

# **REAL-TIME ANALYTICS DASHBOARD**

**A PROJECT REPORT**

*Submitted by*

**ANVESHA**

*In partial fulfilment for the award of the degree of*

**BACHELOR OF ENGINEERING**

**in**

**COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL  
INTELLIGENCE & MACHINE LEARNING)**



**ChandigarhUniversity**

**NOVEMBER 2025**



## BONAFIDE CERTIFICATE

This is to certify that the project report entitled "**“WHEELSPEAK – CAR RENTAL MANAGEMENT SYSTEM”**" is the bonafide work of **Ms. Anvesha Rathee (UID: 23BAI70081)**, who has successfully carried out the project work during the **5th Semester of the Bachelor of Engineering in Computer Science and Engineering (Artificial Intelligence and Machine Learning)** at **Apex Institute of Technology, Chandigarh University, Gharuan, Mohali, Punjab**, under my supervision and guidance.

This project report has been submitted in partial fulfillment of the requirements for the award of the degree of **Bachelor of Engineering in Computer Science and Engineering (AIML)** to **Chandigarh University**.

**INTERNAL EXAMINER**

**EXTERNAL EXAMINER**

Signature: \_\_\_\_\_

Signature: \_\_\_\_\_

# **WHEELSPEAK – AN INTELLIGENT CAR RENTAL MANAGEMENT SYSTEM WITH ROLE-BASED ACCESS AND REAL-TIME BOOKING FUNCTIONALITY**

## **Abstract**

The **Wheelspeak – Car Rental Management System** is a comprehensive web-based application developed to automate and streamline the traditional process of renting cars. The system bridges the gap between customers seeking reliable transportation and administrators managing car rental operations. Designed for scalability, efficiency, and user convenience, the platform allows seamless interaction between both user groups through a unified and intuitive interface.

The project focuses on two primary modules — **Admin Panel** and **User Panel** — each offering specialized functionalities based on their respective roles.

- The **Admin Panel** empowers administrators to manage the car fleet, monitor active rentals, track earnings, view customer transactions, add or remove vehicles, and handle booking requests in real time.
- The **User Panel** allows customers to explore available cars, filter based on preferences such as location, car type, and price, and make secure bookings through an integrated payment system.

Built using modern web technologies, **Wheelspeak** ensures secure authentication through login/signup functionality, enabling users to register and access their personalized dashboard. The system incorporates features such as **real-time car tracking, messaging for customer-admin communication, transaction records, and booking management**, all within a user-friendly interface.

The project enhances user experience through responsive design and role-based navigation, ensuring that admins and users access only relevant features. For example, the **Dashboard** is accessible exclusively to admins, displaying total bookings, income summaries, and current rentals, whereas general users can access the **Bookings, Transactions, Messages, Help, and Settings** sections.

Wheelspeak also addresses several real-world challenges in the rental ecosystem such as inefficient manual bookings, poor record-keeping, and lack of transparency in transactions. By digitalizing the entire process, the system improves operational efficiency, minimizes human error, and ensures accountability.

The platform uses **a centralized database** to store and manage essential information such as user details, car inventory, booking records, payments, and communication history. It also supports **real-time data updates**, ensuring that cars once booked become unavailable for other users until returned.

This project not only demonstrates the implementation of full-stack web development principles but also reflects the integration of **Artificial Intelligence and Machine Learning concepts** (as per the AIML program) for potential future scalability—such as demand-based pricing, predictive analytics for fleet usage, and smart recommendations for users.

## **Modules of the System**

### **A. Admin Module**

The Admin Panel provides full control and monitoring capabilities. Admins can:

- Add, update, or delete car details.
- Manage bookings, returns, and customer information.
- Track total income and transactions.
- View the current status of all cars (rented/available).
- Access analytics and summary reports on rentals and revenue.
- Approve or cancel booking requests.
- Add new cars using a detailed input form (car name, model, type, price, fuel, transmission, location, image).
- Track car locations via map integration.
- View and manage all transactions made through the platform.

### **B. User Module**

The User Panel provides a seamless booking experience and enables customers to:

- Create accounts and log in securely.
- Browse all available cars.
- Filter cars based on **price, type, fuel type, transmission, and location**.
- Book cars instantly and make online payments.
- View current and past bookings.
- Check transaction history with dates and amounts.
- Send and receive messages directly with the admin for support.
- Manage profiles, access help, and update personal details through settings.

