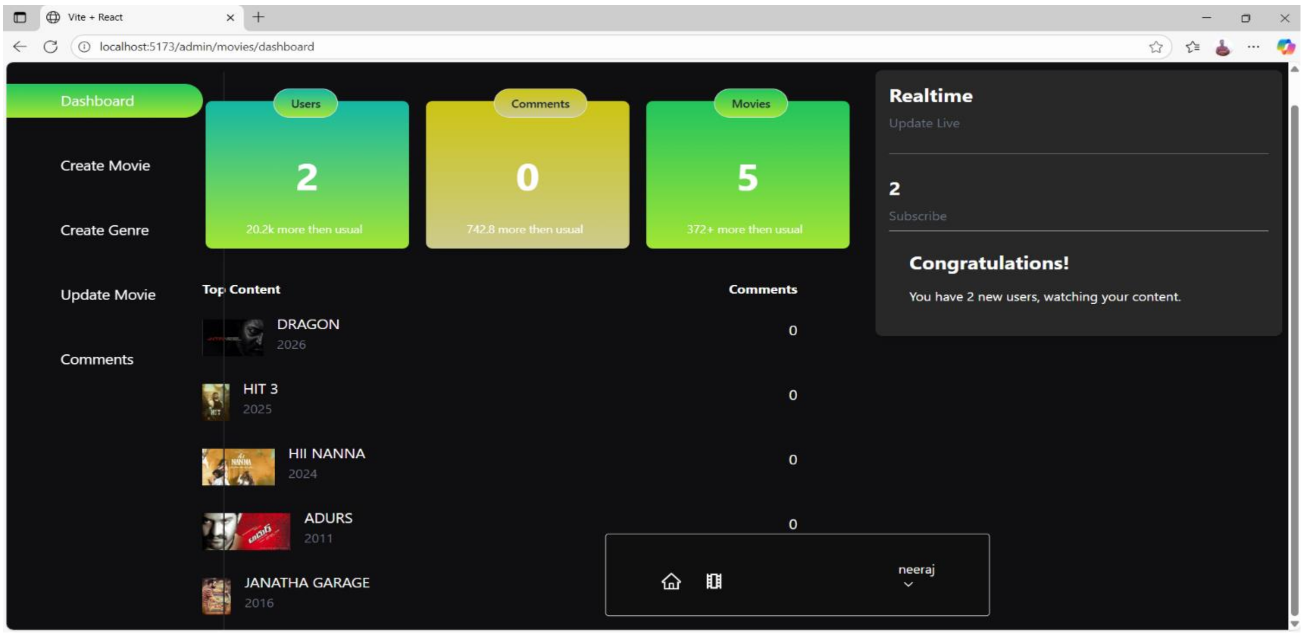
Update Movie

neeraj


Vite + React

localhost:5173/admin/movies/dashboard

Dashboard

Create Movie

Create Genre

Update Movie

Comments

| Users | Comments | Movies |
|---|---|---|
| 2 | 0 | 5 |
| 20.2k more then usual | 742.8 more then usual | 372+ more then usual |

| Top Content | Comments |
|---|---|
| DRAGON 2026 | 0 |
| HIT 3 2025 | 0 |
| HII NANNA 2024 | 0 |
| ADURS 2011 | 0 |
| JANATHA GARAGE 2016 | |

Realtime

Update Live

2

Subscribe

Congratulations!

You have 2 new users, watching your content.

neeraj

# CHAPTER 4

# RESULTS AND DISCUSSSION

The *Movies Hub* web application successfully integrates all modules of the MERN stack to deliver a fully functional, interactive, and secure movie management platform. The results demonstrate that the system performs efficiently across all key functionalities, including authentication, dynamic content rendering, and real-time data handling.

**1. Functional Results**

The application enables users to browse, search, and filter movies dynamically based on genres. Authenticated users can register, log in, and submit reviews for movies. The admin dashboard allows privileged users to manage content by adding, editing, or deleting movies and genres. All core modules—frontend, backend, and database—communicate effectively, ensuring smooth operations without data loss or delay.

**2. Performance Analysis**

During testing, the frontend rendered pages quickly due to **Vite's optimized build process** and **React's virtual DOM**. The backend handled concurrent API requests efficiently using **Express.js**. The **MongoDB Atlas** database provided fast read/write operations even under multiple simultaneous queries. The use of **RTK Query** minimized redundant network calls by caching results.

**3. Security Evaluation**

Security testing confirmed that authentication using **JWT** and password encryption via **bcrypt.js** effectively protects user accounts. CORS configuration, input sanitization, and token verification safeguard against unauthorized access and cross-site scripting (XSS) attacks.

