



# **R. P. Shaha University**

*- an institution of Kumudini Welfare Trust of Bengal (BD) Ltd.*

**Department: COMPUTER SCIENCE AND ENGINEERING**

**Semester: SPRING 2025**

**Program: Bachelor of Computer Science and Engineering**

**Course Title: E-commerce and Web Design**

**Course Code : CSE 433**

## **PROJECT REPORT**

**ON**

## **Zoteo: A Real Estate Booking Platform**

**Student Name:** Sabnam Parvin Bristy

**Student ID:** 2230001

**Student Batch:** 25th

**Submission Date:** 26 May, 2025

**Course Teacher:** Ankan Roy

## Abstract

In the real estate industry platforms that include security, usability, and real-time interection are necessary for the digital transformation. Zoteo is a full-stack real estate booking platform which has been built with MERN stack (Node js, React js, Express js and MongoDB). This platform allows users to browse properties, book available listings also interact with real time updates through Socket.IO. An interactive map for property viewing and JWT-based authentication are important features. Database management has been done with Prisma ORM.

**Keywords:** MERN stack, Socket.IO, real time Authentication, React Map, Prisma ORM, Real time communication, cookie

## Table of Contents

|   |              |
|---|--------------|
| <b>1) Abstract .....</b>                            | <b>2</b>     |
| <b>2) Introduction.....</b>                         | <b>4</b>     |
| <b>3) Background Study .....</b>                    | <b>4</b>     |
| <b>4) Software Requirements Specification .....</b> | <b>5</b>     |
| 4.1) Functional Requirement.....                    | 5            |
| 4.2)Non-Functional Requirement.....                 | 6            |
| <b>5) Methodology.....</b>                          | <b>6-7</b>   |
| <b>6) Implementation &amp; development.....</b>     | <b>8-16</b>  |
| <b>7) Conclusion .....</b>                          | <b>16</b>    |
| <b>8) Reference.....</b>                            | <b>17-18</b> |

## 2. Introduction

At present the real estate platforms are becoming digital. For property discovery, property listing and management. But for this we have to face many challenges like real time interaction, smooth browsing and secure authentication in our existing platforms. For all of these problem Zoteo is a full stack real estate booking platform which has been build using MERN stack(Node js, React js, MongoDB). This platform uses some technology like real time update via Socket.IO communication between clients and servers, map wise visualization using React map also a responsive UI/UX, In this platform JWT authentication with cookie-based sessions had been use for security in backend. In this platform MongoDB has been used for data storage and PRISMA ORM for safe database operation.

## 3. Background Study

The global real estate platforms are shifting toward digital platforms rapidly. With this demand the user demands are also increasing demanding of real-time updates and interactive visualization. According to a report by **Statista** the digital real estate platform is surplus \$2.84 trillion by 2025.[1]

The MERN stack has recently been used as a as a demanding framework for building scalable and interactive web platforms. NoSQL databases are demanding for flexible data modeling in dynamic property listing [2]. Node.js and Express.js provides a optimizing API responses in backend for real time application [3].

Real time communication in modern web application is a important component. Socket.IO is a js library which create bidirectional communication with client and servers with real time interaction. This makes our web platforms more robust where user can get instant feedback on property available, booking property and other things [4].

In real world nowadays token-based authentication via JWT has been on demands for securing web applications. JWT secure transmission of user session information and ensure data integrate with authorized access [5].

Prisma ORM provides simple databases and queries compared to SQL. With MongoDB this ensure efficient nested property handling and boking [6].

In real estate platforms an interactive map are crucial. React Geolocation map provides us a interactive map. .In a survey in 2022 said that almost 78% property searches are map-based[7].

## 4. Software Requirements Specification

### 4.1: Functional Requirement:

- **User Registration and Authentication:** In this platform's user and login, register and maintain secure session using JWT.
- **Property listing:** Property listing is dynamically fetched from databases.
- **Booking System:** User can book properties based on availability.
- **Search Property:** User can search property by location.
- **Interactive Map:** Users can view location of property by using React map with zoom effect.
- **Real time interaction:** Real time interaction are provided via Socket.IO

### 4.1: Functional Requirement:

- **Security:** Maintain secure session tokens and user information using JWT.
- **Performance:** A user-friendly responsive UI with faster interaction.
- **Scalability:** Can handle rapid numbers of user also can handle multiple property listing.
- **Compatibility:** Mobile responsiveness and cross browser compatibility.