### **3. Key Features**

The Wheelspeak platform integrates several advanced and user-oriented features to improve performance and usability:

- **Role-Based Access Control:** Separate admin and user functionalities.
- **Secure Login/Signup:** Ensures privacy and authentication for each user.
- **Real-Time Booking:** Cars automatically update their availability status after booking.
- **Dynamic Dashboard:** Provides instant data on bookings, revenue, and fleet status.
- **Car Management System:** Admin can add or remove cars, set prices, and modify availability.
- **Transaction Management:** Detailed records of payments and earnings.
- **Messaging System:** Built-in chat system for communication between users and admins.
- **Search & Filter Options:** Easy filtering by car category, fuel, price, or city.
- **Help & Settings:** Includes FAQs, contact support, and account management.
- **Responsive UI:** Works efficiently on desktops, tablets, and mobile devices.
- **Scalability:** Architecture supports future features like AI, ML, and IoT integration.

### **4. Objectives of the Project**

The main objective of **Wheelspeak** is to create a **digital car rental ecosystem** that minimizes manual intervention and enhances transparency.

- To automate car rental operations.
- To allow users to book and pay online from any location.
- To manage car inventory efficiently.
- To maintain secure records of users, bookings, and payments.
- To provide real-time updates and analytics for administrators.
- To improve customer experience through communication and instant booking confirmation.
- To ensure system scalability for future enhancements like AI-based features.

## 5. Technical Description

### Frontend Technologies:

- **React.js / Next.js** – for building interactive user interfaces.
- **Tailwind CSS** – for responsive and modern design.

### Backend Technologies:

- **Node.js with Express.js** – for handling business logic and server requests.

### Database:

- **MongoDB or MySQL** – for storing user, car, booking, and transaction data.

### Authentication:

- **JWT (JSON Web Token)** – for secure role-based authentication.

### APIs and Integration:

- **Google Maps API** – for real-time car location tracking.
- **Payment Gateway API** – for secure and smooth online transactions.

### Hosting and Deployment:

- **Vercel / AWS** – for scalable and fast hosting of the web application.
- **Git & GitHub** – for version control and collaborative development

## HARDWARE AND SOFTWARE REQUIREMENTS

The development of the **Wheelspeak – Car Rental Management System** requires a combination of appropriate hardware and software resources to ensure efficient performance, reliability, and scalability. The specifications below outline the minimum and recommended requirements for both developers and end users.

### 1. Hardware Requirements

#### A. For Development System (Admin / Developer Side)

- **Processor (CPU):** Minimum Intel Core i3 (7th Gen) or AMD equivalent; Recommended Intel Core i5/i7 (10th Gen or higher)
- **RAM:** Minimum 4 GB; Recommended 8–16 GB
- **Storage:** Minimum 250 GB HDD; Recommended 512 GB SSD or higher
- **Display:** Minimum 1366 × 768 resolution; Recommended 1920 × 1080 (Full HD)
- **Network:** Stable internet connection (minimum 5 Mbps); Broadband/Wi-Fi (20+ Mbps recommended)
- **Graphics:** Integrated GPU (Dedicated GPU optional)
- **Input Devices:** Keyboard, Mouse (Headset optional for communication)

#### B. For End Users (Customers / Admin Access)

- **Device:** Smartphone, Laptop, or Desktop
- **Browser:** Google Chrome, Microsoft Edge, or Mozilla Firefox (latest version)
- **Internet Speed:** Minimum 2 Mbps
- **Screen Resolution:** 1024 × 768 or higher

### 2. Software Requirements

#### A. Development Software Stack

- **Operating System:** Windows 10 / 11, Ubuntu 22.04, or macOS

- **Frontend Framework:** React.js / Next.js
- **Styling Framework:** Tailwind CSS
- **Backend Framework:** Node.js with Express.js
- **Database:** MongoDB or MySQL
- **Authentication:** JSON Web Token (JWT) / Firebase Auth
- **Version Control:** Git and GitHub
- **API Integrations:** Google Maps API, Payment Gateway API
- **Hosting Platform:** Vercel / AWS / Render
- **IDE / Code Editor:** Visual Studio Code
- **Browser for Testing:** Google Chrome / Mozilla Firefox
- **Package Manager:** npm (Node Package Manager)

