

RAILCONNECT

Smart Train Reservation System

Project Report

- Section – 9P133
- Team Members –
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1. Executive Summary

RailConnect is a web-based Smart Train Reservation System built to give users a secure, efficient, and genuinely easy-to-use platform for booking train tickets online. The system is developed using the Django web framework and follows a modular architecture that cleanly separates user functionalities, booking operations, and administrative controls.

The main goal of this project is to deliver a digital train reservation platform where users can search for trains, book tickets, manage their reservations, and automatically receive email confirmations. Beyond that, the system includes a dedicated Admin Panel that gives administrators centralized control over trains, users, and booking records.

Throughout development, security remained a top priority. RailConnect uses OTP-based login verification, session management, role-based access control, and well-structured data handling to make sure bookings are processed correctly, seat allocation stays consistent, and administrative access is properly protected through separate authentication.

Overall, the project demonstrates a real-world, scalable architecture that can be extended in the future with payment gateway integration, real-time seat tracking, cloud deployment, and analytical reporting features.

2. Introduction

As demand for digital services continues to grow, online ticket booking systems have become more of a necessity than a luxury. Traditional manual booking methods tend to be slow, error-prone, and frustrating for both staff and passengers. Today's users expect platforms that are fast, secure, and easy to access from anywhere.

RailConnect was built with exactly these expectations in mind. The system addresses the shortcomings of manual processes by providing:

- A structured, step-by-step booking workflow
- A secure authentication system with two-step verification
- Automated ticket confirmation via email
- Administrative monitoring and management capabilities
- A clean, responsive user interface that works across devices

The system is designed to closely simulate how real-world railway booking platforms operate, while keeping the implementation straightforward enough for both academic study and practical deployment.

3. System Architecture Overview

RailConnect is built on a three-tier architecture, which keeps the different layers of the application clearly separated and makes the system much easier to maintain and scale over time.

3.1 Presentation Layer (Frontend)

The frontend is built using HTML, CSS, and JavaScript. It handles everything the user sees and interacts with directly, including:

- Displaying available train listings
- Rendering booking forms
- Showing ticket summaries
- Handling dynamic passenger form generation based on passenger count
- Providing a consistent and clean user interface throughout

3.2 Application Layer (Backend)

The backend is developed using Python and the Django framework. This layer contains all of the system's core logic, including:

- Business rules and validation logic
- User authentication and OTP verification
- Seat availability management and allocation
- PNR generation and booking validation
- Email integration for automated confirmations
- Admin dashboard logic and access control

3.3 Data Layer (Database)

A relational database is used to store all of the system's data, including user accounts, train information, booking records, passenger details, seat assignments, and admin credentials. Django's ORM is used throughout to interact with the database in a safe and efficient way.

4. User Module

The User Module handles everything related to customer-facing functionality. It ensures that users can securely access the platform and carry out all booking-related activities without any friction.

4.1 User Registration

New users can create an account by providing a username, email address, and password. The system validates that usernames are unique, that all required fields are filled in, and that the input format is correct before saving anything to the database. This user data then serves as the foundation for all future login authentication.

4.2 User Login with OTP Verification

To keep the platform secure, RailConnect implements a two-step login process using OTP verification. Here is how it works:

1. The user enters their username and password.
2. The system checks whether the credentials are valid.
3. If they are, a One-Time Password (OTP) is generated automatically.
4. The OTP is sent to the user's registered email address.
5. The user enters the OTP to complete the login process.

This two-step approach adds a meaningful layer of security by ensuring that only someone with access to the registered email can log in. It protects against unauthorized access and also confirms that the email address associated with the account actually belongs to the user.

4.3 Session Management

Once a user successfully logs in, a session variable is stored to keep them authenticated as they navigate the platform. This gives them access to all booking-related pages without needing to log in repeatedly. When the user logs out, the session is cleared securely, preventing any unauthorized access to protected routes after the fact.

4.4 User Functionalities

After logging in, users have access to the full range of features the platform offers. They can view available trains, book tickets, check their booking history, cancel existing reservations, and access their ticket summaries. All of these features are restricted to authenticated users only, so none of them are accessible without a valid login session.

5. Booking Module

The Booking Module is the heart of the RailConnect system. It manages the entire train reservation process, from the moment a user selects a train to the point where their confirmation email lands in their inbox.

