# **Railway Reservation System Application**

#### **Project Overview**

This Railway Reservation System is a comprehensive software solution designed to streamline and modernize the process of booking train tickets, managing train schedules, and administering railway operations. The application features both user and administrator interfaces with role-based access control.

#### **Tools Used**

- Python: Core language for application development
- **CustomTkinter**: Enhanced Tkinter framework for modern UI components
- MySQL: Relational database to store booking, train, and user information
- MySQL Connector: For database connectivity and operations
- BCrypt: For secure password hashing and verification
- Pillow (PIL): For image processing and display
- Matplotlib: For data visualization and analytical charts
- **TkCalendar**: For date selection widgets
- Python-dotenv: For environment variable management

# **Application Features**

#### **Authentication System**

- Login Interface
  - Modern interface with background image and user-friendly controls
  - Secure authentication against the users table
  - Password verification using BCrypt
  - Role-based redirection (Admin Dashboard or User Dashboard)

# **User Journey Features**

- Registration System
  - New user registration with validation
  - Secure password storage with BCrypt hashing
  - Email format validation and duplicate account prevention

# Ticket Booking Process

- Four-step booking workflow: Search, Select Train, Enter Passenger Details, Payment
- Filter options by train class (Sleeper, AC, General)
- Multiple payment method support
- Real-time fare calculation
- Booking confirmation with PNR generation

# Passenger Management

- Support for multiple passengers per booking (up to 6)
- Individual passenger details with seating preferences
- o Age and gender capture for each passenger

# Booking Management

- View upcoming journeys
- Access booking history
- o Cancel bookings with confirmation
- View detailed booking information with PNR

#### **Admin Features**

#### Dashboard Analytics

- Visual representation of booking statistics
- Revenue tracking with pie and bar charts
- Daily booking trends analysis
- Train status monitoring

# Train Management

- Add new trains with details
- o Edit existing train information
- o Remove trains from the system
- Search and filter train data

# Schedule Management

- Create train schedules with routes
- Set fares for different classes

- Update departure/arrival times
- Mark delays or cancellations

# • Passenger Oversight

- View all passenger bookings
- Filter by travel class
- Export passenger data to CSV
- Search functionality

# Revenue Analytics

- Revenue breakdown by travel class
- Top performing routes analysis
- Payment method statistics
- Date-range based filtering

#### **User Profile Features**

# Personal Settings

- o Profile information management
- Password change functionality
- Theme preference (Light/Dark mode)
- View booking history and statistics

# **Database Design**

The system uses a MySQL database with the following key tables:

- 1. **users**: Stores user account information and authentication details
- 2. **trains**: Contains train details including number, name and seat capacity
- 3. **schedules**: Maintains journey details with routes, times, and fares
- 4. **bookings**: Records ticket bookings with payment information
- 5. passengers: Stores individual passenger details linked to bookings

#### **Key Relationships in Database**

- Users can have multiple bookings
- Each booking can have multiple passengers
- Each schedule is linked to a specific train

• Schedules determine the routes and fares available for booking

#### **UI/UX Design**

- Modern Interface: Clean, intuitive design with consistent color scheme
- Responsive Layout: Adapts to window resizing
- Theme Options: Light and dark mode support
- Meaningful Feedback: Notifications, alerts, and confirmation dialogs
- Visual Hierarchy: Clear organization of information with appropriate spacing
- Progress Indicators: Loading animations and progress bars

# **Security Features**

- Password encryption using BCrypt
- Validation of user inputs
- Role-based access control
- Authentication for sensitive operations

#### **Additional Features**

- Date selection using calendar widget
- Real-time fare calculation
- Booking cancellation with confirmation
- Search functionality throughout the application
- Export data capability for administrative purposes

