DormNest: Student Accommodation Finder

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Computer Technology

Madras Institute of Technology, Anna University.

Executive Summary

DormNest is a student accommodation finder application designed to simplify the search for housing tailored to students' needs. Recognizing the challenges students face when looking for affordable, accessible, and suitable accommodations, DormNest serves as a digital platform where students can browse, filter, and select housing options from listings provided by property owners. By bringing both students and owners onto a unified platform, DormNest seeks to streamline the accommodation search and selection process, providing an efficient, user-friendly solution.

Objectives:

- To connect students with verified, student-friendly housing options.
- To provide property owners with a dedicated space to list and manage their properties aimed at the student demographic.
- To facilitate an efficient and secure booking process, minimizing the typical challenges associated with finding and securing student housing.

Key Features and Technical Highlights:

- User Registration: Tailored registration forms for students and property owners ensure that users provide relevant information for their roles within the application.
- Owner Dashboard: A comprehensive dashboard for property owners where they can view and manage their listings, update property details, and monitor inquiries from students.
- Property Listings: A searchable and filterable database of properties that includes details such as location, pricing, amenities, and property images.
- Database Integration: DormNest is backed by a PostgreSQL database that securely stores user and property data, ensuring smooth retrieval and scalability as the application grows.
- User Interface (UI): A clean, intuitive interface designed to enhance user experience, making it easy for students to navigate listings and for owners to manage properties.
- Security and Data Integrity: Implemented measures to protect user data and prevent unauthorized access, adhering to data privacy standards.

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Problem Statement

Finding suitable accommodation is one of the most significant challenges faced by students, especially when they are moving to new cities or countries for their studies. The lack of a centralized platform specifically designed for students leads to inefficient search processes, with students often relying on generic housing platforms that do not cater to their unique needs. Furthermore, property owners who wish to rent their properties to students often face difficulties reaching a targeted audience, managing listings, and responding to inquiries efficiently.

Key Challenges:

- **For Students:**
    - Difficulty in finding affordable, reliable, and student-friendly accommodation.
    - Lack of a streamlined process to search and filter properties based on specific student needs (e.g., budget, proximity to educational institutions, amenities).
    - Time-consuming and inefficient communication with property owners.
- **For Property Owners:**
    - Difficulty in reaching students looking for accommodations.
    - The challenge of managing multiple property listings across different platforms.
    - Lack of a system to directly interact with potential student tenants, making it difficult to manage inquiries and respond promptly.

Introduction

Background

Finding suitable accommodation is a common challenge for students, especially those moving to new cities or countries for their studies. Many face issues such as limited budget options, lack of reliable sources, and time constraints in finding a place to live. Traditional housing search platforms often don't cater specifically to student needs, leading to frustration and inefficiency. DormNest addresses this gap by providing a dedicated platform focused on student accommodation, simplifying the search for affordable, verified, and accessible housing options tailored to students.

Purpose

DormNest aims to streamline the student housing search process by connecting students with property owners who offer accommodations suited to student requirements. By centralizing accommodation listings, DormNest provides students with a user-friendly platform to browse, filter, and book housing options, thereby reducing the time and effort needed to find suitable accommodation. For property owners, DormNest provides an interface to manage listings, reach a targeted audience, and communicate directly with prospective student tenants.

Requirements Overview:

DormNest encompasses both functional and non-functional requirements to ensure it meets the needs of users efficiently:

- **Functional Requirements:**
    - User Registration and Authentication: Allows students and property owners to create accounts, ensuring secure access.
    - Owner Dashboard: Provides a portal for property owners to manage property listings, add details, and update availability.
    - Property Listings with Search and Filters: Displays property details, including location, pricing, and amenities, allowing students to search and filter based on their preferences.
    - Database Integration: Uses PostgreSQL to manage and store all user and property information securely.
    - Communication Interface: Enables direct interaction between students and property owners to arrange property viewings or negotiate terms.

- **Non-Functional Requirements:**
  - Usability: Designed for ease of use, with a straightforward interface that ensures seamless navigation for both students and property owners.
  - Performance: Ensures quick response times for loading property listings and dashboard actions.
  - Security: Protects user data through secure authentication and data handling practices.
  - Scalability: Built to handle an increasing number of users and properties as the application grows in popularity.

Requirements Analysis

Functional Requirements

DormNest provides several core functions to facilitate efficient user interaction and property management. The main functional requirements include:

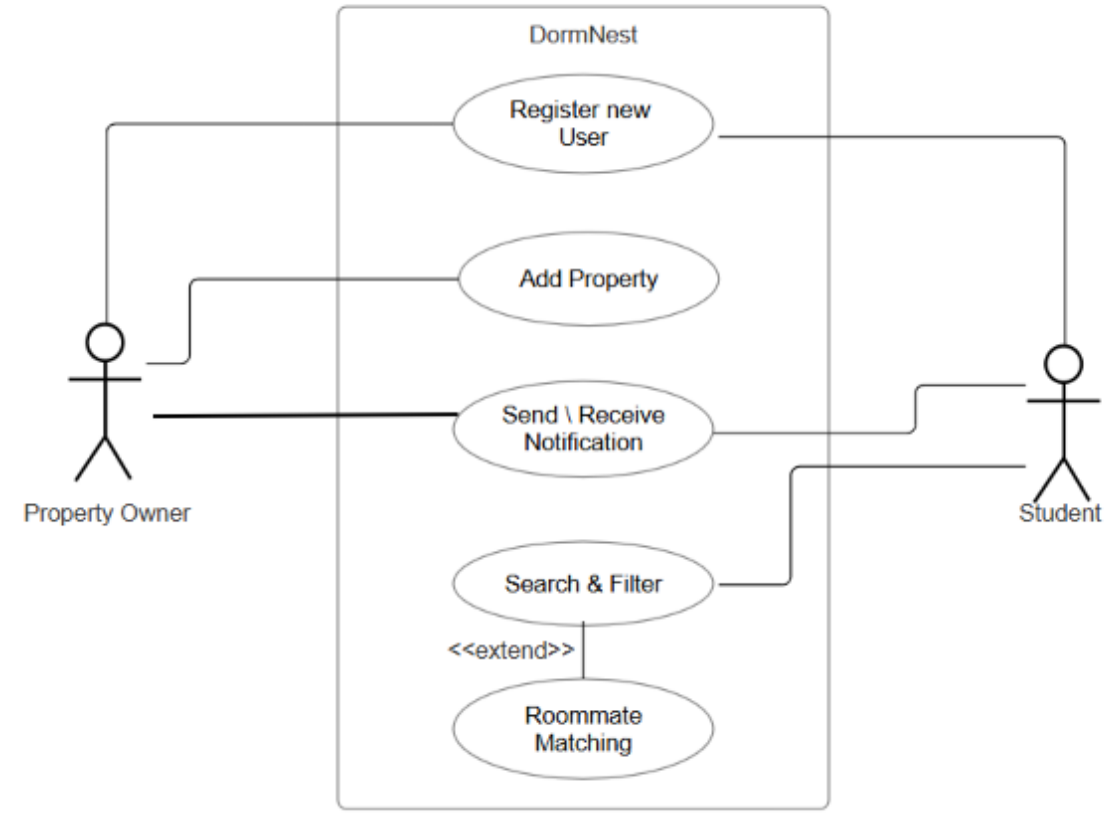
- **User Registration and Authentication:**
  - Allows students and property owners to create and securely access accounts.
  - Authentication protocols ensure that only registered users can access specific functionalities.
- **Property Listing Creation and Management:**
  - Property owners can create listings, including details such as location, price, property type, amenities, and upload images.
  - Owners can edit or update listings to reflect current availability or pricing changes.
- **Search and Filtering of Properties:**
  - Students can search for properties based on specific criteria, including location, budget range, and preferred amenities.
  - Filter options provide students with targeted search results based on their individual needs.
- **Owner Dashboard:**
  - A dedicated interface for property owners to view and manage their listings.
  - Owners can monitor engagement (such as views or inquiries) and respond to messages from interested students.
- **Student/Owner Communication:**
  - Students can send requests directly to property owners, facilitating a streamlined communication process.
- **Database Integration with PostgreSQL:**
  - Stores and manages all user data (students and owners) and property listing details in a PostgreSQL database.
  - Ensures efficient retrieval and updates of information while maintaining data integrity.

Non-Functional Requirements

To ensure DormNest operates effectively, it adheres to the following non-functional requirements:

- **Usability:**
    - Designed with a simple and intuitive user interface, making it easy for students and property owners to navigate.
    - Provides a smooth user experience with straightforward access to search, filter, and dashboard functionalities.
- **Performance:**
    - Optimized to load property listings quickly and handle simultaneous user actions without delays.
- **Scalability:**
    - Built with scalability in mind, allowing for increased listings and user activity as the application's popularity grows.
    - Database and application architecture support expansion to accommodate additional functionalities or higher traffic.
- **Security:**
    - Incorporates secure authentication and authorization mechanisms to protect user data and restrict unauthorized access.
    - Follows data protection standards, ensuring sensitive user information is encrypted and stored securely.