5.1 Train Listing

The system displays a list of available trains along with all the details a passenger would need to make a decision: the train name, source and destination stations, departure and arrival times, ticket price, and the number of seats currently available. This gives users everything they need to pick the right train for their journey.

5.2 Booking Form and Passenger Details

Once a user selects a train, they are presented with a booking form. They need to enter the travel date, the number of passengers travelling, and the individual details for each passenger, including their name, age, and gender. The passenger input fields are generated dynamically based on how many passengers the user specifies, so the form always adapts to their needs.

5.3 Travel Date Validation

To maintain logical consistency, the system checks the selected travel date before allowing a booking to go through. If a user tries to book a ticket for a date that has already passed, the booking is rejected and an error message is shown. This simple check prevents a whole category of mistakes that could otherwise cause confusion.

5.4 Seat Availability Management

Before confirming any booking, the system verifies that there are enough seats available for the number of passengers selected. This check prevents overbooking and ensures that the seat counts in the database remain accurate. After a successful booking, the available seat count is reduced accordingly and the updated number is saved to the database right away.

5.5 Seat Allocation

Seats are assigned to passengers sequentially as bookings come in. For example, if a booking includes two passengers, Passenger 1 receives Seat 1 and Passenger 2 receives Seat 2, and so on. These seat numbers are stored alongside the passenger details and are shown on both the booking summary and the final ticket view so passengers always know exactly where they are sitting.

5.6 PNR Generation

Every successful booking generates a unique PNR (Passenger Name Record) number. The PNR serves as the booking's unique identifier, making it easy to track, retrieve, and reference specific reservations. The system is designed to ensure that PNR numbers are never duplicated, so each booking always has its own distinct record.

5.7 Booking Summary

After a booking is confirmed, the system displays a detailed summary page showing the PNR number, train details, travel date, passenger information, assigned seat numbers, and the total fare. This page gives the user a chance to review everything before moving on to view their final ticket.

5.8 Email Confirmation

Once a booking is completed, the system automatically sends a confirmation email to the user. The email contains all the important details: the PNR, passenger information, seat numbers, and the total fare. This acts as the official confirmation of the booking and gives users a record they can refer back to later.

5.9 My Bookings & Cancellation

Users can view all of their past bookings at any time through the My Bookings section. From there, they can look at the details of any specific ticket or cancel a booking if their plans change. When a cancellation is processed, the seats are restored to the available pool and the booking record is removed from the system. This keeps seat availability accurate and up to date across the platform.

6. Admin Module

The Admin Module operates completely independently from the User Module. It is designed specifically for system administrators who need to manage and monitor the platform as a whole.

6.1 Admin Authentication

Admin login is handled through a completely separate authentication flow from the standard user login. Admin credentials are stored independently, admin sessions use a different session key, and admin pages cannot be accessed without a valid admin login. This separation ensures proper role-based access control and prevents regular users from accidentally or intentionally reaching administrative functions.

6.2 Admin Dashboard

The dashboard gives administrators a quick overview of the entire system at a glance. It shows the total number of registered users, the total number of trains in the system, and the total number of bookings that have been made. It serves as the central management hub from which administrators can navigate to any part of the system.

6.3 Train Management

Administrators have full control over the trains listed in the system. They can add new trains, edit the details of existing ones, delete trains that are no longer in service, and manage seat availability. This gives the admin team everything they need to keep the train listings accurate and current.

6.4 User Management

The admin panel also provides visibility into the user base. Administrators can view the full list of registered users, keep track of new registrations, and monitor user activity across the platform. This helps with identifying any unusual patterns or issues that might need attention.

6.5 Booking Management

Administrators can view all bookings made through the system, track PNR records, review passenger information, and get a broad picture of how the system is being used. This level of visibility is important for resolving any booking disputes and keeping operations running smoothly.

6.6 Reports and Monitoring

The admin module also supports basic reporting based on booking statistics, user counts, and train utilization. These reports help administrators understand how the system is performing and make informed decisions about capacity, scheduling, and future improvements.