#### Queries

```
CREATE DATABASE IF NOT EXISTS railway_system;
USE railway_system;
```

-- Users table

```
create table if not exists users (
id INT AUTO_INCREMENT PRIMARY KEY,
name VARCHAR(100) NOT NULL,
email VARCHAR(100) UNIQUE NOT NULL,
```

```
password VARCHAR(255) NOT NULL,
  phone VARCHAR(15),
 is admin BOOLEAN DEFAULT FALSE,
  profile_pic VARCHAR(255),
  theme VARCHAR(10) DEFAULT 'light',
  created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP
);
-- Trains table
CREATE TABLE IF NOT EXISTS trains (
 id INT AUTO_INCREMENT PRIMARY KEY,
 train_number VARCHAR(20) UNIQUE NOT NULL,
 train name VARCHAR(100) NOT NULL,
 total seats sleeper INT NOT NULL,
 total_seats_ac INT NOT NULL,
  total_seats_general INT NOT NULL,
  created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP
);
-- Schedules table
CREATE TABLE IF NOT EXISTS schedules (
 id INT AUTO_INCREMENT PRIMARY KEY,
 train_id INT NOT NULL,
  source VARCHAR(100) NOT NULL,
  destination VARCHAR(100) NOT NULL,
  departure_date DATE NOT NULL,
  departure time TIME NOT NULL,
  arrival_date DATE NOT NULL,
  arrival_time TIME NOT NULL,
```

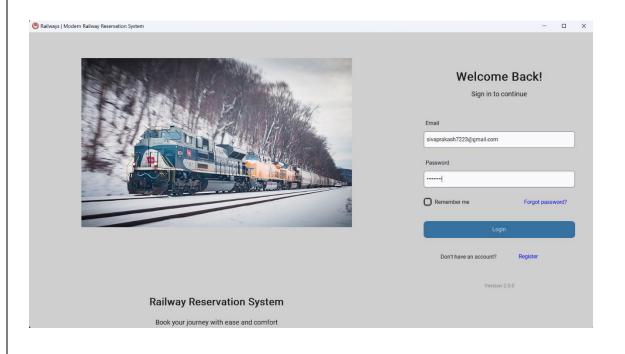
```
fare_sleeper DECIMAL(10, 2) NOT NULL,
  fare_ac DECIMAL(10, 2) NOT NULL,
 fare general DECIMAL(10, 2) NOT NULL,
  status ENUM('on-time', 'delayed', 'cancelled') DEFAULT 'on-time',
  delay minutes INT DEFAULT 0,
  created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
  FOREIGN KEY (train id) REFERENCES trains(id) ON DELETE CASCADE
);
-- Bookings table
CREATE TABLE IF NOT EXISTS bookings (
 id INT AUTO_INCREMENT PRIMARY KEY,
  user id INT NOT NULL,
  schedule id INT NOT NULL,
  pnr VARCHAR(10) UNIQUE NOT NULL,
  booking_date TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
 total fare DECIMAL(10, 2) NOT NULL,
  status ENUM('confirmed', 'cancelled') DEFAULT 'confirmed',
  payment_method ENUM('credit_card', 'debit_card', 'net_banking', 'upi') NOT NULL,
  payment id VARCHAR(100),
  FOREIGN KEY (user id) REFERENCES users(id) ON DELETE CASCADE,
  FOREIGN KEY (schedule_id) REFERENCES schedules(id) ON DELETE CASCADE
);
-- Passengers table
CREATE TABLE IF NOT EXISTS passengers (
  id INT AUTO INCREMENT PRIMARY KEY,
  booking_id INT NOT NULL,
  name VARCHAR(100) NOT NULL,
```

```
age INT NOT NULL,
gender ENUM('male', 'female', 'other') NOT NULL,
seat_class ENUM('sleeper', 'ac', 'general') NOT NULL,
seat_number VARCHAR(10),
FOREIGN KEY (booking_id) REFERENCES bookings(id) ON DELETE CASCADE
);

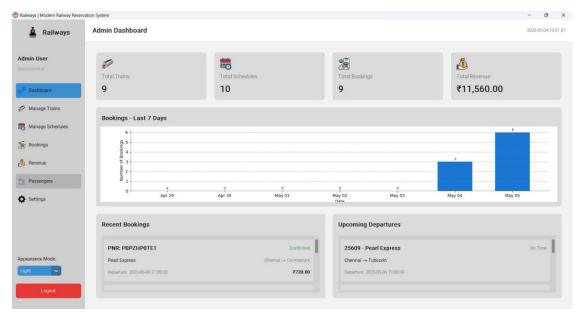
-- Notifications table

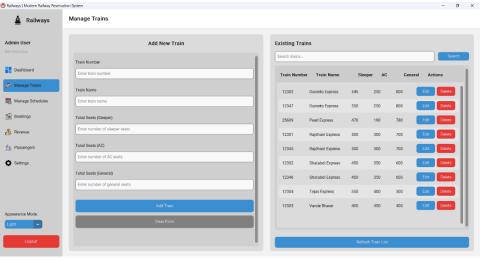
CREATE TABLE IF NOT EXISTS notifications (
    id INT AUTO_INCREMENT PRIMARY KEY,
    user_id INT NOT NULL,
    message TEXT NOT NULL,
    is_read BOOLEAN DEFAULT FALSE,
    created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
    FOREIGN KEY (user_id) REFERENCES users(id) ON DELETE CASCADE
);
```