## B. Software Libraries and Dependencies

- React Router DOM – for navigation and routing
- Axios / Fetch API – for API communication
- Mongoose / Sequelize – for database operations
- bcrypt.js – for password hashing
- JSON Web Token (jsonwebtoken) – for authentication
- Express Validator – for data validation
- Nodemon – for automatic server restarts during development
- Dotenv – for managing environment variables
- CORS – for handling cross-origin requests
- Framer Motion (optional) – for animations and transitions

## 3. Additional Tools and Utilities

- Postman – for testing APIs
- Canva / Figma – for UI/UX design mockups
- MongoDB Compass / MySQL Workbench – for database visualization
- Google Cloud Console / Firebase – for hosting and database integration
- Slack / Discord / Notion – for project communication and coordination

## 4. Deployment Environment

- **Server:** Hosted on Vercel or AWS (supports CI/CD pipeline)
- **Database Hosting:** MongoDB Atlas or AWS RDS for remote data access
- **Domain:** wheelspeak.com (active live deployment)
- **SSL Certificate:** Enabled for HTTPS security

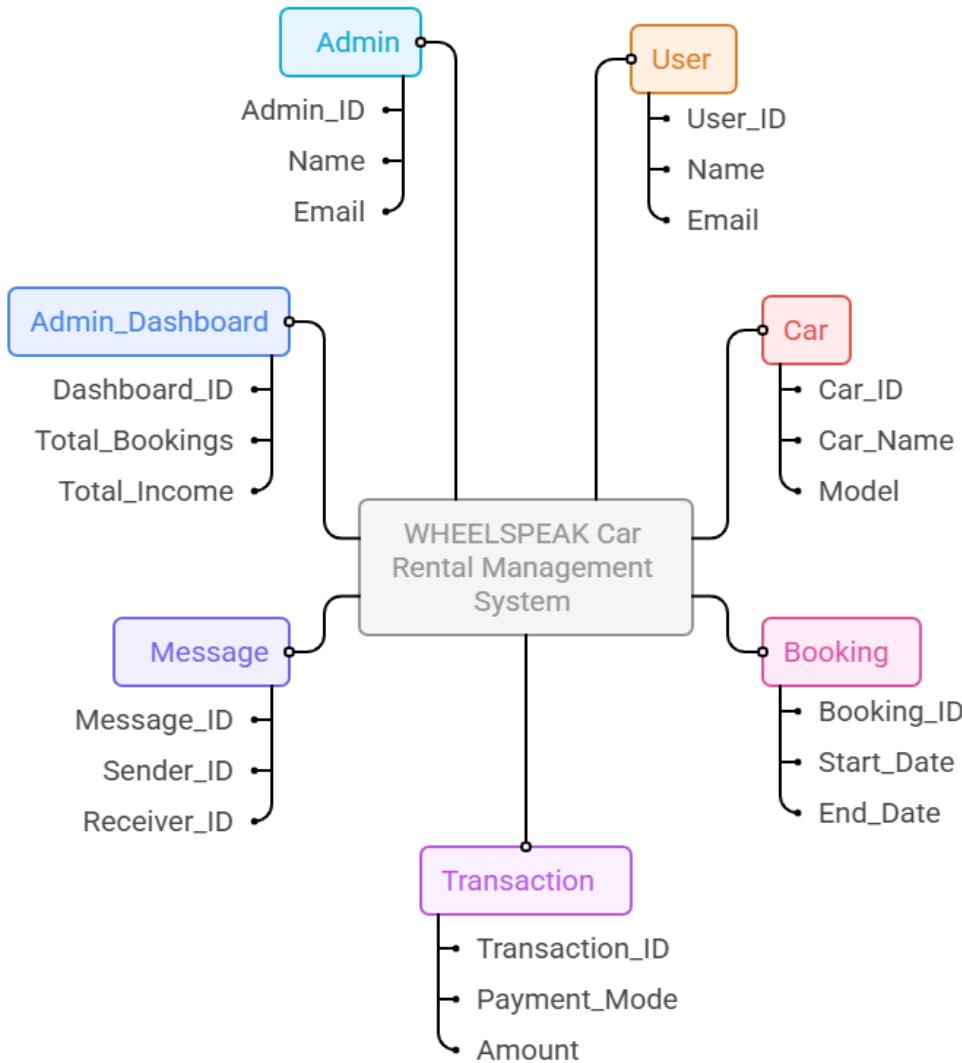
## ER DIAGRAM

The **Entity–Relationship (ER) Diagram** of the **Wheelspeak – Car Rental Management System** represents the logical structure of the database that stores, manages, and organizes all essential data related to users, cars, bookings, payments, and communication within the system.