7. Security Considerations

Security was taken seriously throughout the development of RailConnect. The system incorporates several layers of protection to guard against unauthorized access and misuse:

- Session-based authentication to manage user state securely
- OTP verification as a second factor during login
- Role-based access control to keep admin and user functions strictly separated
- CSRF protection built in through Django's security middleware
- Input validation to prevent malformed or malicious data from being processed
- Separate admin authentication to ensure the management layer is never exposed to regular users

8. Future Enhancements

There are several directions in which RailConnect could be expanded and improved in the future. Some of the most promising possibilities include:

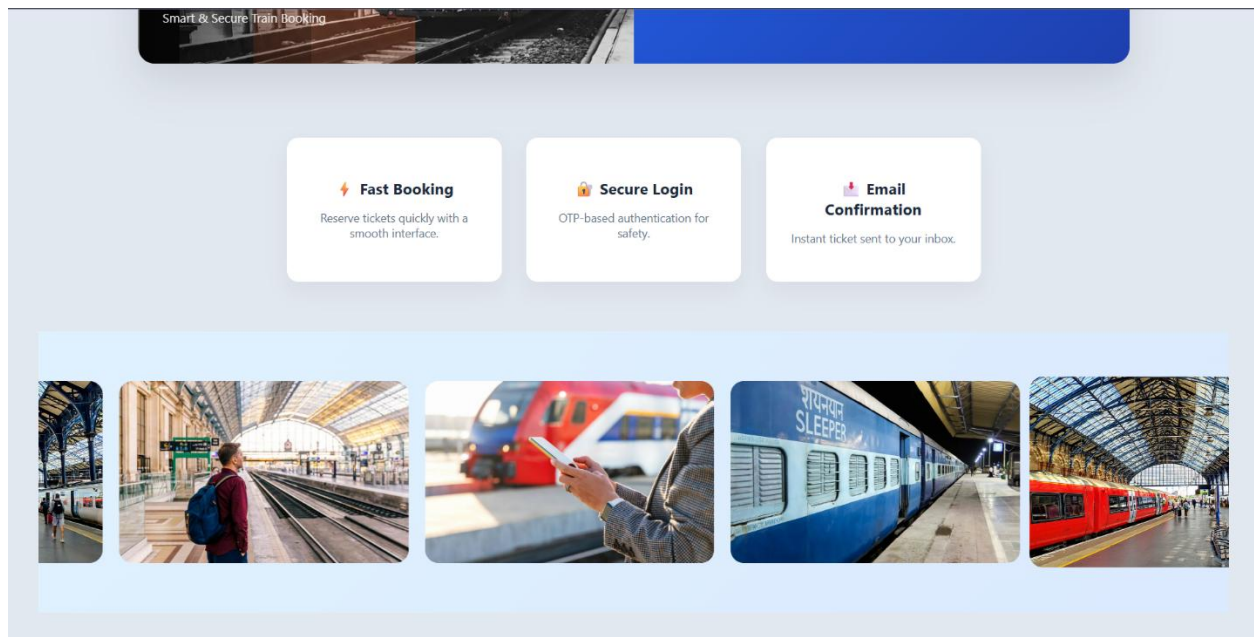
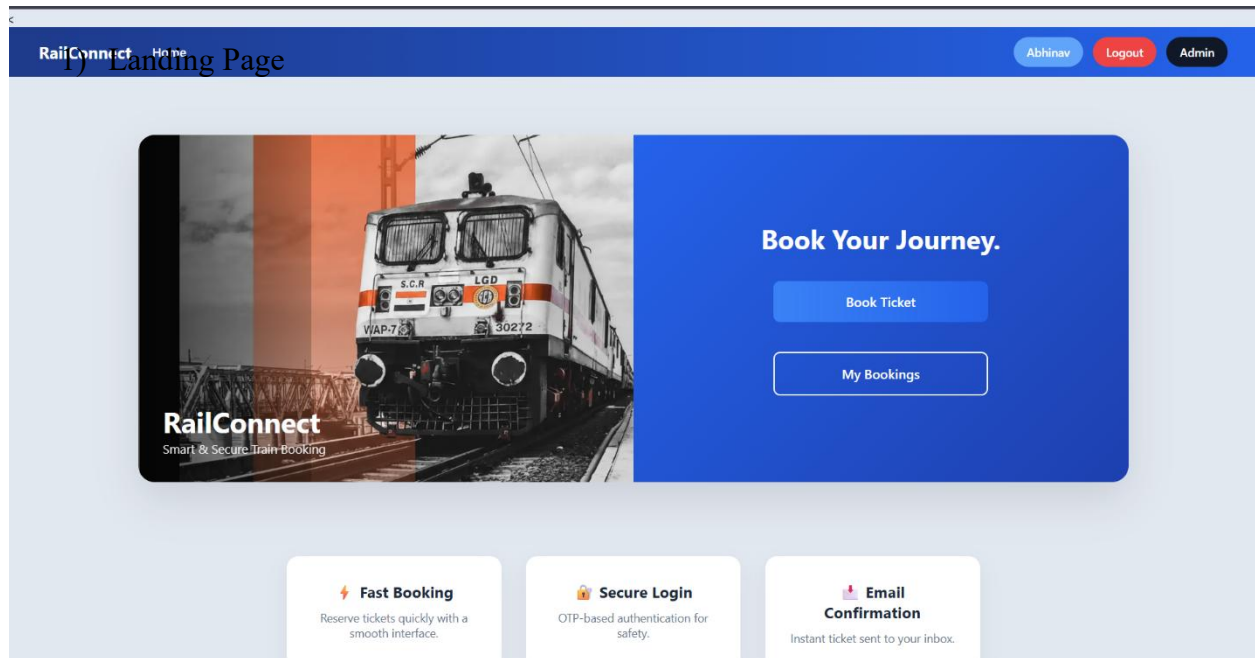
- Payment gateway integration to support online transactions directly within the platform
- A waitlist system to manage demand when trains are fully booked
- Cloud deployment to make the system accessible at scale
- QR code ticketing to simplify the boarding process
- A mobile application version to give users access on the go