# **Application Screenshots (GUI)**

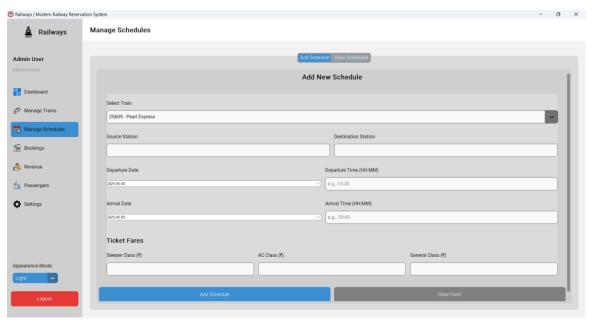


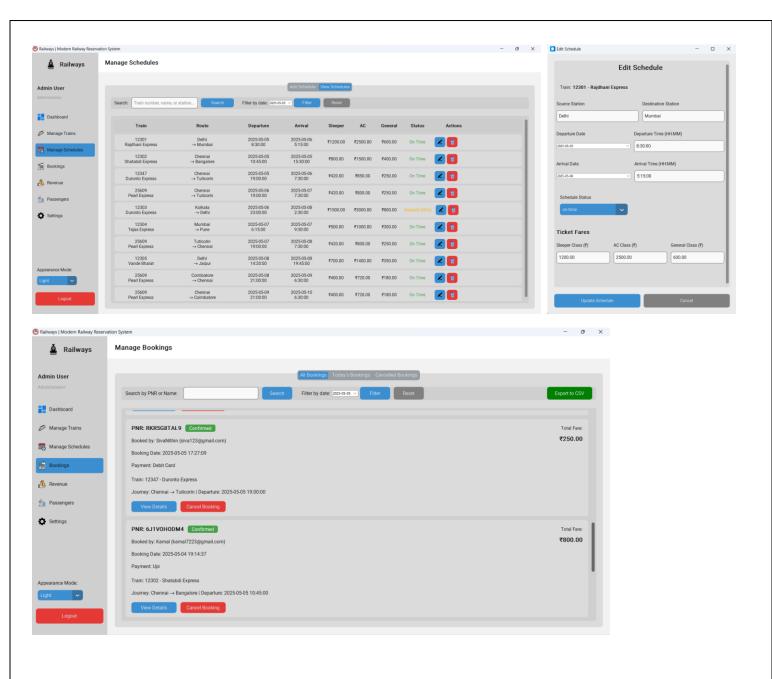
#### **Admin User**

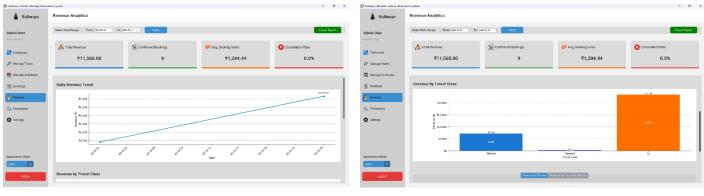


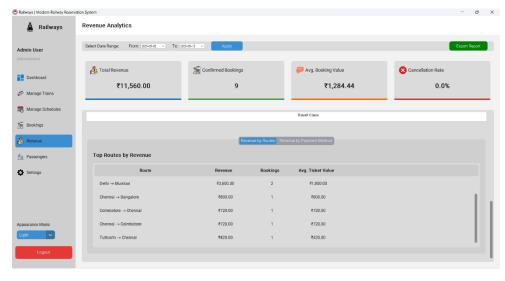


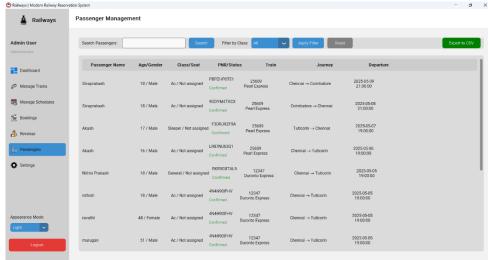