The system consists of two major user roles — **Admin** and **Customer** — each interacting with multiple entities.

The ER model ensures **data consistency**, **referential integrity**, and **smooth interaction** among all system components.

## WHEELSPEAK Car Rental Management System: ER Diagram



Made with Napkin

## DATABASE SCHEMA

The **database schema** of the **Wheelspeak – Car Rental Management System** defines the logical structure and relationships between various entities in the system.

It ensures efficient data storage, integrity, and quick access to information for all car rental operations including users, bookings, transactions, messages, and cars.

The schema follows a **relational database model**, where each entity is represented as a separate table, linked through primary and foreign keys.

## 1. Table: USERS

Stores details of all registered users (admins and customers).

### Attributes:

- User\_ID – INT (Primary Key, Auto Increment)
- Name – VARCHAR(100)
- Email – VARCHAR(100), UNIQUE
- Password – VARCHAR(255)
- Phone\_Number – VARCHAR(15)
- Role – ENUM('Admin', 'Customer')
- Address – VARCHAR(255)

### Description:

Each record represents a unique user. The Role attribute defines access privileges (Admin or Customer).

## 2. Table: CARS

Stores information about all cars available for rent.

### Attributes:

- Car\_ID – INT (Primary Key, Auto Increment)
- Car\_Name – VARCHAR(100)
- Model – VARCHAR(100)
- Type – VARCHAR(50) (e.g., SUV, Sedan, Hatchback)
- Fuel\_Type – VARCHAR(50)
- Transmission – VARCHAR(50) (Manual / Automatic)
- Price\_Per\_Day – DECIMAL(10,2)

- Availability\_Status – ENUM('Available', 'Booked', 'Unavailable')
- Location – VARCHAR(100)
- Image\_URL – VARCHAR(255)

**Description:**

This table maintains the list of all cars, their details, rental cost, and availability.

### 3. Table: BOOKINGS

Stores booking details for each user and car.

**Attributes:**

- Booking\_ID – INT (Primary Key, Auto Increment)
- User\_ID – INT (Foreign Key → USERS.User\_ID)
- Car\_ID – INT (Foreign Key → CARS.Car\_ID)
- Start\_Date – DATE
- End\_Date – DATE
- Total\_Amount – DECIMAL(10,2)
- Booking\_Status – ENUM('Confirmed', 'Completed', 'Cancelled')
- Booking\_Date – DATETIME

**Description:**

Links users and cars through booking records. The status helps track the current state of each booking.

### 4. Table: TRANSACTIONS

Stores all payment-related information.

**Attributes:**

- Transaction\_ID – INT (Primary Key, Auto Increment)

- Booking\_ID – INT (Foreign Key → BOOKINGS.Booking\_ID)
- User\_ID – INT (Foreign Key → USERS.User\_ID)
- Payment\_Mode – VARCHAR(50) (UPI / Card / Net Banking / Wallet)
- Amount – DECIMAL(10,2)
- Transaction\_Date – DATETIME
- Transaction\_Status – ENUM('Success', 'Pending', 'Failed')

**Description:**

Tracks all payments made by users for car bookings. Each booking corresponds to one transaction.

## 5. Table: MESSAGES

Stores chat communication between users and admins.

**Attributes:**

- Message\_ID – INT (Primary Key, Auto Increment)
- Sender\_ID – INT (Foreign Key → USERS.User\_ID)
- Receiver\_ID – INT (Foreign Key → USERS.User\_ID)
- Message\_Text – TEXT
- Timestamp – DATETIME

**Description:**

Used for internal messaging between users (customers) and administrators. Maintains conversation history for support or clarification.

## 6. Table: ADMIN\_DASHBOARD

Stores summarized data for admin monitoring.

**Attributes:**

- Dashboard\_ID – INT (Primary Key, Auto Increment)

- Total\_Bookings – INT
- Total\_Income – DECIMAL(10,2)
- Cars\_Rented – INT
- Pending\_Bookings – INT
- Date\_Updated – DATETIME

**Description:**

Provides analytical data for the admin's dashboard to monitor income, bookings, and system performance.