9. Conclusion

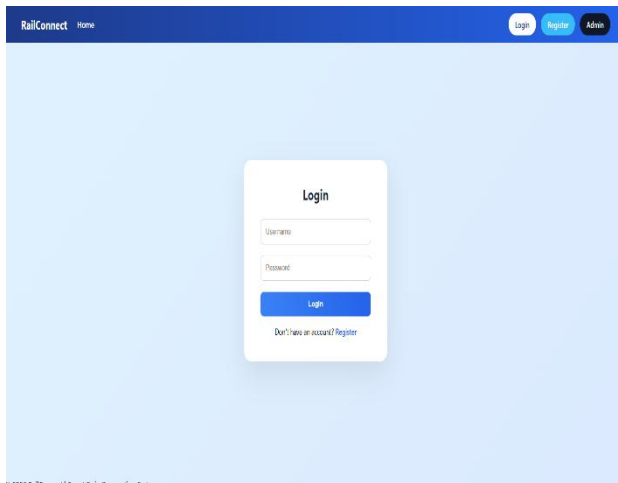
RailConnect successfully delivers a modular, secure, and scalable train reservation system that covers all the core requirements of a real-world booking platform. By combining user authentication, dynamic booking logic, seat management, automated email confirmations, and an independent admin dashboard, the system provides a complete end-to-end solution.

Its modular structure makes it straightforward to maintain and extend as requirements evolve. The system accurately reflects how real-world train booking platforms work and provides a solid technical foundation for anyone looking to build more advanced transportation management systems in the future.