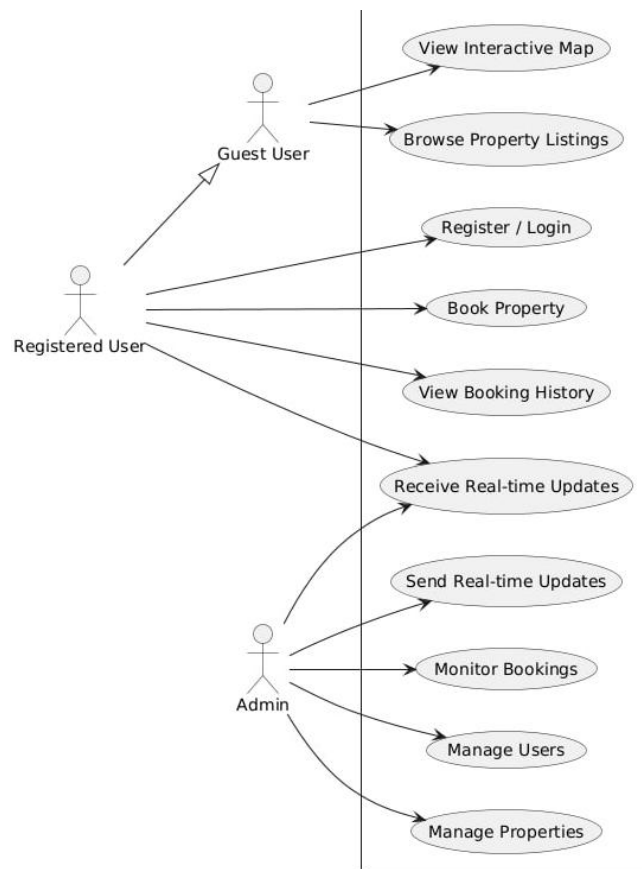


Fig 1: Use case diagram

## 5. Methodology

- **Requirement Analysis:** Functional requirement collecting and detailed process.
- **Design phase:** Design a architecture with MERN stack, API design, database design.
- **Development Phase:**
  - Design Backend API with Node and Express js
  - Map interaction with react map.
  - Frontend UI development vis React with React map.
  - JWT authentication and secure cookie management.
  - Real time interaction via Socket.IO
  - Design frontend and make it responsive.
  - Connect backend with Axios.
  - Control routes using react routes.
- **Testing Phase:** Unit testing, backend testing, integration testing.

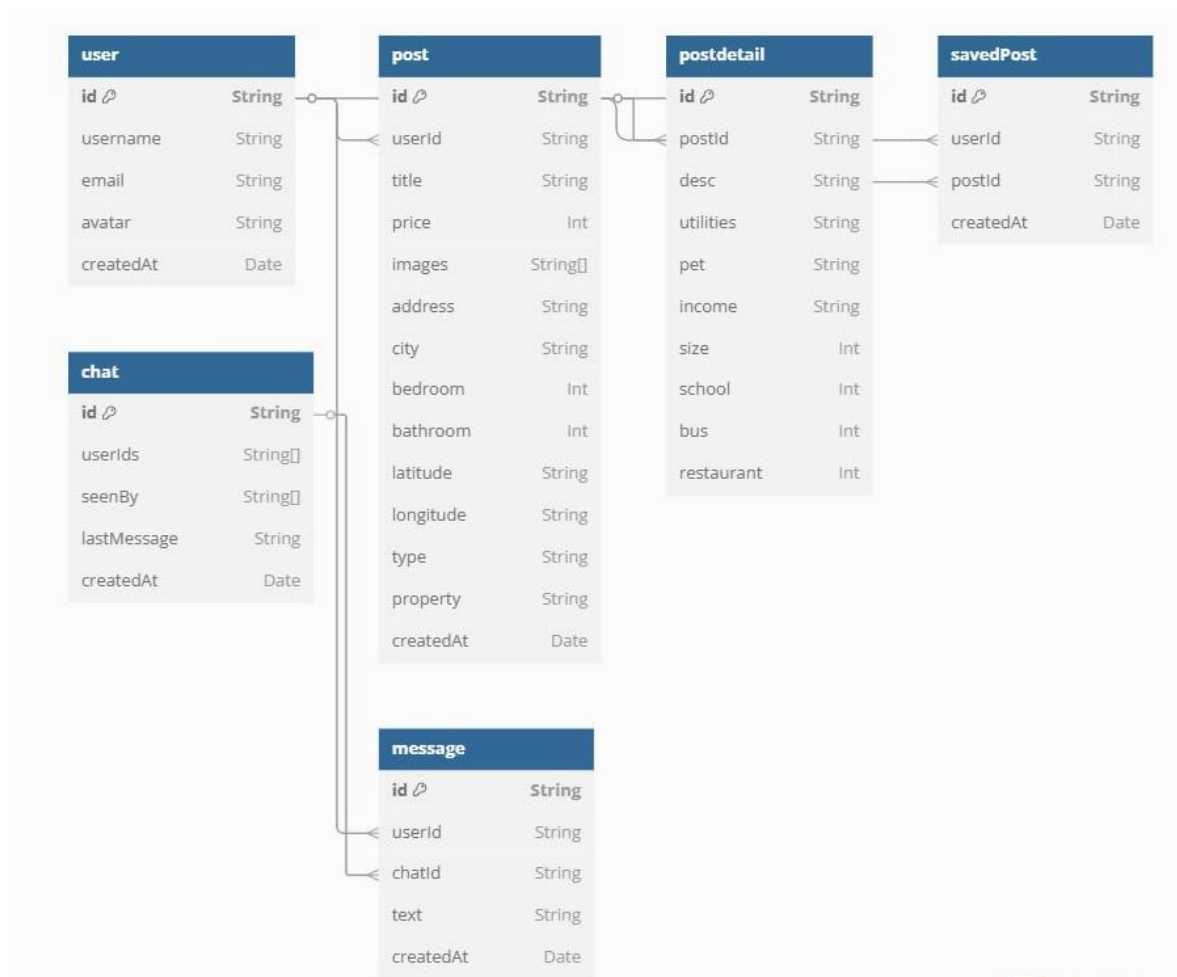
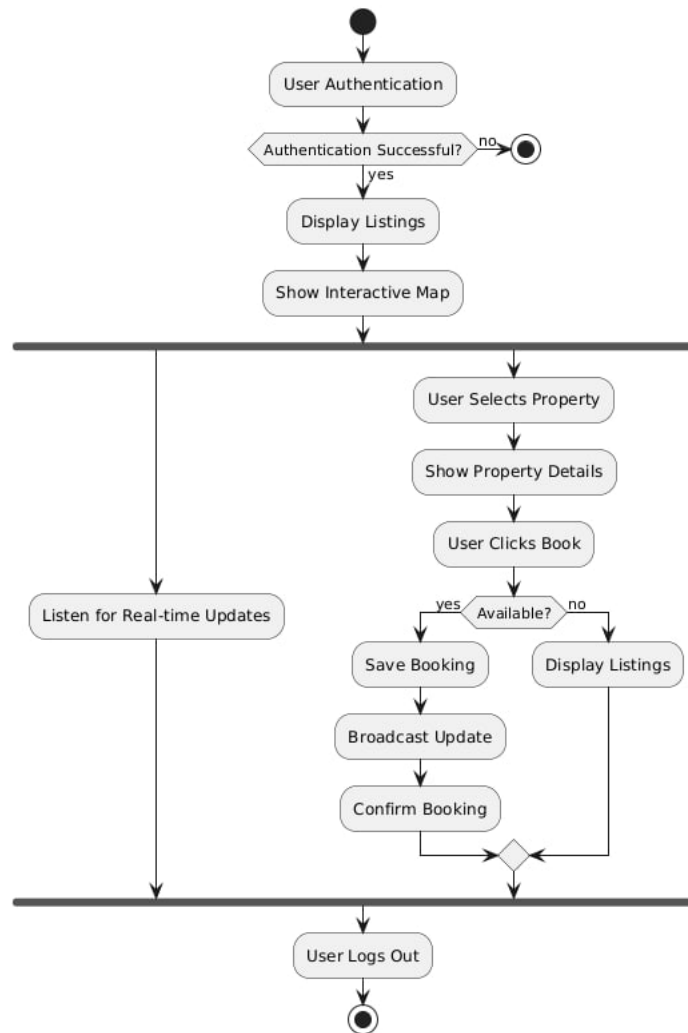