## 7. Relationships Between Tables

- **USERS → BOOKINGS:** One-to-Many  
(One user can make many bookings.)
- **CARS → BOOKINGS:** One-to-Many  
(One car can be booked by many users at different times.)
- **BOOKINGS → TRANSACTIONS:** One-to-One  
(Each booking has one transaction.)
- **USERS → MESSAGES:** One-to-Many (self-referencing)  
(Users can send multiple messages to each other or admin.)
- **ADMIN → ADMIN\_DASHBOARD:** One-to-One  
(One admin manages one dashboard summary.)

## 8. Database Normalization

The database is designed using **Third Normal Form (3NF)** to eliminate redundancy:

- Each table has a primary key.
- Non-key attributes depend only on the primary key.
- No transitive dependencies exist.
- Data is modular and relationally linked for easy maintenance.

## 9. Example of Table Relationships (Schema Representation)

USERS (User\_ID, Name, Email, Password, Phone\_Number, Role, Address)

↓

BOOKINGS (Booking\_ID, User\_ID, Car\_ID, Start\_Date, End\_Date, Total\_Amount, Booking\_Status)

↓

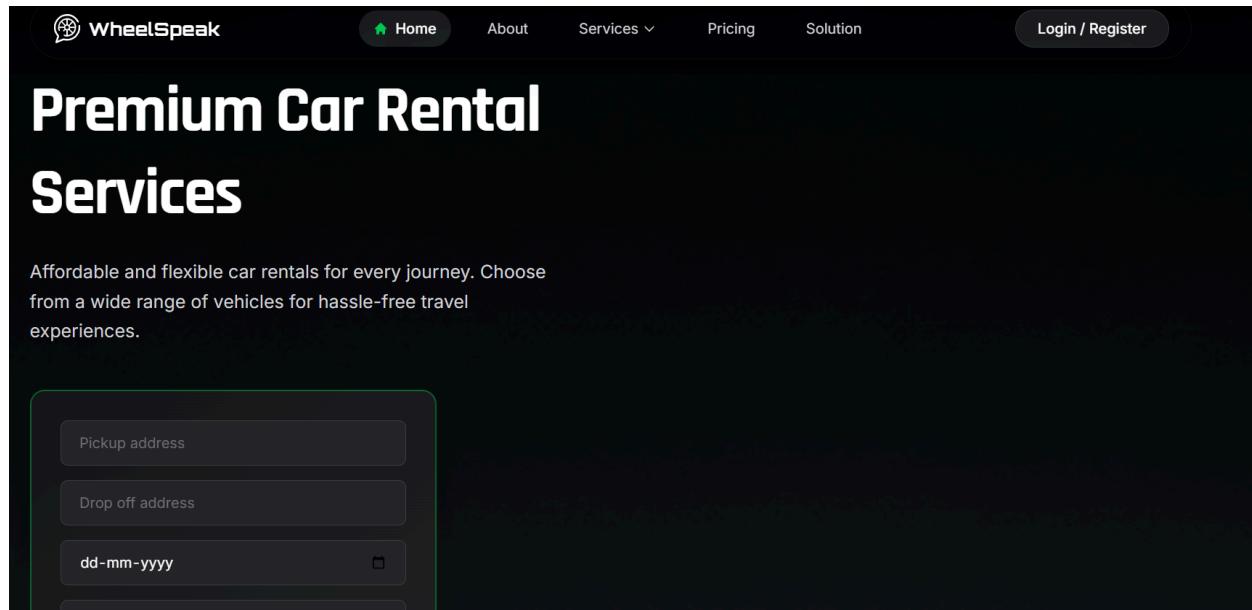
TRANSACTIONS (Transaction\_ID, Booking\_ID, User\_ID, Payment\_Mode, Amount, Transaction\_Date)

CARS (Car\_ID, Car\_Name, Model, Type, Fuel\_Type, Transmission, Price\_Per\_Day, Availability\_Status, Location)

MESSAGES (Message\_ID, Sender\_ID, Receiver\_ID, Message\_Text, Timestamp)

ADMIN\_DASHBOARD (Dashboard\_ID, Total\_Bookings, Total\_Income, Cars\_Rented, Pending\_Bookings)