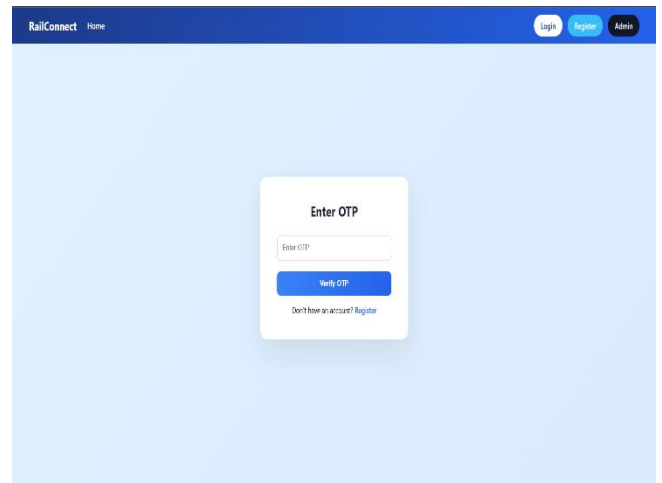
Website Screenshots



2) Login

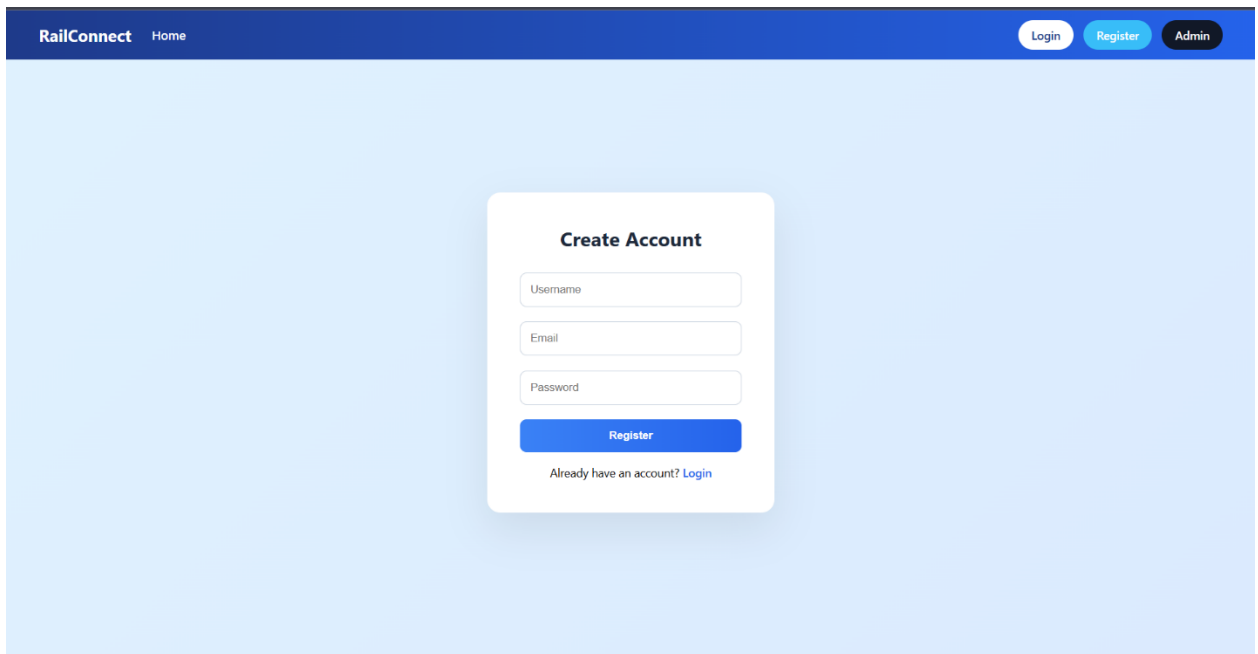


The screenshot shows the login page of the RailConnect application. The header is dark blue with the 'RailConnect' logo and a 'Home' link on the left, and 'Login', 'Register', and 'Admin' buttons on the right. The main content area is light blue. In the center, there is a white 'Login' form with a title 'Login'. It contains two input fields: 'Username' and 'Password'. Below these is a blue 'Login' button. At the bottom of the form, there is a link that says 'Don't have an account? Register'.



The screenshot shows the 'Enter OTP' page of the RailConnect application. The header is identical to the login page. The main content area is light blue. In the center, there is a white 'Enter OTP' form with a title 'Enter OTP'. It contains one input field labeled 'Enter OTP'. Below the input field is a blue 'Verify OTP' button. At the bottom of the form, there is a link that says 'Don't have an account? Register'.

3) Register



The screenshot shows the 'Create Account' page of the RailConnect application. The header is dark blue with the 'RailConnect' logo and a 'Home' link on the left, and 'Login', 'Register', and 'Admin' buttons on the right. The main content area is light blue. In the center, there is a white 'Create Account' form with a title 'Create Account'. It contains three input fields: 'Username', 'Email', and 'Password'. Below these is a blue 'Register' button. At the bottom of the form, there is a link that says 'Already have an account? Login'.