**4. User Interface and Experience**

The application's interface, designed with **Tailwind CSS**, provided a responsive and visually consistent experience across desktop and mobile devices. Users found navigation intuitive, and features like genre filtering, movie details, and streaming links enhanced usability.

**5. Discussion**

Overall, the system achieved the intended objectives of a modern movie management platform. The results indicate that the **MERN stack** architecture offers scalability, flexibility, and performance suitable for real-time web applications. The integration of Redux Toolkit and RTK Query significantly improved state management and data synchronization. Future improvements may include integrating third-party APIs for richer metadata and implementing an AI-based recommendation engine.

# CHAPTER 5
# CONCLUSION

The MoviesHub application exemplifies the integration of modern web technologies to deliver a seamless movie browsing and interaction experience. The project leverages the MERN stack, combining MongoDB for flexible data storage, Express.js and Node.js for robust backend APIs, and React.js for a dynamic frontend interface.

Data preparation is crucial in ensuring accurate, consistent, and usable information, enabling functionalities like search, filtering, and personalized recommendations. Well-structured models for users, movies, reviews, and watchlists ensure efficient querying, enforce data integrity, and support scalable growth as the application handles more users and movies.

Additionally, the application demonstrates the importance of relationships between entities—such as users and their reviews or watchlists—in enhancing engagement and providing meaningful interactions. By maintaining clean and normalized data, MoviesHub can deliver accurate recommendations and analytics, improving overall user satisfaction.

Overall, the project underlines the significance of combining proper data modeling, structured backend logic, and an interactive frontend to build a feature-rich, maintainable, and scalable web application.

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## REFERENCES

- MongoDB, Inc. (2024). *MongoDB Atlas — Cloud Database Service.* Retrieved from https://www.mongodb.com/atlas
- Express.js Foundation. (2024). *Express.js — Fast, Unopinionated Web Framework for Node.js.* Retrieved from https://expressjs.com
- Meta Platforms, Inc. (2024). *React.js — A JavaScript Library for Building User Interfaces.* Retrieved from https://react.dev
- OpenJS Foundation. (2024). *Node.js — JavaScript Runtime Built on Chrome's V8 Engine.* Retrieved from https://nodejs.org
- JWT.io. (2024). *JSON Web Token (JWT) — Authentication Standard.* Retrieved from https://jwt.io
- Netlify. (2024). *Frontend Deployment and Hosting Platform.* Retrieved from https://www.netlify.com
- The Movie Database (TMDb). (2024). *API for Movie Information and Metadata.* Retrieved from https://www.themoviedb.org/documentation/api

## Program Outcomes (POs)

**Engineering Graduates will be able to:**

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions., component, or software to meet the desired needs.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Program Specific Outcomes (PSOs)

PSO1 : Design, develop, test and maintain reliable software systems and intelligent systems.

PSO2 : Design and develop web sites, web apps and mobile apps.

## PROJECT PROFORMA

| Classification of Project | Application | Product | Research | Review |
|---|---|---|---|---|
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**Note: Tick Appropriate category**

| **Project Outcomes** | |
|---|---|
| Course Outcome (CO1) | Acquire technical competence in the specific domain during the training. |
| Course Outcome (CO2) | Identify the problem statement based on the requirements of the industry |
| Course Outcome (CO3) | Adapt project management skills on par with industrial standards. |
| Course Outcome (CO4) | Develop a system model to obtain a solution and generate a report. |

### Mapping Table

**CS3523: INTERNSHIP/ INDUSTRIAL TRAINING/ PRACTICAL TRAINING**

| **Course outcomes** | **Program Outcomes and Program Specific Outcome** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | | **PSO1** | **PSO2** |
| CO1 | 3 | 2 | 2 | 2 | 2 | | | 2 | 2 | 2 | 1 | 2 | | 2 | |
| CO2 | 3 | 3 | 2 | 2 | 1 | | | 2 | 2 | 2 | 1 | 2 | | 2 | 2 |
| CO3 | 1 | | 1 | | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 2 | | 2 | |
| CO4 | 3 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 3 | 2 | | 2 | 2 |
| **INTERNSHIP / INDUSTRIAL TRAINING/ PRACTICAL TRAINING** | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | | 2 | 1 |

**Note: Map each project outcomes with POs and PSOs with either 1 or 2 or 3 based on level of mapping as follows:**

1-Slightly (Low) mapped 2-Moderately (Medium) mapped 3-Substantially (High) mapped