Fig 2: Entitiy Relationship diagram



**Fig 3: Activity diagram**

## 6. Implementation and Development:

### System Architecture:

Zoteo is a client server model. In frontend Node.js, Express.js has been used to communicate with backend through API. MongoDB stores data, collection and property through Prisma ORM. Socket.io controls real time interaction.

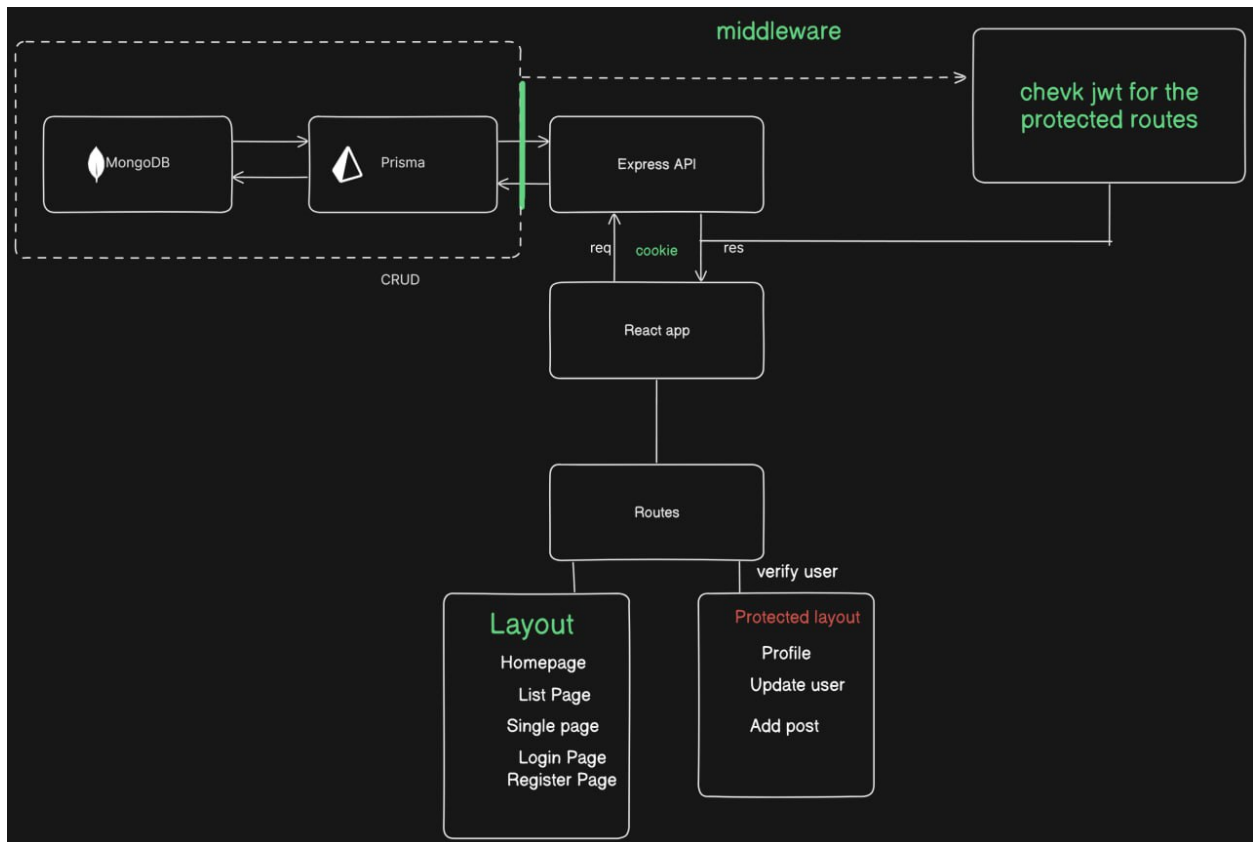


Fig 4: System Architecture



## Frontend Design:

React.js has been used for UI,profile,Booking properties, also property viewing and React map. A leaflet or React map has been implemented for location visualize of property. JWT token and cookies has been used for secure session.