4) Train & Booking

RailConnectHome

AbhinavLogoutAdmin

Search Trains

From

To

Sort By

Search

Available Trains

Train No	Name	From	To	Departure	Arrival	Price	Seats	Action
20001	Demo Express	Delhi	Mumbai	8 a.m.	5 p.m.	₹600	48	Book
100452	AP Express	Jalandhar	Proddatur	11:30 a.m.	4:45 a.m.	₹1500	15	Book
120874	Humsafar	Guntur	Hyderabad	10 a.m.	10:30 p.m.	₹1000	46	Book

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RailConnectHome

AbhinavLogoutAdmin

My Bookings

Train Name	From	To	Date	Passengers	Total	Action
Demo Express	Delhi	Mumbai	Feb. 18, 2026	2	₹1200	View TicketCancel
AP Express	Jalandhar	Proddatur	Feb. 20, 2026	2	₹3000	View TicketCancel
AP Express	Jalandhar	Proddatur	Feb. 20, 2026	2	₹3000	View TicketCancel
Demo Express	Delhi	Mumbai	Feb. 20, 2026	3	₹1800	View TicketCancel
Demo Express	Delhi	Mumbai	Feb. 20, 2026	4	₹2400	View TicketCancel
AP Express	Jalandhar	Proddatur	Feb. 20, 2026	4	₹6000	View TicketCancel
AP Express	Jalandhar	Proddatur	Feb. 20, 2026	4	₹6000	View TicketCancel
Demo Express	Delhi	Mumbai	Feb. 20, 2026	1	₹600	View TicketCancel