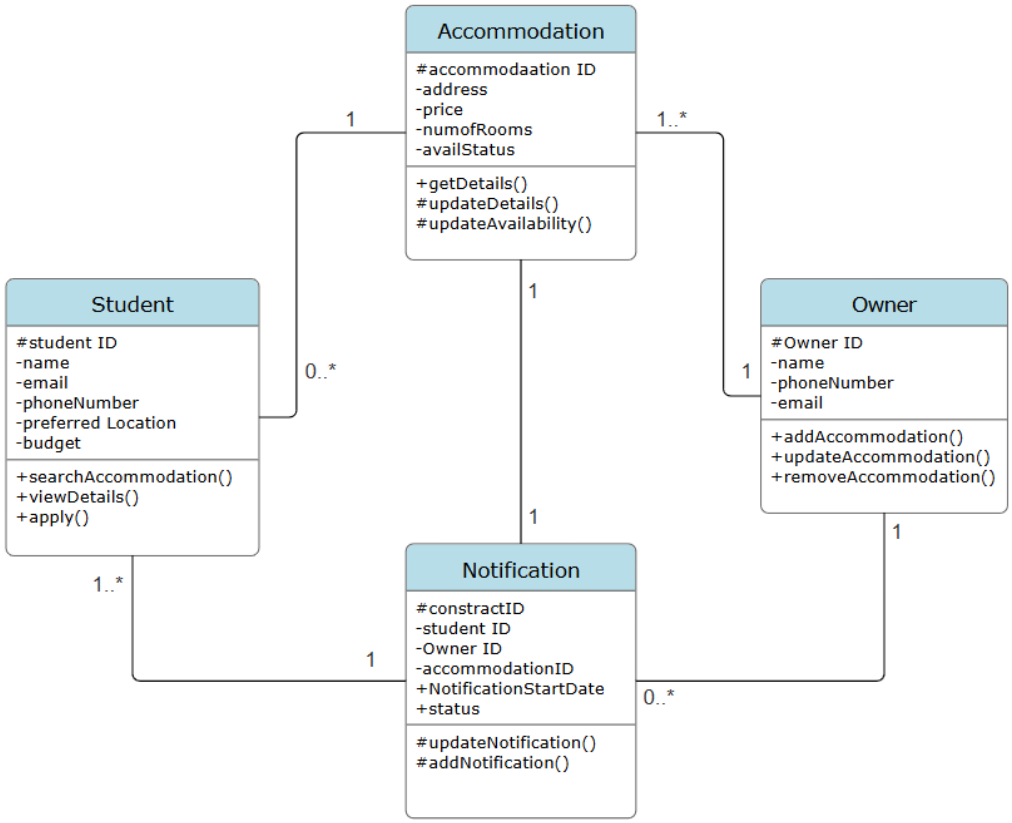
Use Case Diagram:



Requirement Traceability Matrix

Req. ID	Description	Design	Status
REQ-001	User registration	Swing forms	Complete
REQ-002	Property listing management	Owner dashboards	Complete
REQ-003	Property search and filter	Search in UI	Complete
REQ-004	User login/logout	Login Form	Complete
REQ-005	Database integration	PostgreSQL Schema	Complete

Class Diagram



Class Responsibility-Collaboration cards CRC

Student	
student ID	Notification
Name	Accommodation
Email	
Phone number	
Preferred Location	
Budget	
Search for Accommodation	
View Accommodation Details	
Apply for Accommodation	

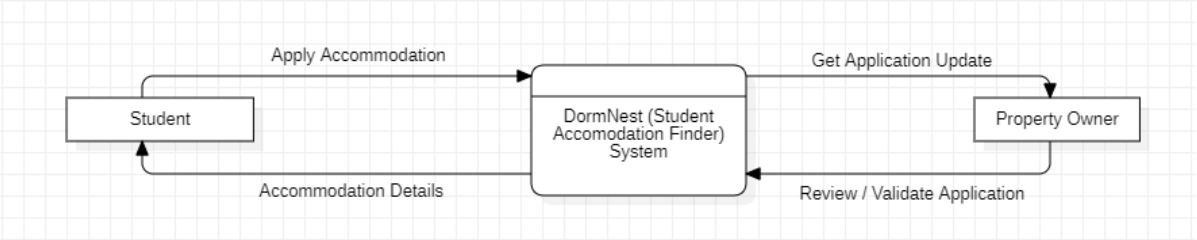
Accommodation	
Accommodation ID	Student
Accommodation Address	Owner
Price	Notification
Number of rooms	
Availability Status	
Get details of accommodation	
Update details of Accomodation	
Update availability status	

Owner	
Owner ID	Notification
Owner Name	Accommodation
Email	
Phone number	
Add an Accommodation	
Update Details of accommodation	
Remove the accommodation	

Notification	
Notification ID	Student
Student ID	Accommodation
Owner ID	Owner
Accommodation ID	
Notification start date	
Notification Status	
Update Status	
Add Notification	
Delete Notification	

Data Flow Diagarm DFD

Level 0:



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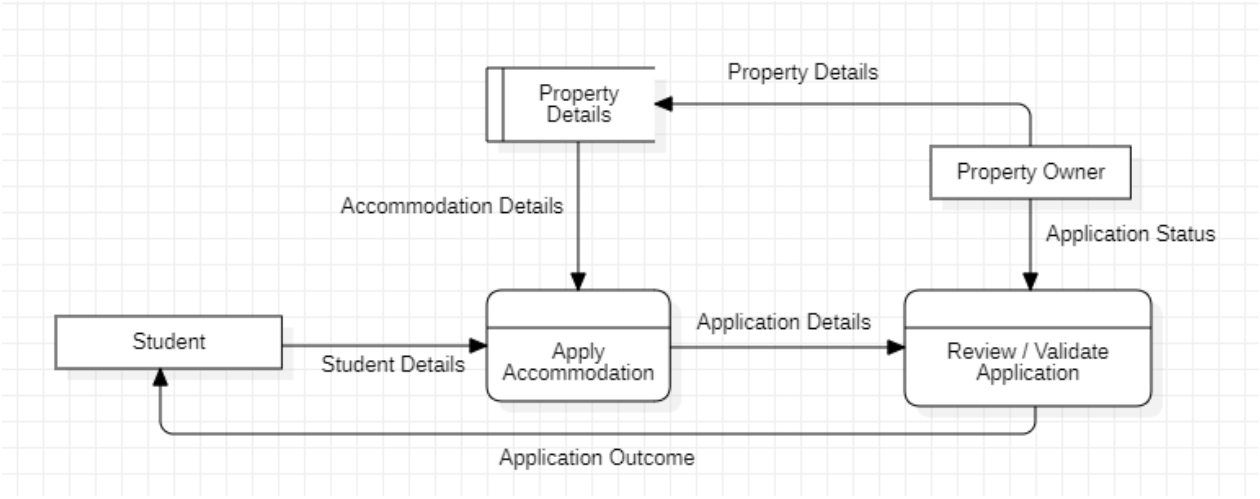
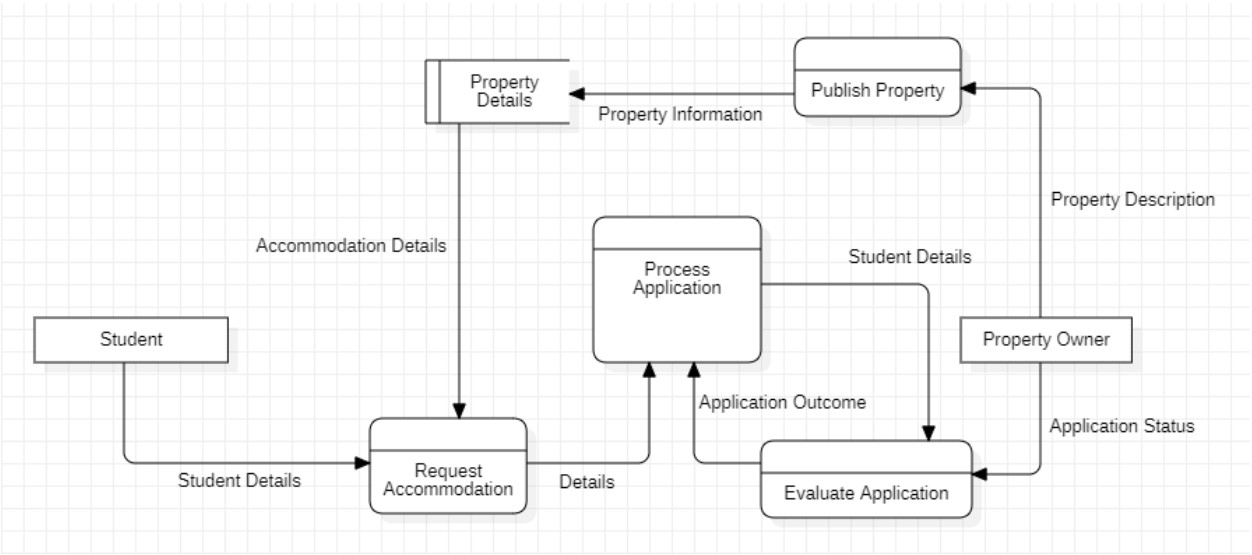


Level 2:



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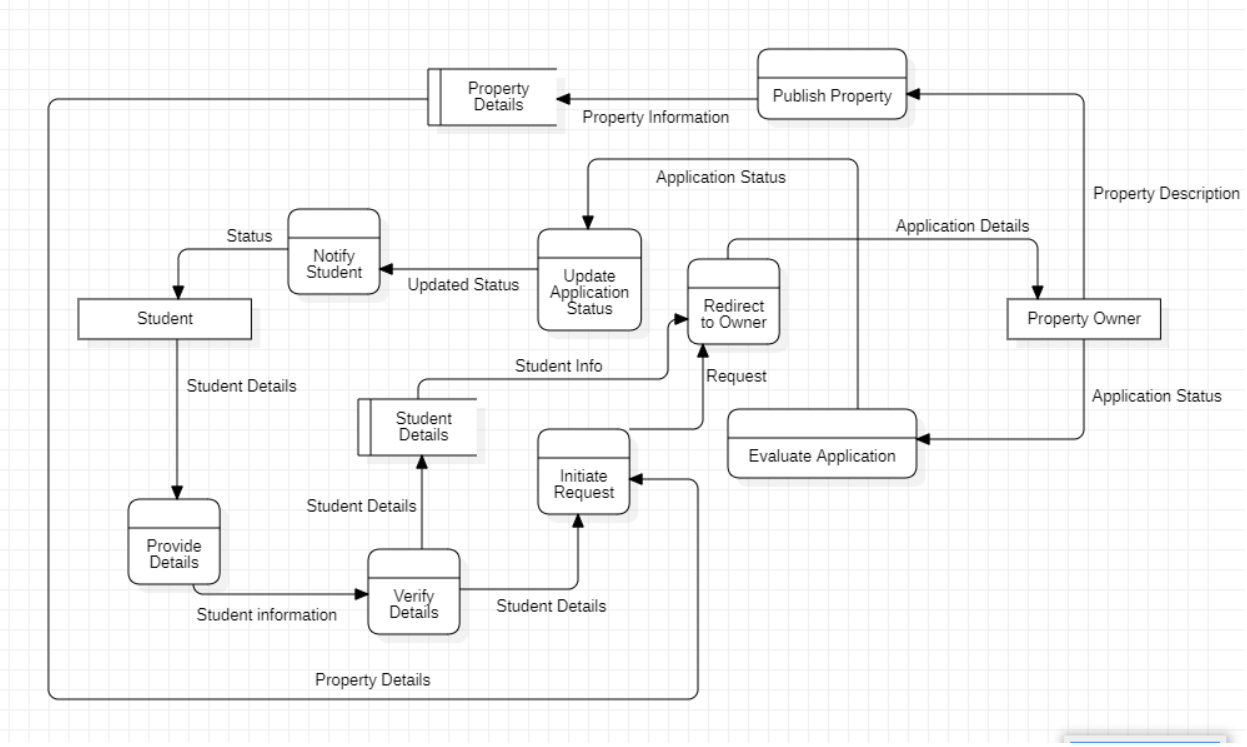
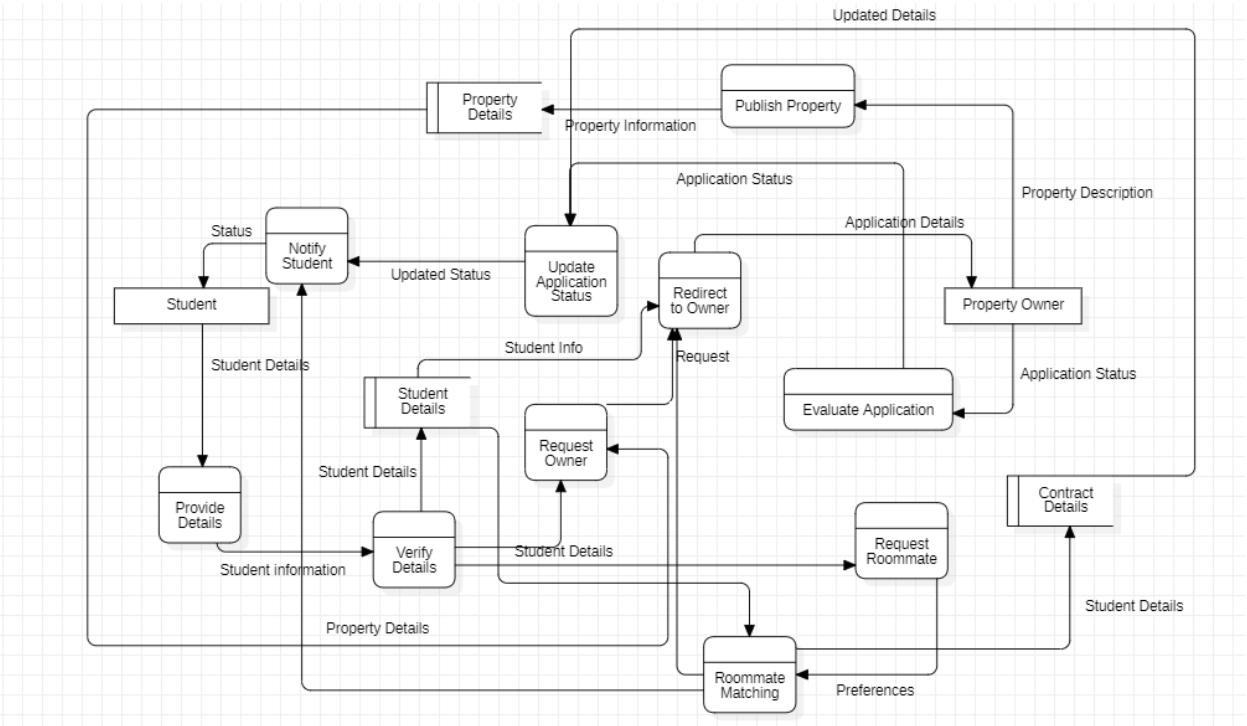
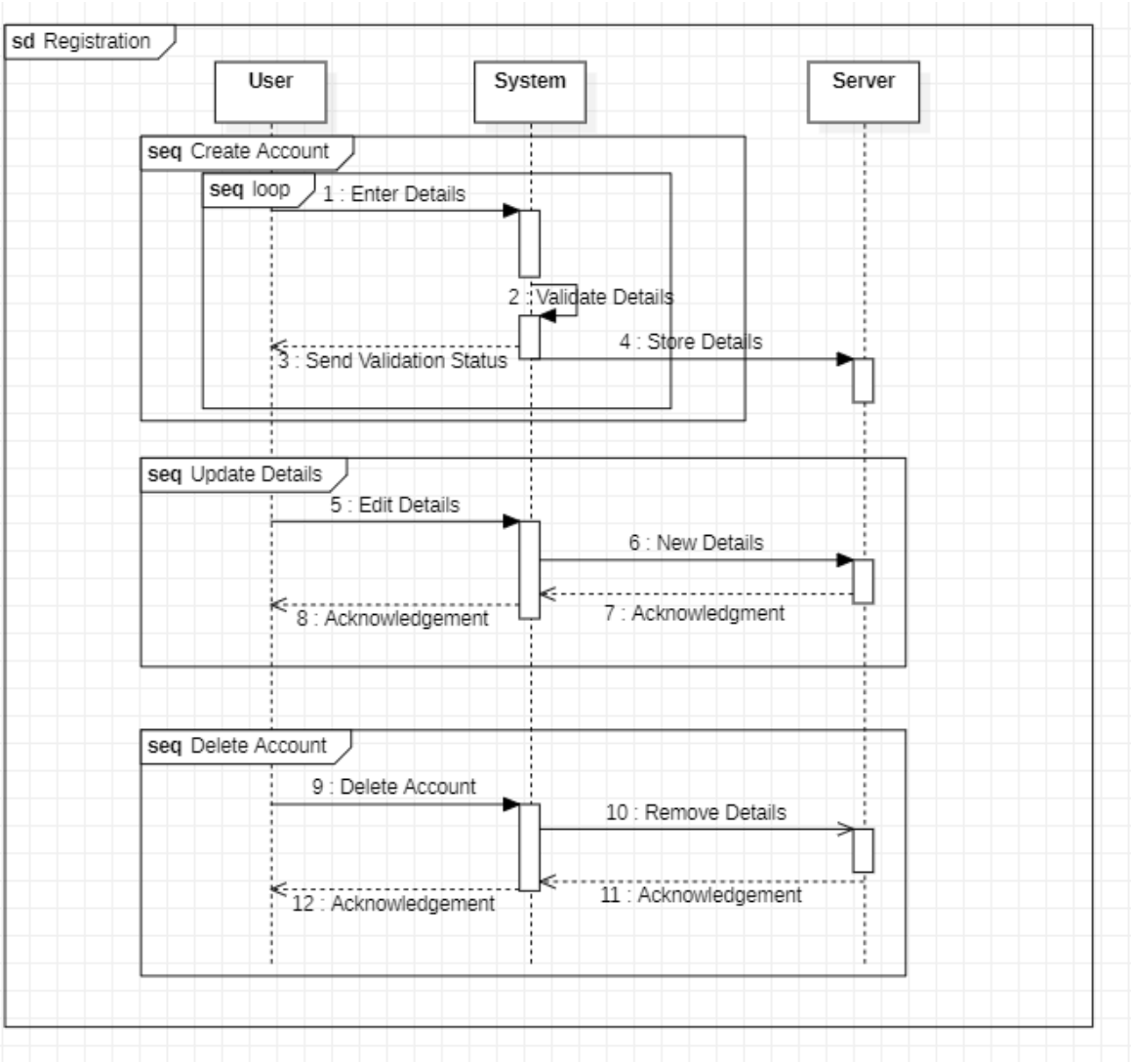


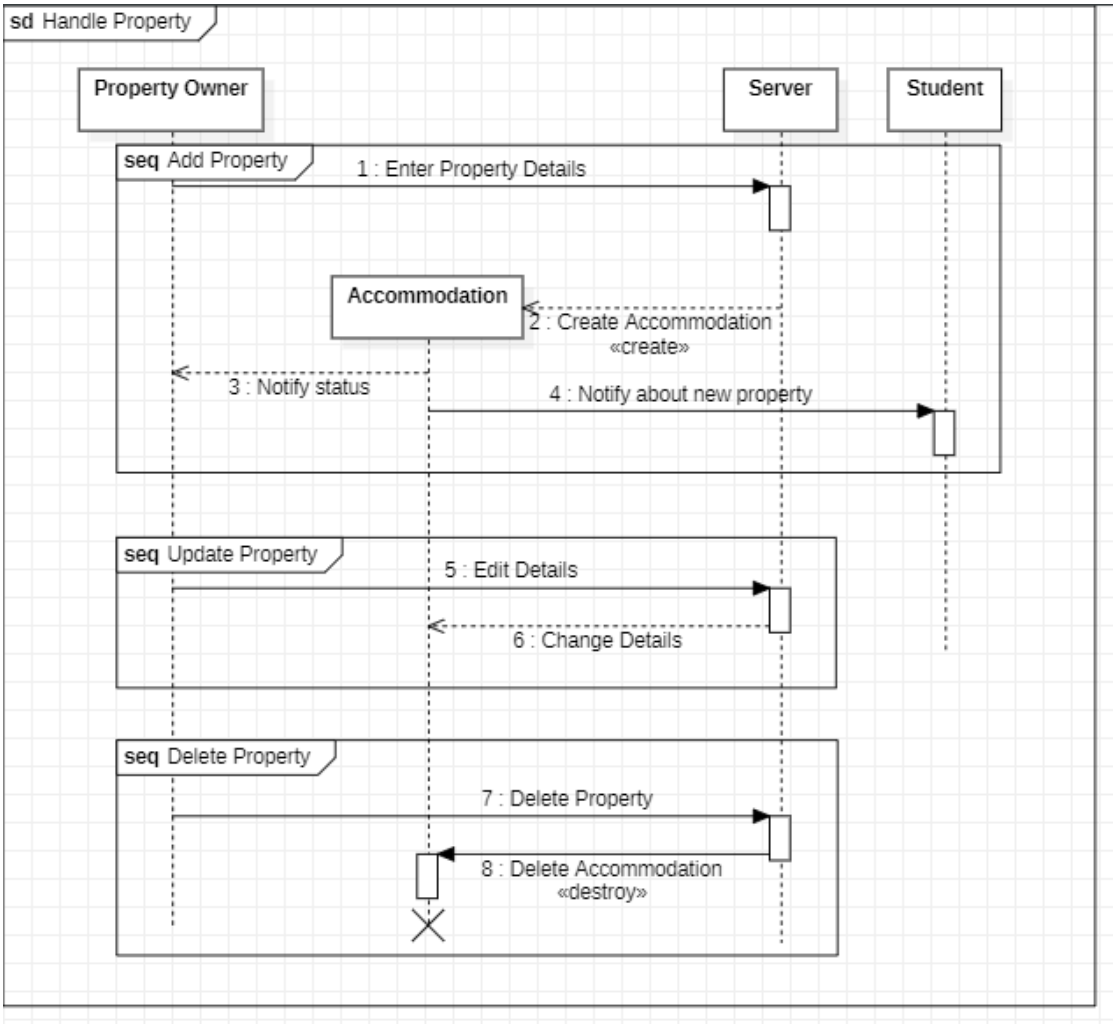
Level 4:



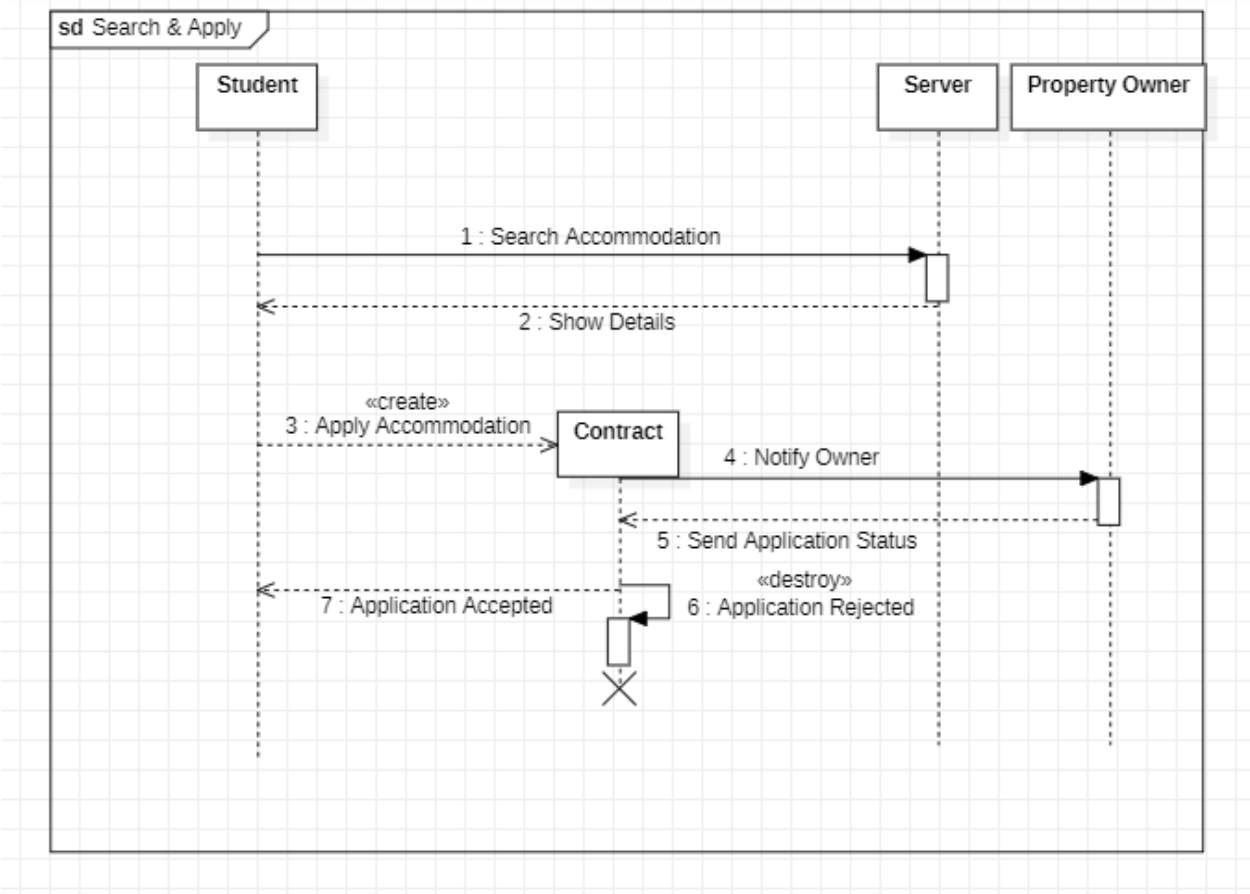
Registration:



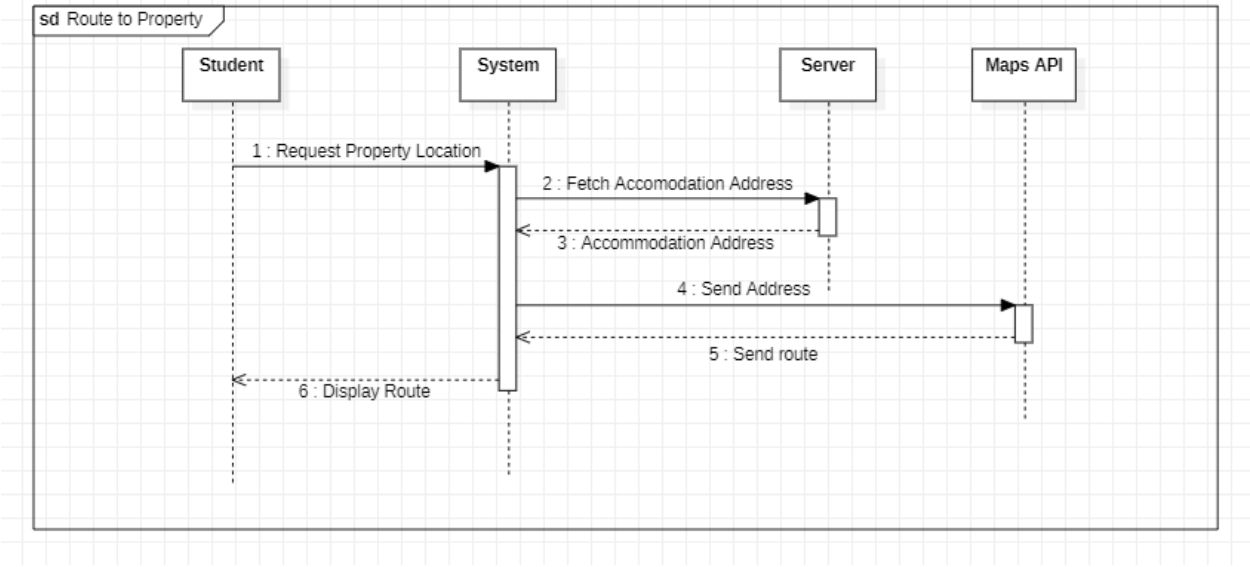
Handle Property:



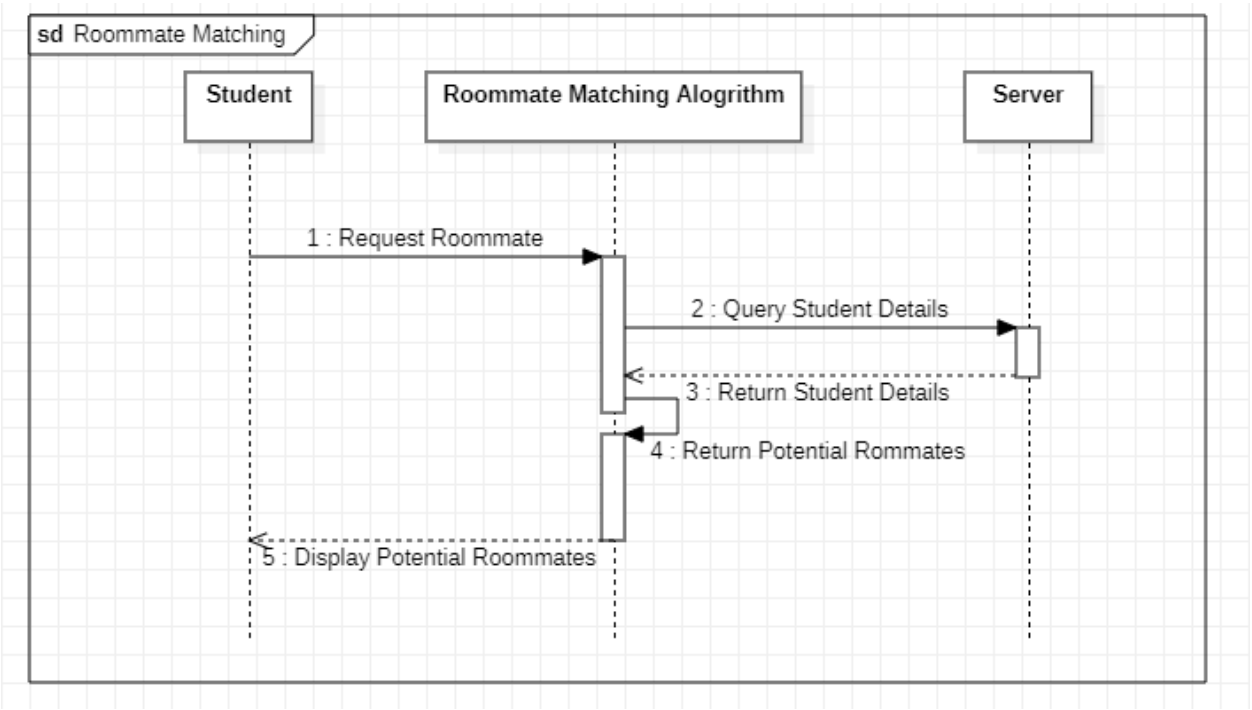
Search & Apply:



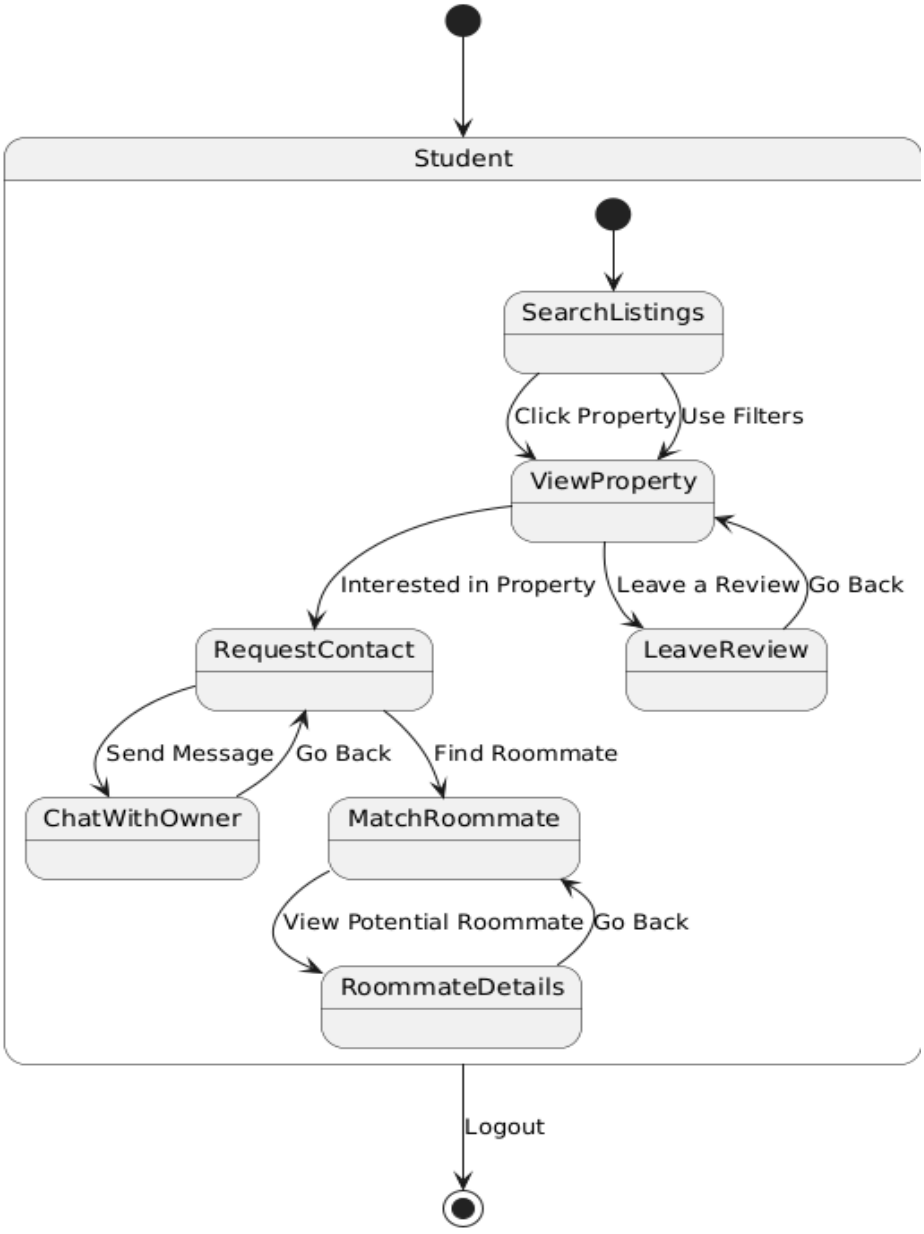
Route to Property:

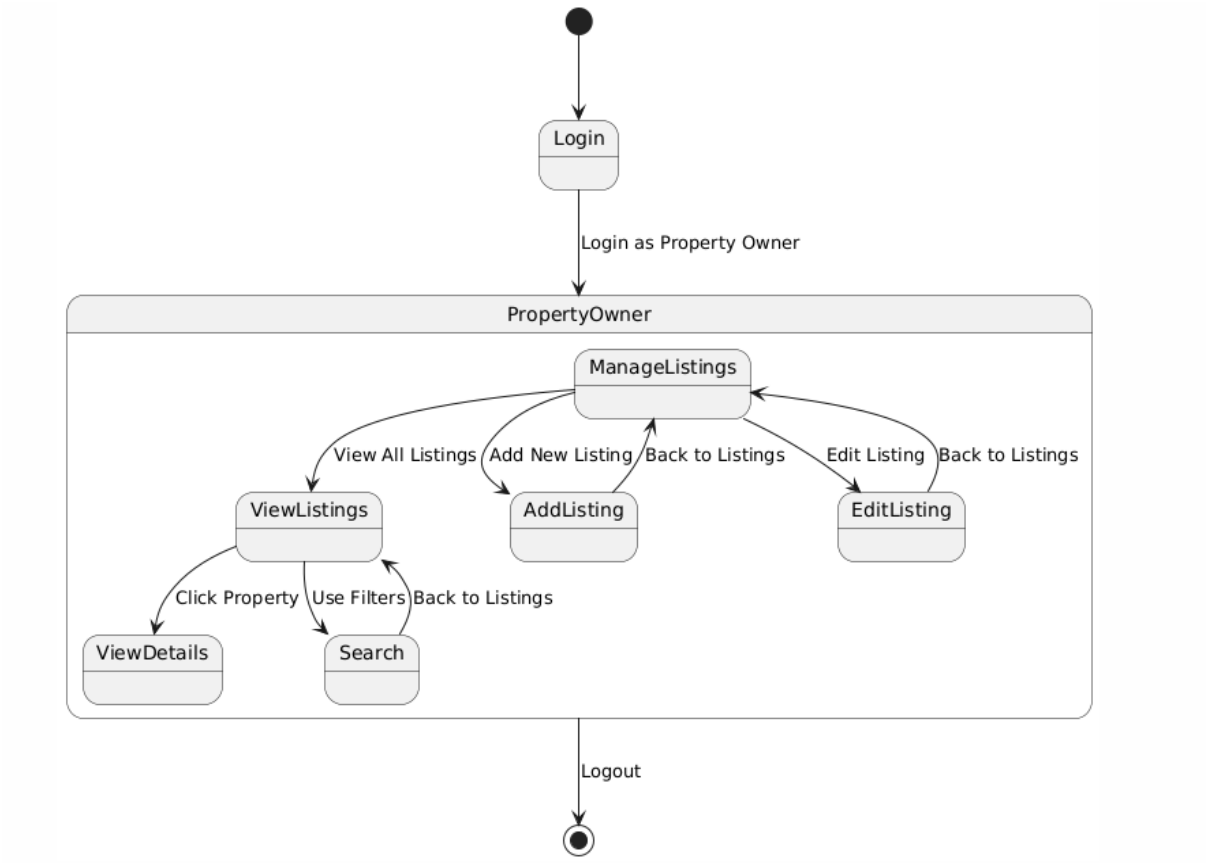


Roommate Matching:



State Machine Diagram




Login
Login as Property Owner
PropertyOwner
ManageListings
View All Listings
Add New Listing
Back to Listings
Edit Listing
Back to Listings
ViewListings
AddListing
EditListing
Click Property
Use Filters
Back to Listings
ViewDetails
Search
Logout

Sample Implementation of Student Home Page

Code:

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import java.sql.*;

public class StudentHomePageGUI extends JFrame {

    int userID;
    private JPanel contentPanel;
    private JComboBox<String> rentFilter;
    private JTextField locationField;

    public StudentHomePageGUI( int userID ) {

        this.userID = userID;

        setTitle("Student Home Page");
        setSize(800, 600);
        setDefaultCloseOperation(EXIT_ON_CLOSE);
        setLayout(new BorderLayout());
        setExtendedState(JFrame.MAXIMIZED_BOTH);

        JPanel mainHeaderPanel = new JPanel(new BorderLayout());
        mainHeaderPanel.setBorder(BorderFactory.createEmptyBorder(10, 10, 10, 10));

        JLabel notificationHeading = new JLabel("Student Home Page",
SwingConstants.CENTER);
        notificationHeading.setFont(new Font("Arial", Font.BOLD, 16));
        mainHeaderPanel.add(notificationHeading, BorderLayout.NORTH);

        JButton notificationButton = new JButton(" 🔔 ");
        notificationButton.setPreferredSize(new Dimension(50, 50));
        mainHeaderPanel.add(notificationButton, BorderLayout.WEST);
        notificationButton.addActionListener(e -> {
            StudentNotificationGUI sn = new StudentNotificationGUI();
        });