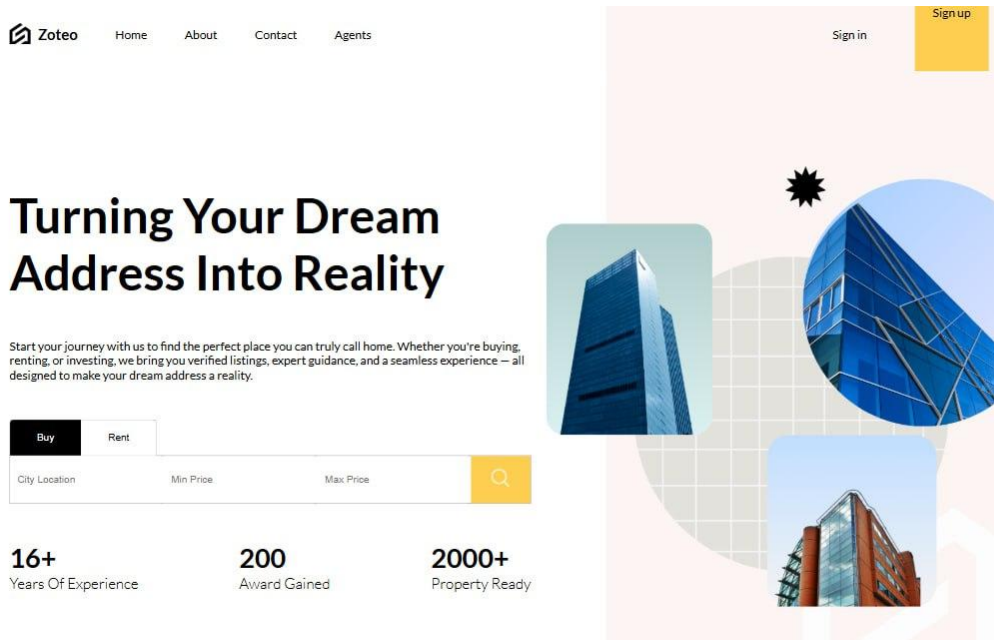


Fig: Output homepage

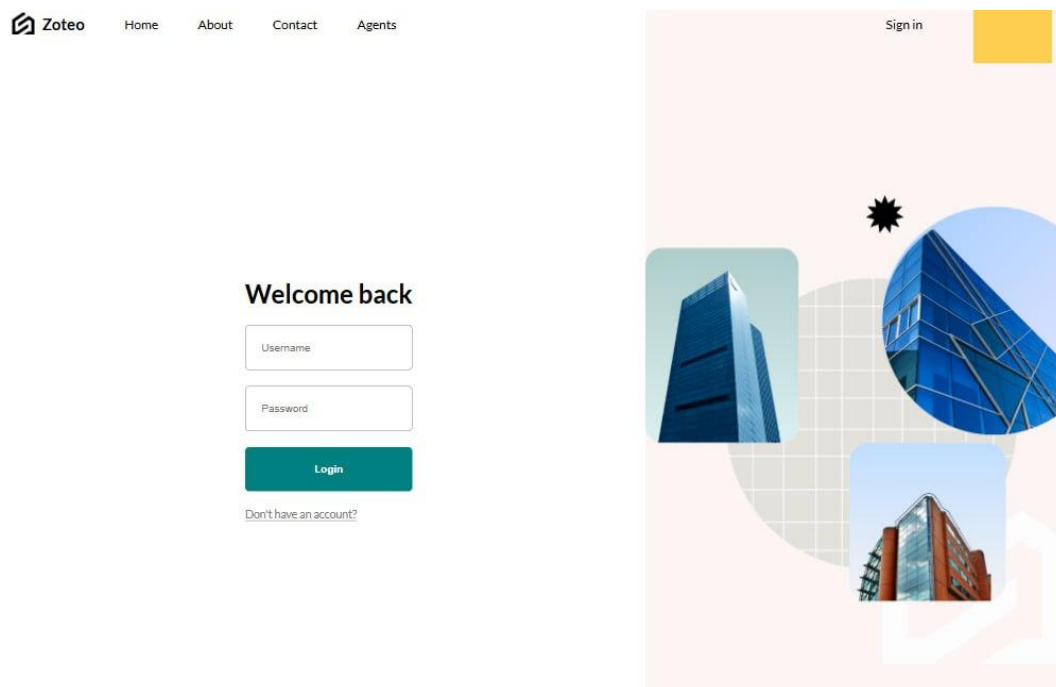


Fig: Signin page

## Create an Account

Username

Email

Password

Register

[Have an account?](#)



Fig: Registration page

## User Information

Update Profile

Avatar:

Username: test20

E-mail: test20@gmail.com

Logout

Fig: User Information

## My List

Create New Post

- Modern 2BHK apartment in Dhanmondi**

House 12, Road 5, Dhanmondi, Dhaka 1205

৳ 12500000

2 bedroom 2 bathroom
- Spacious flat near Chittagong city center**

GEC Circle, Chittagong

৳ 9500000

3 bedroom 3 bathroom

Fig: Listing

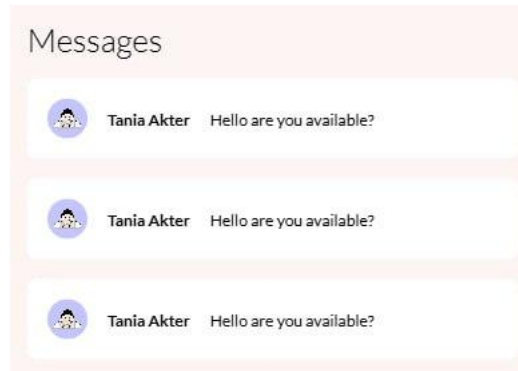


Fig: Message Section

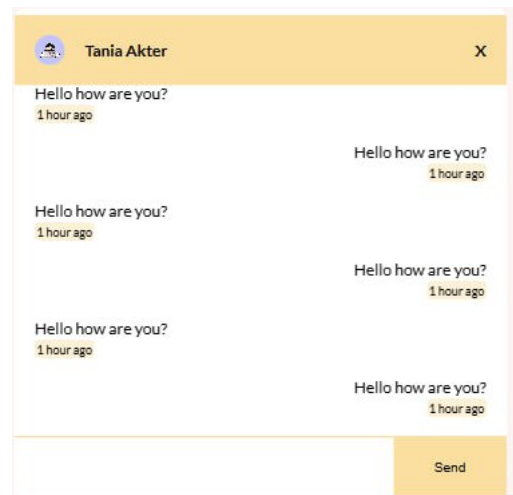


Fig: Chat Section

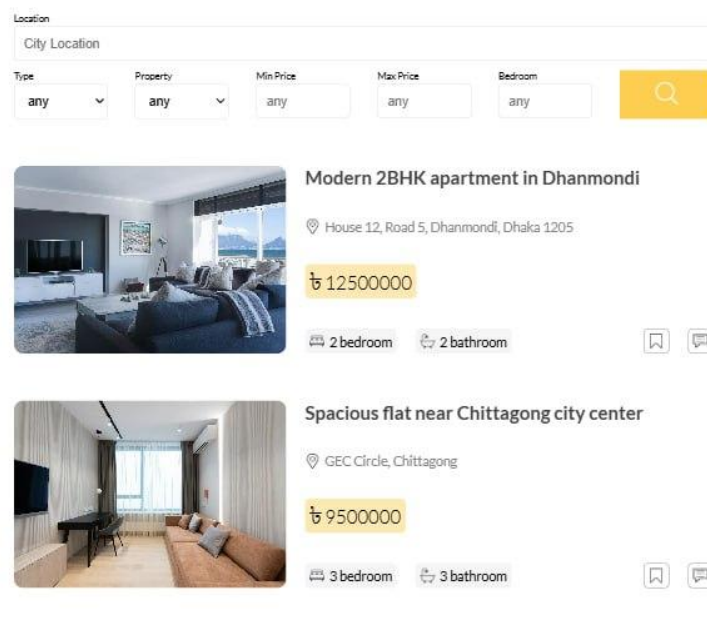


Fig: Property Search by location

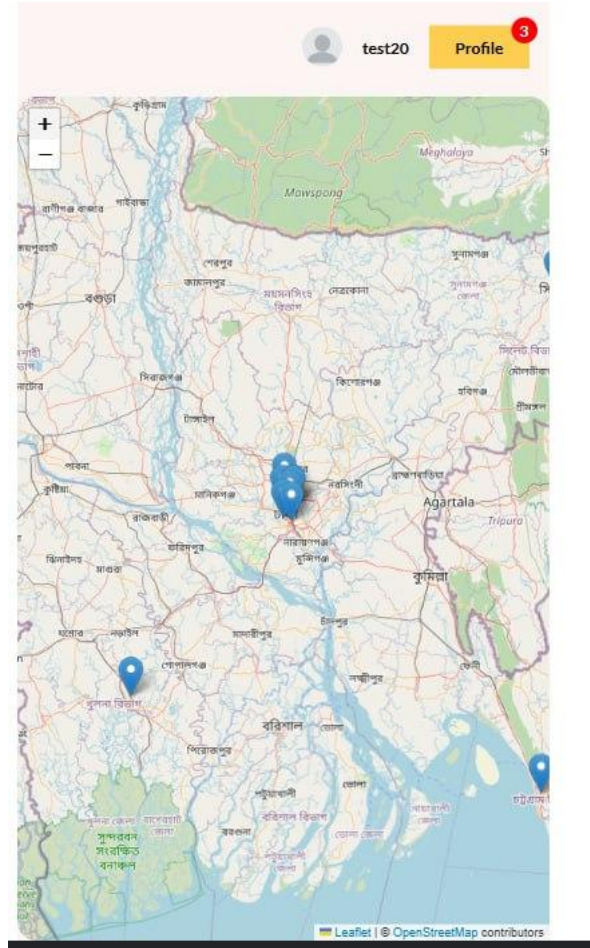


Fig: React Map with location

### Backend Design:

JWT token authenticate secure session middleware. Express.js handles API endpoints for booking and user authentication. Prisma ORM gather MongoDB queries also offer schema. Scket.IO interact with real time communication.

```
model User {
  id      String  @id @default(auto()) @map("_id") @db.ObjectId // MongoDB ObjectId field
  email   String  @unique // Ensure unique email for each user
  username String  @unique // Ensure unique username
  password String  // Store hashed password
  avatar  String? // Optional avatar field
  createdAt DateTime @default(now()) // Automatically set to the current timestamp
}
```