Book AP Express

Jalandhar --> Proddatur
Price per passenger: ₹1500

Travel Date
28-02-2026

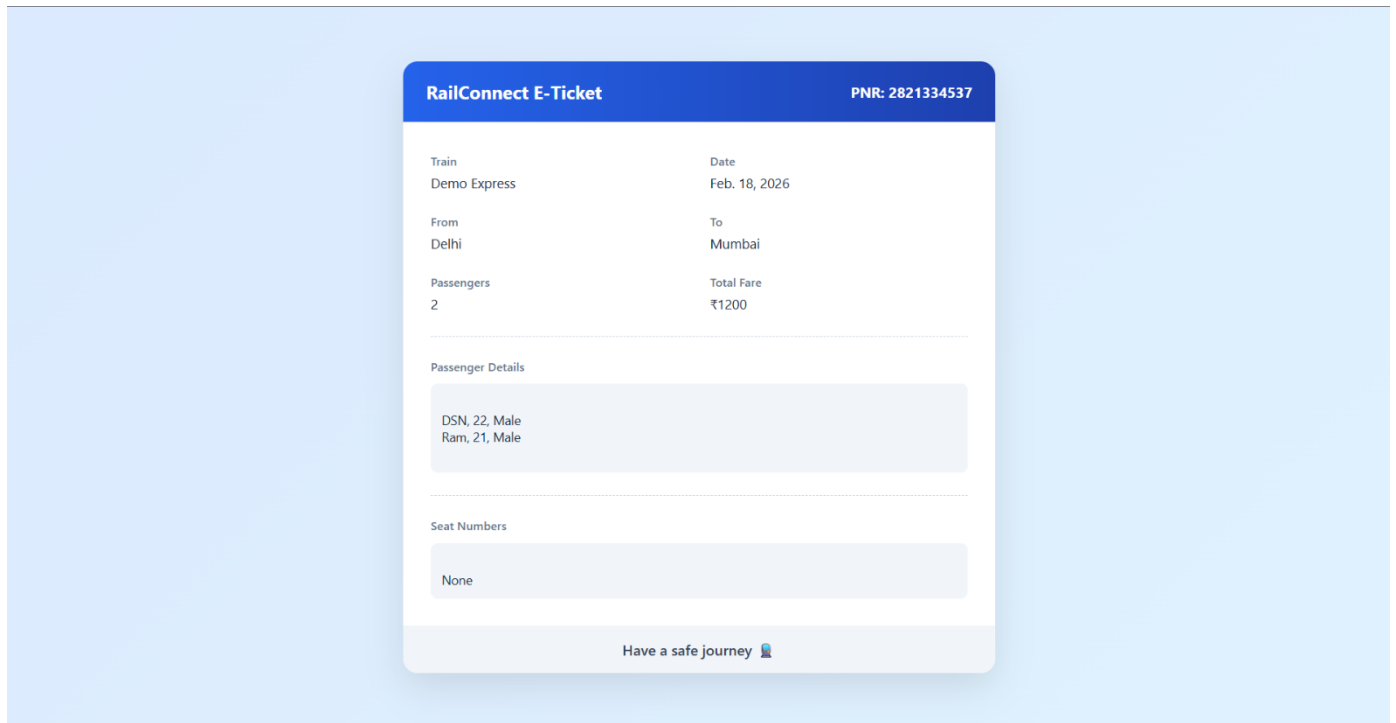
Number of Passengers
2

Passenger 1
Name
Age
Gender

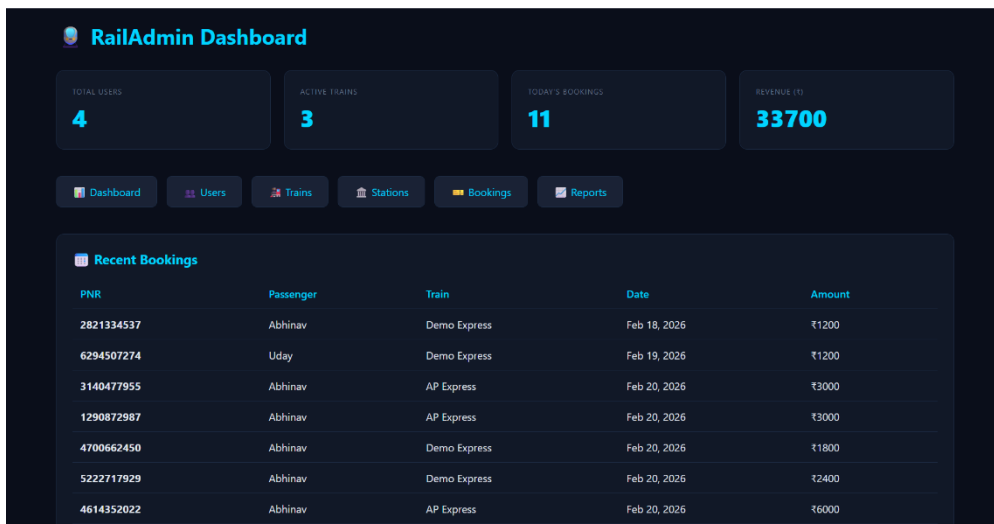
Passenger 2
Name
Age
Gender

Total: ₹3000

5) Ticket



6) Admin Panel



Booking Management

Back to Dashboard

Search by PNR or username...

Search

PNR	Passenger	Train	Route	Travel Date	Seats	Amount	Status
5938376897	Sashank	Humsafar	Guntur → Hyderabad	Feb 21, 2026	2	₹2000	Confirmed
4702063075	Sashank	Humsafar	Guntur → Hyderabad	Feb 20, 2026	2	₹2000	Confirmed
4567957138	Pavan	AP Express	Jalandhar → Proddatur	Feb 20, 2026	1	₹1500	Confirmed
8277597167	Pavan	AP Express	Jalandhar → Proddatur	Feb 20, 2026	1	₹1500	Confirmed
7362751122	Pavan	AP Express	Jalandhar → Proddatur	Feb 20, 2026	1	₹1500	Confirmed
4842064221	Abhinav	Demo Express	Delhi → Mumbai	Feb 20, 2026	1	₹600	Confirmed
6010020512	Abhinav	AP Express	Jalandhar → Proddatur	Feb 20, 2026	4	₹6000	Confirmed
4614352022	Abhinav	AP Express	Jalandhar → Proddatur	Feb 20, 2026	4	₹6000	Confirmed
5222717929	Abhinav	Demo Express	Delhi → Mumbai	Feb 20, 2026	4	₹2400	Confirmed
4700662450	Abhinav	Demo Express	Delhi → Mumbai	Feb 20, 2026	3	₹1800	Confirmed

Train Management

Back to Dashboard

Add Train

Search Train

Train No.	Name	Source	Destination	Time	Seats	Status
20001	Demo Express				48 / 60	On Time
100452	AP Express				15 / 30	On Time
120874	Humsafar	Guntur → Hyderabad		10:00 - 22:30	46 / 50	On Time

Add New Train

Train Number

Source

--|--

Total Seats

Train Name

Destination

--|--

Price

Add Train

Cancel

All Status

Filter

Reports & Analytics

Back to Dashboard

TOTAL BOOKINGS

14

TOTAL REVENUE (₹)

33700

Top Routes

#	Route	Bookings
1	Jalandhar → Proddatur	7
2	Delhi → Mumbai	5
3	Guntur → Hyderabad	2

7) Email