        JPanel searchPanel = new JPanel(new GridLayout(1, 3, 10, 10));
        locationField = new JTextField("Search By Location");

        rentFilter = new JComboBox<>(new String[]{"All", "0-100", "100-200", "200-300",
```

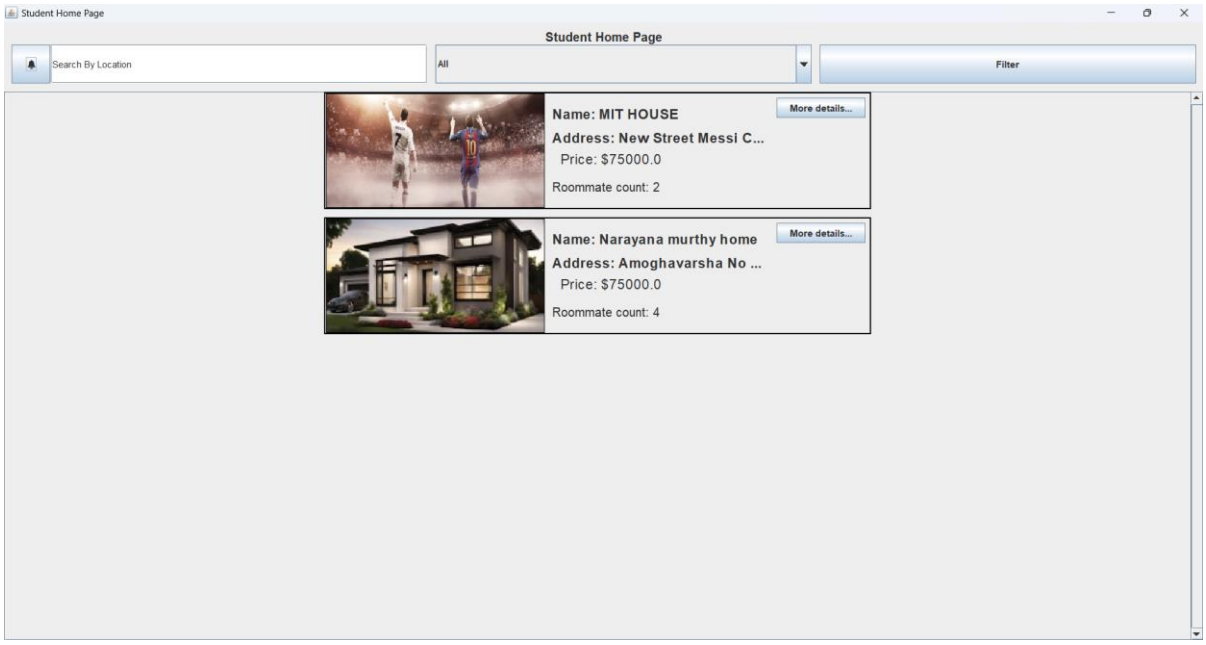
```
"300-400", "400+"});
        JButton filterButton = new JButton("Filter");
        filterButton.addActionListener(new FilterAction());

        searchPanel.add(locationField);
        searchPanel.add(rentFilter);
        searchPanel.add(filterButton);

        mainHeaderPanel.add(searchPanel, BorderLayout.CENTER);
        add(mainHeaderPanel, BorderLayout.NORTH);

        contentPanel = new JPanel();
        contentPanel.setLayout(new BoxLayout(contentPanel, BoxLayout.Y_AXIS));
        JScrollPane scrollPane = new JScrollPane(contentPanel);
        scrollPane.setVerticalScrollBarPolicy(JScrollPane.VERTICAL_SCROLLBAR_ALWAYS);

        loadAccommodations(null, null);
        add(scrollPane, BorderLayout.CENTER);
        setVisible(true);
    }

    private void loadAccommodations(String location, String rentRange) {
        contentPanel.removeAll();

        DB_Functions db = new DB_Functions();
        try (Connection conn = db.connect_to_db()) {
            String query = String.format("SELECT * FROM accommodation WHERE
user_id=%d",userID);

            if (location != null && !location.isEmpty()) {
                query += " AND accommodation_address ILIKE ?";
            }

            if (rentRange != null) {
                if (rentRange.equals("0-100")) {
                    query += " AND rent <= 100";
                } else if (rentRange.equals("100-200")) {
                    query += " AND rent > 100 AND rent <= 200";
                } else if (rentRange.equals("200-300")) {
                    query += " AND rent > 200 AND rent <= 300";
                } else if (rentRange.equals("300-400")) {
                    query += " AND rent > 300 AND rent <= 400";
                } else if (rentRange.equals("400+")) {
                    query += " AND rent > 400";
                }
            }
```

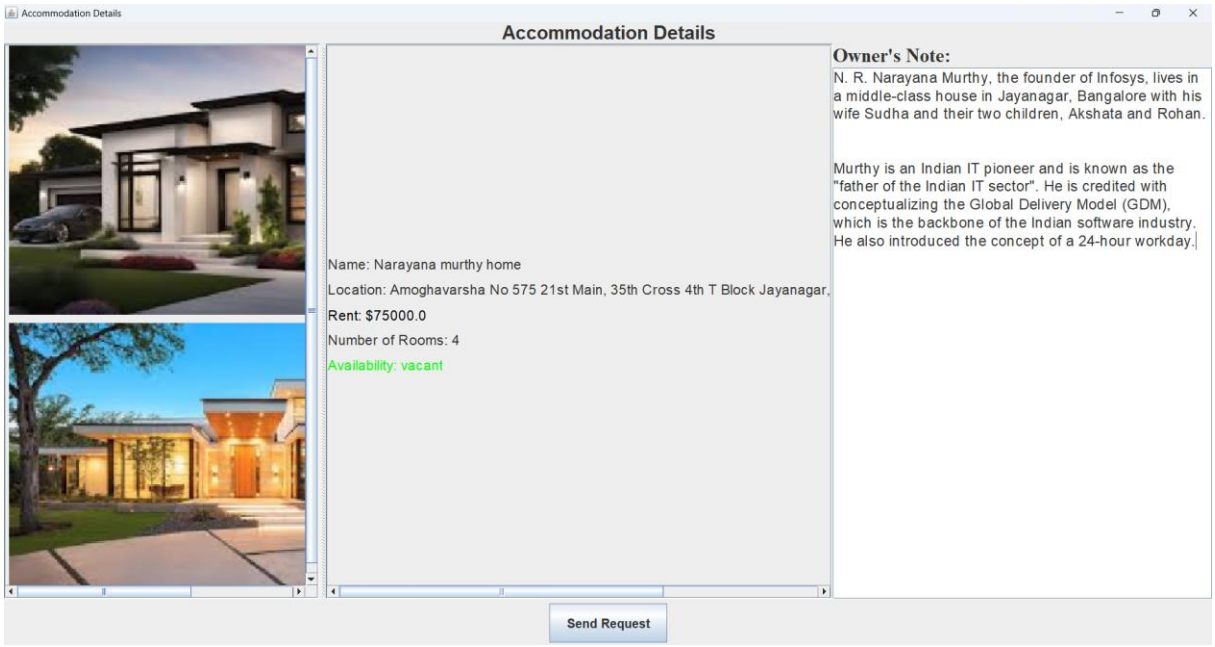
```
            PreparedStatement stmt = conn.prepareStatement(query);
            int paramIndex = 1;

            if (location != null && !location.isEmpty()) {
                stmt.setString(paramIndex++, "%" + location + "%");
            }

            ResultSet rs = stmt.executeQuery();
            while (rs.next()) {
                String accName = rs.getString("accommodation_name");
                String address = rs.getString("accommodation_address");
                String price = "$" + rs.getDouble("rent");
                int roommateCount = rs.getInt("numRooms");
                int accId = rs.getInt("accommodation_id");

                String query2 = "SELECT image_data FROM accommodation_images WHERE
accommodation_id = ?";
                PreparedStatement stmt2 = conn.prepareStatement(query2);
                stmt2.setInt(1, accId);
                ResultSet forImage = stmt2.executeQuery();

                ImageIcon accImage = null;
                ImageIcon scaledAccImage = null;
                if (forImage.next()) {

                    byte[] imageBytes = forImage.getBytes("image_data");
                    if (imageBytes != null) {
                        accImage = new ImageIcon(imageBytes);

                        Image scaledImage = accImage.getImage().getScaledInstance(280, 200,
Image.SCALE_SMOOTH);
                        scaledAccImage = new ImageIcon(scaledImage);
                    }
                }
                forImage.close();
                stmt2.close();

                JPanel accommodationCard = createAccommodationCard(accId, accName,
scaledAccImage, address, price, roommateCount);
                contentPanel.add(accommodationCard);
                contentPanel.add(Box.createVerticalStrut(10));
            }
            rs.close();
            stmt.close();
        } catch (SQLException e) {
```

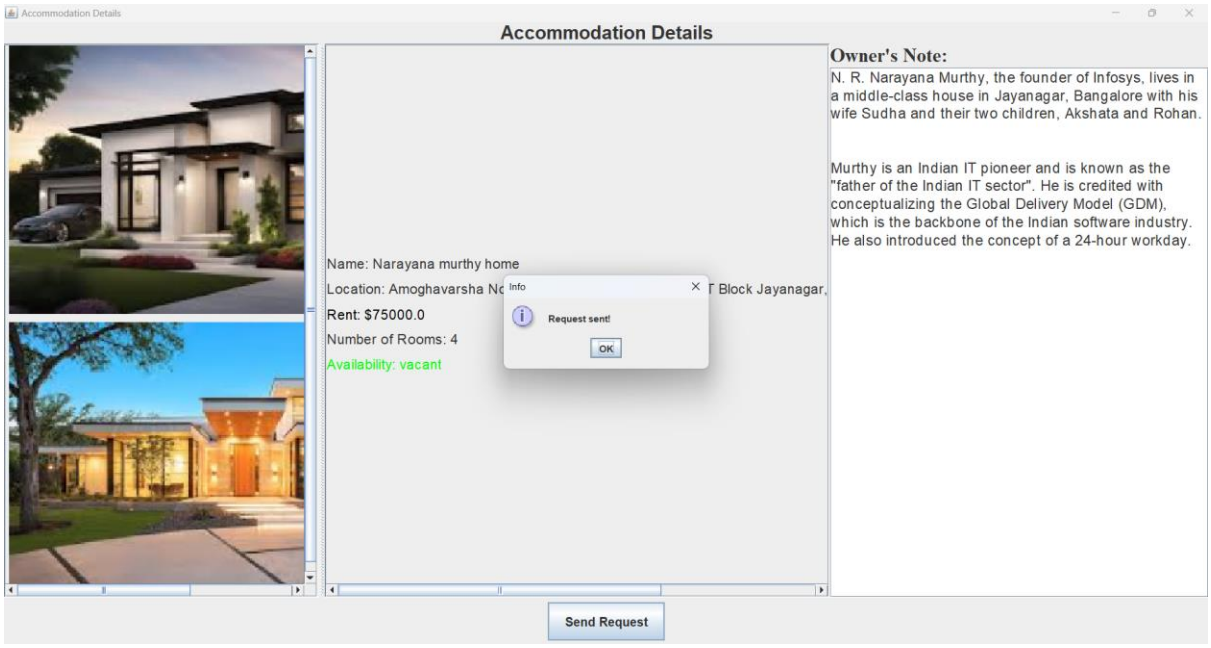
```
            JOptionPane.showMessageDialog(null, e.getMessage());
        }

        contentPanel.revalidate();
        contentPanel.repaint();
    }

    private JPanel createAccommodationCard(int accoID,String accName,ImageIcon
accImage ,String address, String price, int roommateCount) {
        JPanel card = new JPanel(new BorderLayout());
        card.setPreferredSize(new Dimension(700, 150));
        card.setMaximumSize(new Dimension(700, 150));
        card.setBorder(BorderFactory.createLineBorder(Color.BLACK, 2));
        card.setBackground(Color.WHITE);