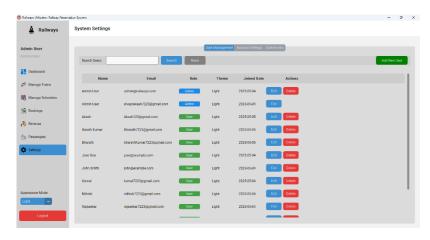




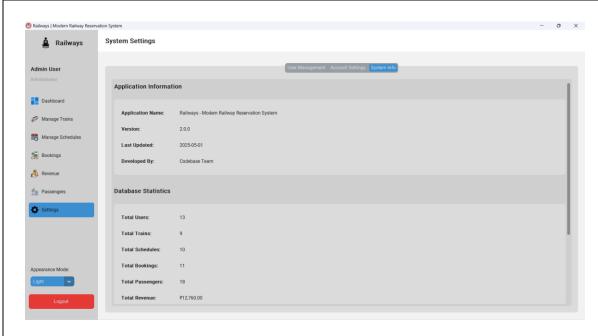




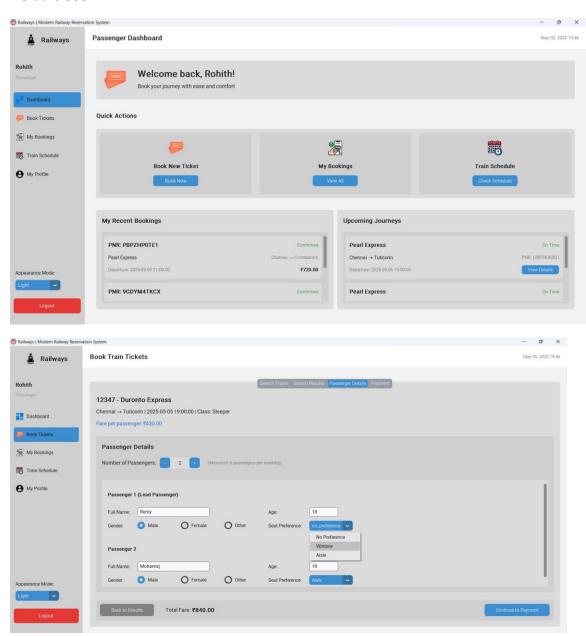


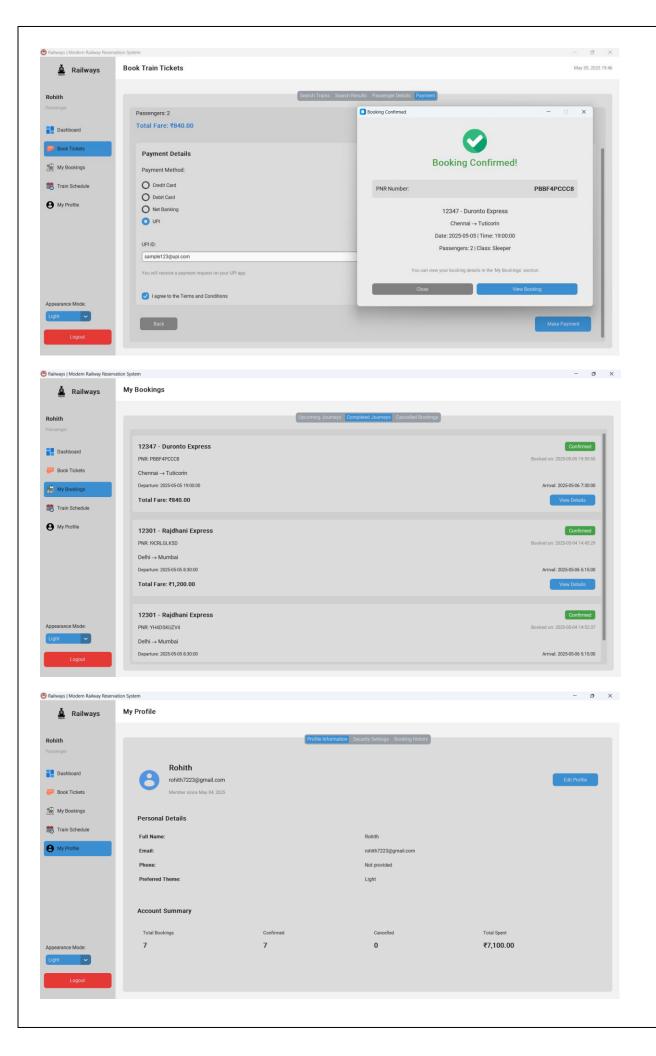






#### **Default User**





#### **MySQL Tables**