Fig: Database Schema

```
_id: ObjectId('6830b2f582757f4eac48faf2')
email: "test2@gmail.com"
username: "test2"
password: "$2b$12$MrBk0KGLt2ZYsn0JGMItuA3XbUr0wb0Xoxr6bg.EC6eW6brchIf6"
createdAt: 2025-05-23T17:40:05.000+00:00
```

```
_id: ObjectId('6830d2574e19f8725f7dabba')
email: "test20@gmail.com"
username: "test20"
password: "$2b$12$w6z2HVfbPaQvTCQmtCFW/.4kTYdWpqBgC6EAMQ6q4jRrH0jIS6rZK"
createdAt: 2025-05-23T19:53:59.231+00:00
```

Fig: cookies with hashed password

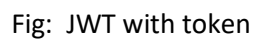
```
pi > middleware > JS verifyToken.js > ...
1
2
3 import jwt from "jsonwebtoken";
4
5 export const verifyToken = (req, res, next) => {
6   const token = req.cookies.token;
7   if (!token) return res.status(401).json({ message: "Not Authenticated!" });
8
9   jwt.verify(token, process.env.JWT_SECRET_KEY, (err, payload) => {
10     if (err) return res.status(403).json({ message: "Token is not valid!" });
11
12     req.userId = payload.id;
13     next();
14   });
15 };
16
```

Fig: JWT web token for secure authentication

The screenshot shows a REST client interface with a POST request to `((BASE_URL)) /auth/login`. The request body is a JSON object: `{ "username": "test", "password": "123456" }`. The response is `200 OK` with a status of `809 ms` and a body size of `631 B`. The Cookies tab is active, showing three cookies:

| Name          | Value             | Domain    | Path | Expires           | HttpOnly | Secure |
|---------------|-------------------|-----------|------|-------------------|----------|--------|
| session_token | fake_token_value  | localhost | /    | Tue, 20 May 20... | true     | false  |
| test          | mytest            | localhost | /    | Tue, 20 May 20... | true     | false  |
| token         | eyJhbGciOiJIUz... | localhost | /    | Tue, 20 May 20... | true     | false  |