        JLabel photoLabel = new JLabel(accImage); //"Photo", SwingConstants.CENTER
        photoLabel.setPreferredSize(new Dimension(280, 200));
        photoLabel.setBorder(BorderFactory.createLineBorder(Color.BLACK));
        card.add(photoLabel, BorderLayout.WEST);

        JPanel infoPanel = new JPanel(new GridLayout(4, 1));
        infoPanel.setBorder(BorderFactory.createEmptyBorder(10, 10, 10, 10));

        JLabel accNameLabel = new JLabel("Name: "+ accName);
        accNameLabel.setFont(new Font("Arial", Font.BOLD, 18));
        infoPanel.add(accNameLabel);

        JLabel addressLabel = new JLabel("Address: " + address);
        addressLabel.setFont(new Font("Arial", Font.BOLD, 18));
        infoPanel.add(addressLabel);

        JPanel detailsPanel = new JPanel(new FlowLayout(FlowLayout.LEFT, 10, 0));
        JLabel priceLabel = new JLabel("Price: " + price);
        priceLabel.setFont(new Font("Arial", Font.PLAIN, 18));
        JLabel roommateCountLabel = new JLabel("Roommate count: " + roommateCount);
        roommateCountLabel.setFont(new Font("Arial", Font.PLAIN, 16));
        detailsPanel.add(priceLabel);
        infoPanel.add(detailsPanel);
        infoPanel.add(roommateCountLabel);

        card.add(infoPanel, BorderLayout.CENTER);


        JPanel buttonPanel = new JPanel(new FlowLayout(FlowLayout.RIGHT));
        JButton detailsButton = new JButton("More details...");
        detailsButton.addActionListener(e -> {
```

```
            AccommodationDetailsSwingGUI accDetailedPage  = new
AccommodationDetailsSwingGUI(2, accoID , true );
        });
        buttonPanel.add(detailsButton);

        card.add(buttonPanel, BorderLayout.EAST);

        return card;
    }

    private class FilterAction implements ActionListener {
        @Override
        public void actionPerformed(ActionEvent e) {
            String location = locationField.getText().equals("Search By Location") ? "" :
locationField.getText();
            String rentRange = (String) rentFilter.getSelectedItem();
            loadAccommodations(location, rentRange.equals("All") ? null : rentRange);
        }
    }

    public static void main(String[] args) {
         new StudentHomePageGUI(1);
    }
}
```

Result:

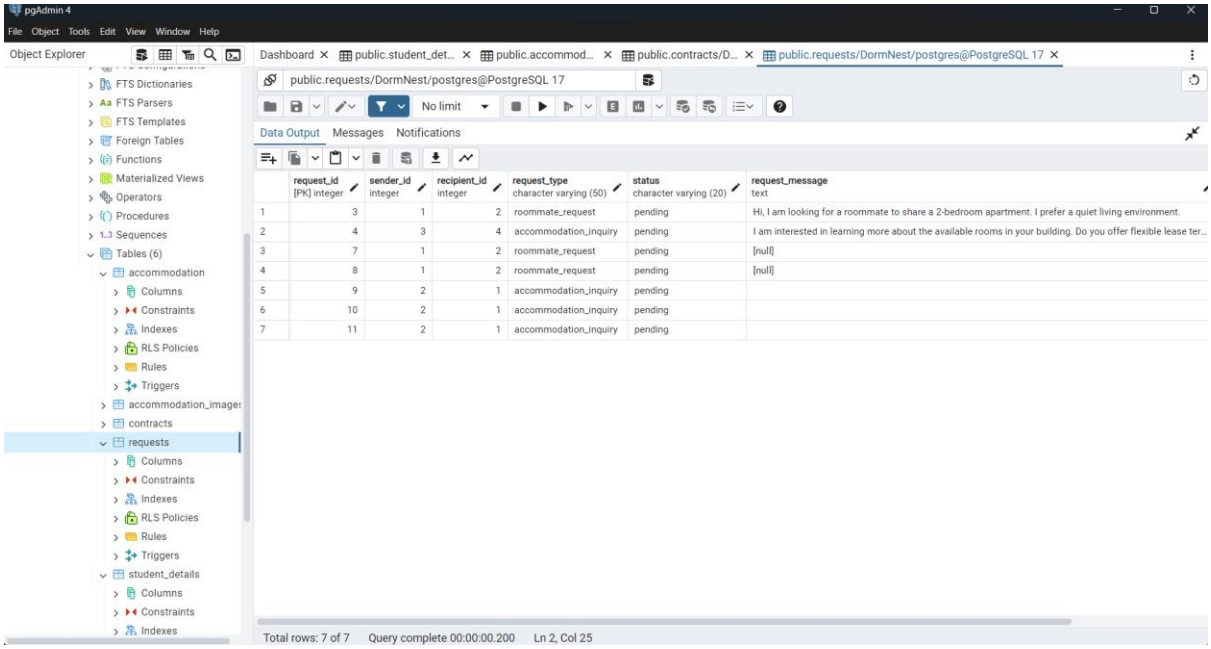

Student Home Page
Student Home Page
Search By Location
All
Filter
Name: MIT HOUSE
Address: New Street Messi C...
Price: $75000.0
Roommate count: 2
More details...
Name: Narayana murthy home
Address: Amoghavarsha No ...
Price: $75000.0
Roommate count: 4
More details...


Accommodation Details
Accommodation Details
Name: Narayana murthy home
Location: Amoghavarsha No 575 21st Main, 35th Cross 4th T Block Jayanagar.
Rent: $75000.0
Number of Rooms: 4
Availability: vacant
Owner's Note:
N. R. Narayana Murthy, the founder of Infosys, lives in a middle-class house in Jayanagar, Bangalore with his wife Sudha and their two children, Akshata and Rohan.
Murthy is an Indian IT pioneer and is known as the "father of the Indian IT sector". He is credited with conceptualizing the Global Delivery Model (GDM), which is the backbone of the Indian software industry. He also introduced the concept of a 24-hour workday.
Send Request


Accommodation Details
Accommodation Details
Owner's Note:
N. R. Narayana Murthy, the founder of Infosys, lives in a middle-class house in Jayanagar, Bangalore with his wife Sudha and their two children, Akshata and Rohan.
Murthy is an Indian IT pioneer and is known as the "father of the Indian IT sector". He is credited with conceptualizing the Global Delivery Model (GDM), which is the backbone of the Indian software industry. He also introduced the concept of a 24-hour workday.
Name: Narayana murthy home
Location: Amoghavarsha Nc
Block Jayanagar,
Rent: $75000.0
Number of Rooms: 4
Availability: vacant
Info
Request sent!
OK
Send Request


Name: Parameshwaran K
Preferred Rent: $12000.00
Social Lifestyle: Extroverted
Meal Preference: Non-Vegetarian
Matching Score: 94.00%
Send Request
Name: Karthigeyan Sn
Preferred Rent: $12400.00
Social Lifestyle: Extroverted
Meal Preference: Non-Vegetarian
Matching Score: 75.20%
Send Request

DataBase:


pgAdmin 4
File Object Tools Edit View Window Help
Object Explorer
Dashboard
public.student_det...
public.accommod...
public.contracts/D...
public.requests/DormNest/postgres@PostgreSQL 17
public.requests/DormNest/postgres@PostgreSQL 17
No limit
Data Output
Messages
Notifications
FTS Dictionaries
FTS Parsers
FTS Templates
Foreign Tables
Functions
Materialized Views
Operators
Procedures
Sequences
Tables (6)
accommodation
Columns
Constraints
Indexes
RLS Policies
Rules
Triggers
accommodation_image
contracts
requests
Columns
Constraints
Indexes
RLS Policies
Rules
Triggers
student_details
Columns
Constraints
Indexes
request_id [PK] integer
sender_id integer
recipient_id integer
request_type character varying (50)
status character varying (20)
request_message text
1 3 1 2 roommate_request pending Hi, I am looking for a roommate to share a 2-bedroom apartment. I prefer a quiet living environment.
2 4 3 4 accommodation_inquiry pending I am interested in learning more about the available rooms in your building. Do you offer flexible lease ter...
3 7 1 2 roommate_request pending [null]
4 8 1 2 roommate_request pending [null]
5 9 2 1 accommodation_inquiry pending
6 10 2 1 accommodation_inquiry pending
7 11 2 1 accommodation_inquiry pending
Total rows: 7 of 7
Query complete 00:00:00.200
Ln 2, Col 25

Testing and Evaluation

Creating a Tester Class to test Register Module:

Register Page contains Several Testers (Listed Below) :

```
@Test
void testValidRegistration() {
    // Simulate user input for valid registration
    registrationForm.userNameField.setText("testUser");
    registrationForm.passwordField.setText("validPassword123");
    registrationForm.emailField.setText("testuser@example.com");

    boolean result = registrationForm.registerUser();
    assertTrue(result, message: "The registration should be successful with valid input.");
}
```

```
@Test
void testEmptyUsername() {
    registrationForm.userNameField.setText("");
    registrationForm.passwordField.setText("validPassword123");
    registrationForm.emailField.setText("testuser@example.com");

    boolean result = registrationForm.registerUser();
    assertFalse(result, message: "The registration should fail due to empty username.");
}
```

```
@Test
void testEmptyPassword() {
    registrationForm.userNameField.setText("testUser");
    registrationForm.passwordField.setText("");
    registrationForm.emailField.setText("testuser@example.com");

    boolean result = registrationForm.registerUser();
    assertFalse(result, message: "The registration should fail due to empty password.");
}
```

```java
@Test
void testEmptyEmail() {
    registrationForm.userNameField.setText("testUser");
    registrationForm.passwordField.setText("validPassword123");
    registrationForm.emailField.setText("");

    boolean result = registrationForm.registerUser();
    assertFalse(result, message: "The registration should fail due to empty email.");
}
```

```java
@Test
void testInvalidEmailFormat() {
    registrationForm.userNameField.setText("testUser");
    registrationForm.passwordField.setText("validPassword123");
    registrationForm.emailField.setText("invalidEmail");

    boolean result = registrationForm.registerUser();
    assertFalse(result, message: "The registration should fail due to invalid email format.");
}
```

```java
@Test
void testPasswordLengthTooShort() {
    registrationForm.userNameField.setText("testUser");
    registrationForm.passwordField.setText("short");
    registrationForm.emailField.setText("testuser@example.com");

    boolean result = registrationForm.registerUser();
    assertFalse(result, message: "The registration should fail due to password being too short.");
}
```

```java
@Test
void testPasswordWithoutNumbers() {
    registrationForm.userNameField.setText("testUser");
    registrationForm.passwordField.setText("NoNumberPassword");
    registrationForm.emailField.setText("testuser@example.com");

    boolean result = registrationForm.registerUser();
    assertFalse(result, message: "The registration should fail because password should contain numbers.");
}
```

```java
@Test
void testPasswordWithoutSpecialCharacter() {
    registrationForm.userNameField.setText("testUser");
    registrationForm.passwordField.setText("NoSpecialChar123");
    registrationForm.emailField.setText("testuser@example.com");

    boolean result = registrationForm.registerUser();
    assertFalse(result, message: "The registration should fail because password should contain a special chara
}
```

```java
@Test
void testPasswordWithValidLengthAndSpecialChar() {
    registrationForm.userNameField.setText("testUser");
    registrationForm.passwordField.setText("Valid@123Password");
    registrationForm.emailField.setText("testuser@example.com");

    boolean result = registrationForm.registerUser();
    assertTrue(result, message: "The registration should be successful with valid password containing a specia
}
```

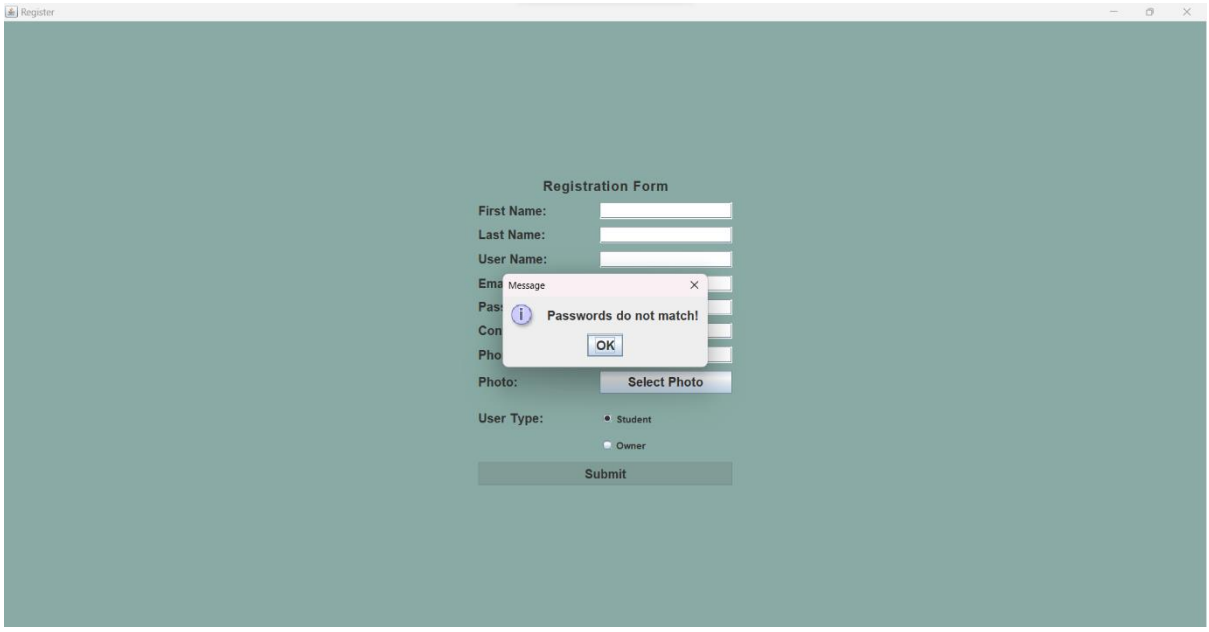
```java
@Test
void testUsernameAlreadyTaken() {
    registrationForm.userNameField.setText("existingUser"); // assuming this username is already in the databa
    registrationForm.passwordField.setText("validPassword123");
    registrationForm.emailField.setText("newuser@example.com");

    boolean result = registrationForm.registerUser();
    assertFalse(result, message: "The registration should fail if the username is already taken.");
}
```

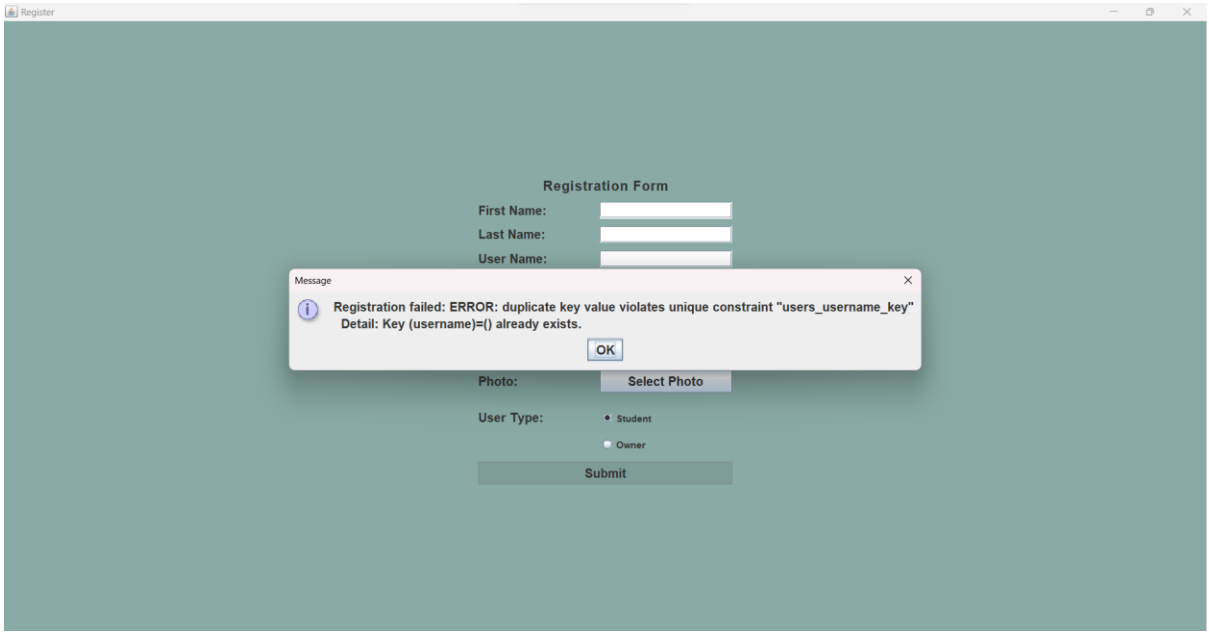
```java
@Test
void testEmailAlreadyUsed() {
    registrationForm.userNameField.setText("newUser");
    registrationForm.passwordField.setText("validPassword123");
    registrationForm.emailField.setText("existinguser@example.com"); // assuming this email is already registe

    boolean result = registrationForm.registerUser();
    assertFalse(result, message: "The registration should fail if the email is already used.");
}
```

Driver to run the Test Methods:

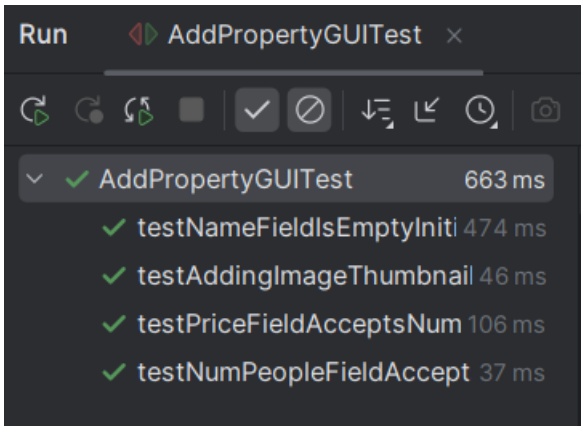
```
public static void main(String[] args) {
    Result result = JUnitCore.runClasses(RegistrationFormTest.class);
    System.out.println("Test run was successful: " + result.wasSuccessful());
    for (Failure failure : result.getFailures()) {
        System.out.println("Test failed: " + failure.toString());
    }
}
```

Final Result of All the Test Cases:





```
"C:\Program Files\Java\jdk-22\bin\java.exe" ...
Started: testPasswordMismatch
Passed: testPasswordMismatch
Started: testSuccessfulRegistration
Passed: testSuccessfulRegistration
Started: testPasswordHashingConsistency
Passed: testPasswordHashingConsistency
Started: testEmptyFieldsValidation
Connection Established :)
Passed: testEmptyFieldsValidation
All tests passed: true

Process finished with exit code 0
```



Conclusion:

The development of DormNest has addressed the pressing need for a streamlined, student-focused accommodation finder. By providing a dedicated platform that connects students with property owners, DormNest simplifies the housing search process for students while helping owners reach their target audience efficiently. The platform's essential features—including user registration, property listing management, search and filter functionalities, and a communication system—contribute to creating a user-friendly and effective tool for both students and property owners.

Throughout this project, I have gained invaluable skills, particularly in Java Swing for UI design, PostgreSQL database integration, and building a user-centered application. This experience has strengthened my knowledge of application architecture, data management, and secure coding practices.