Fig: JWT authentication





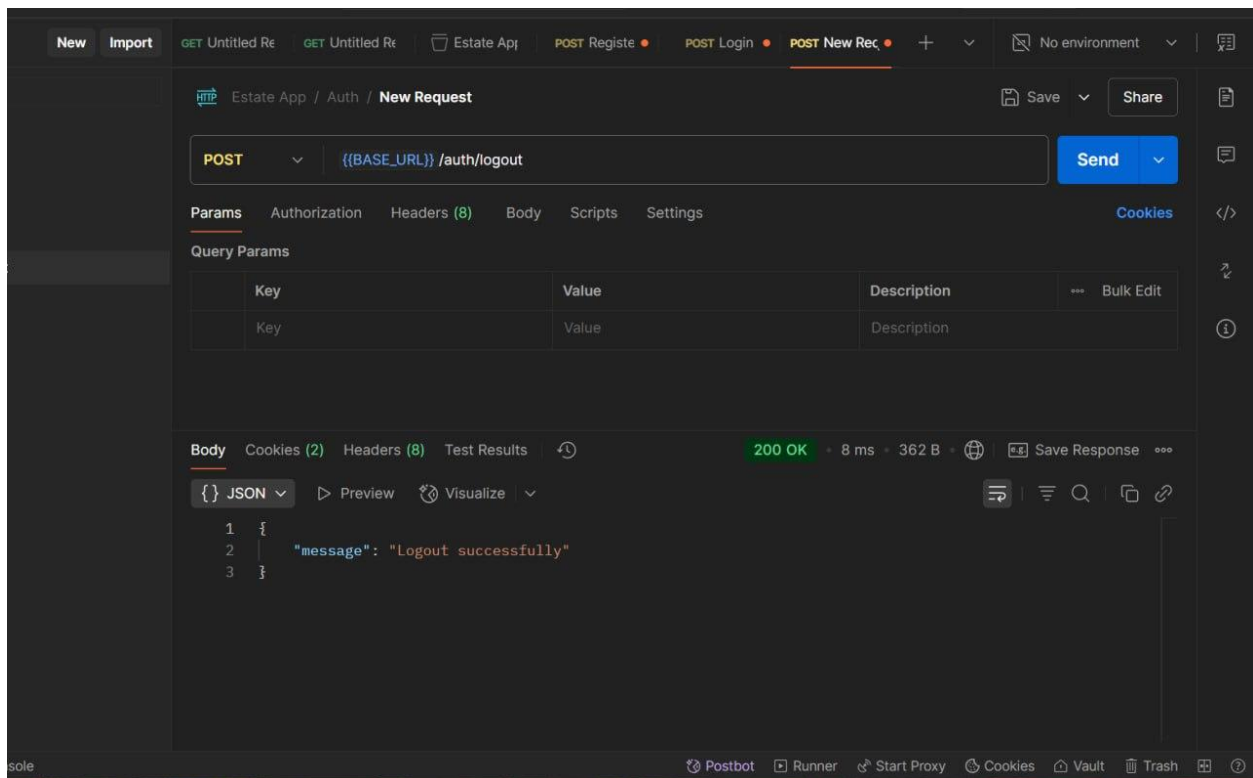


Fig: Logout with cookies

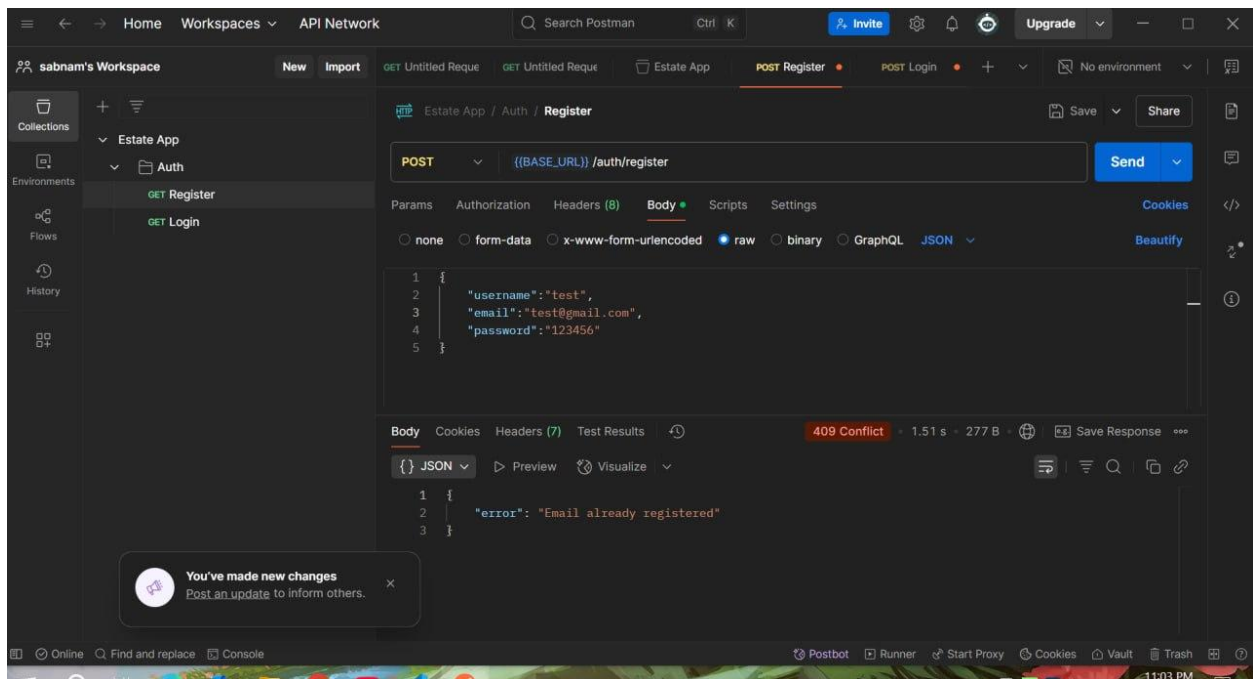


Fig: Logout session

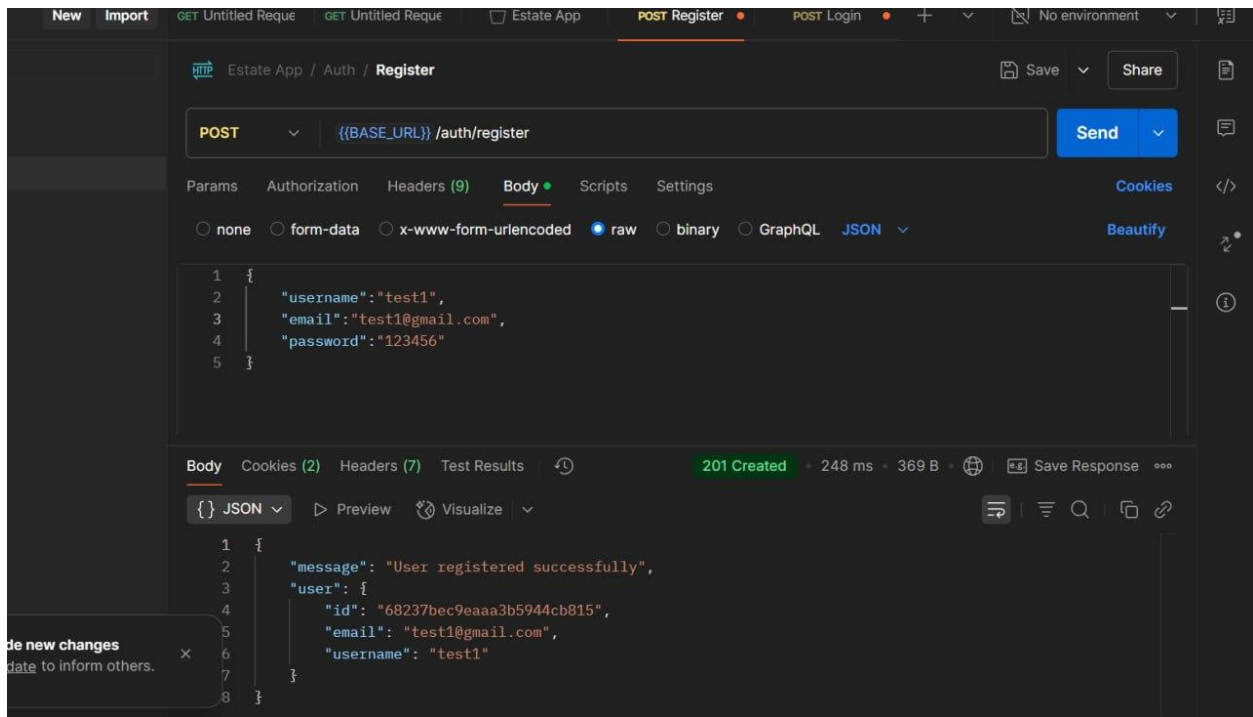


Fig: Existing User registration

## 7. Conclusion:

Zoteo demonstrate a successful modern real estate booking platform Developed with MERN stack with react map and real-life interaction. Some effective technologies like Prima ORM, Socket.IO has been used for security and scalability. An interactive react map and real time updates engage user with trust. Secure authentication ensure that user data and other information are safe.



## 6. References:

- [1] Statista, "Real Estate - Bangladesh." [Online]. Available: <https://www.statista.com/outlook/fmo/real-estate/bangladesh>
- [2] MongoDB, "NoSQL Explained." [Online]. Available: <https://www.mongodb.com/resources/basics/databases/nosql-explained>
- [3] H. Edin, "How to Optimize Node.js APIs," *freeCodeCamp*. [Online]. Available: <https://www.freecodecamp.org/news/how-to-optimize-nodejs-apis/>
- [4] B. Dharan, "Real-time communication in web application with Socket.io," *Medium*. [Online]. Available: <https://medium.com/@balankdharan/real-time-communication-in-web-application-with-socket-io-54442e2bcb70>
- [5] Extio, "Understanding JSON Web Tokens (JWT): A Secure Approach to Web Authentication," *Medium*. [Online]. Available: <https://medium.com/@extio/understanding-json-web-tokens-jwt-a-secure-approach-to-web-authentication-f551e8d66deb>
- [6] Prisma, "Why Prisma." [Online]. Available: <https://www.prisma.io/docs/orm/overview/introduction/why-prisma>
- [7] Arab MLS, "Creating Interactive Maps for Property Searches." [Online]. Available: <https://arabmls.org/creating-interactive-maps-for-property-searches/>
- [8] Scribd, "Project Report On Real State Web App." [Online]. Available: <https://www.scribd.com/document/438228412/Project-Report-On-Real-State-Web-App>
- [9] IRJMETS, "Real Estate Web App," *Int. Res. J. Modernization Eng. Technol. Sci.*, Jan. 2024. [Online]. Available: [https://www.irjmets.com/uploadedfiles/paper/issue\\_1\\_january\\_2024/48613/final/fin\\_irjmets1705586700.pdf](https://www.irjmets.com/uploadedfiles/paper/issue_1_january_2024/48613/final/fin_irjmets1705586700.pdf)
- [10] Prisma, "Prisma Docs." [Online]. Available: <https://www.prisma.io/docs>
- [11] Express.js, "Routing." [Online]. Available: <https://expressjs.com/en/guide/routing.html>
- [12] Express.js, "Writing Middleware." [Online]. Available: <https://expressjs.com/en/guide/writing-middleware.html>
- [13] Express.js, "Using Middleware." [Online]. Available: <https://expressjs.com/en/guide/using-middleware.html>
- [14] Express.js, "Error Handling." [Online]. Available: <https://expressjs.com/en/guide/error-handling.html>
- [15] React Leaflet, "Introduction." [Online]. Available: <https://react-leaflet.js.org/docs/start-introduction/>
- [16] MongoDB, "MongoDB Docs." [Online]. Available: <https://www.mongodb.com/docs/>

- [17] JWT.io, "Introduction to JSON Web Tokens." [Online]. Available: <https://jwt.io/introduction>
- [18] M. Illott, "Password Storage Basics," *Medium*. [Online]. Available: <https://markillott.medium.com/password-storage-basics-2aa9e1586f98>
- [19] 1Password, "What is a Hashed Password?" [Online]. Available: <https://blog.1password.com/what-is-hashed-password/>
- [20] "MongoDB + Node.js + REST API Crash Course," *YouTube*. [Online]. Available: <https://youtu.be/deNIgVyDyJY>
- [21] npm, "nodemon." [Online]. Available: <https://www.npmjs.com/package/nodemon>
- [22] M. Samadian *et al.*, "Real estate research trends and most impact real estate journals: A co-citation analysis," *ResearchGate*. [Online]. Available: [https://www.researchgate.net/publication/353932096\\_Real\\_estate\\_research\\_trends\\_and\\_most\\_impact\\_real\\_estate\\_journals\\_a\\_co-citation\\_analysis](https://www.researchgate.net/publication/353932096_Real_estate_research_trends_and_most_impact_real_estate_journals_a_co-citation_analysis)
- [23] R. Elahi and R. Haque, "Smart real estate web application for property buying and selling," *Smart Cities*, vol. 1, no. 1, pp. 35–47, 2023. [Online]. Available: <https://link.springer.com/article/10.1007/s44268-023-00016-0>
- [24] T. Guttentag *et al.*, "Exploring the Booking Determinants of the Airbnb Properties: An Example of the Listings of London," *ResearchGate*. [Online]. Available: [https://www.researchgate.net/publication/322026220\\_Exploring\\_the\\_Booking\\_Determinants\\_of\\_the\\_Airbnb\\_Properties\\_An\\_Example\\_of\\_the\\_Listings\\_of\\_London](https://www.researchgate.net/publication/322026220_Exploring_the_Booking_Determinants_of_the_Airbnb_Properties_An_Example_of_the_Listings_of_London)