### Front end screens



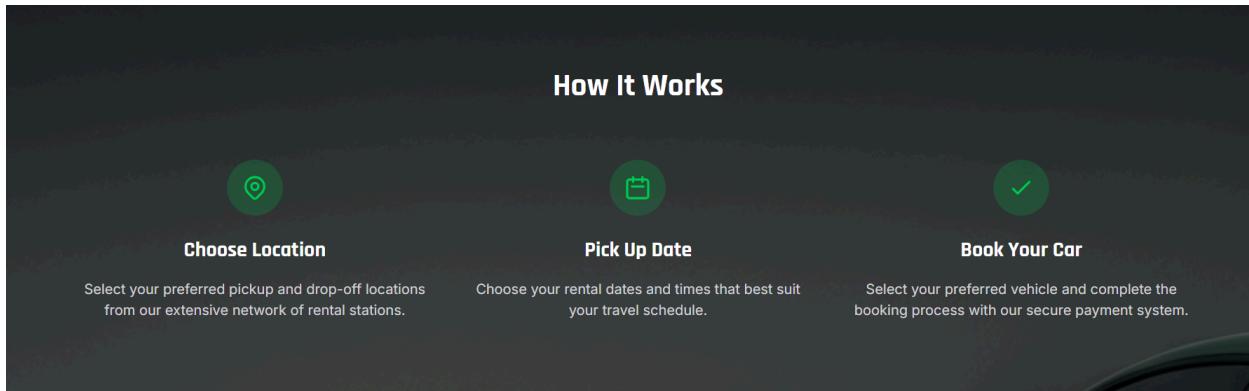
Pickup address

Drop off address

dd-mm-yyyy

--:--

**Search now**



**WheelSpeak**

- Home
- About
- Services
- Pricing
- Solution
- Login / Register

From our extensive network of rental stations.

your travel schedule.

booking process with our secure payment system.

Explore more to get your comfort zone

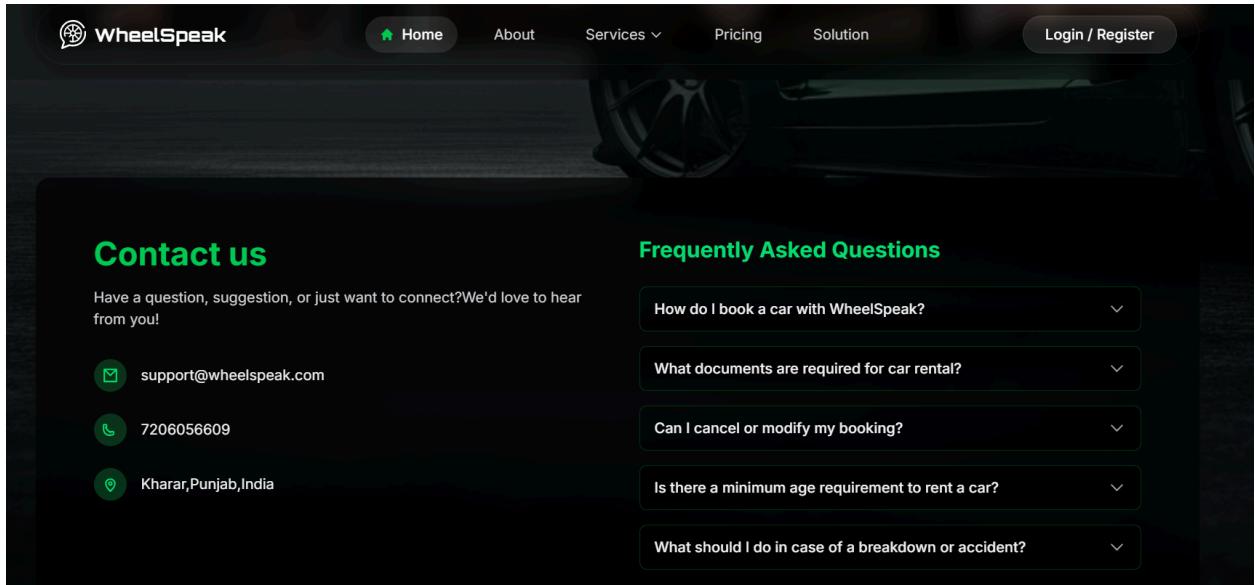
Book your perfect stay with us.

**Booking Now →**

Vehicle Available

**3,490**

**Beyond accommodation,  
creating memories of a  
lifetime**



The screenshot shows the 'Contact us' section of the WheelSpeak website. At the top, there's a navigation bar with links for Home, About, Services, Pricing, Solution, and Login / Register. Below the navigation is a dark banner featuring a car wheel icon. The main content area has a white background. On the left, there's a 'Contact us' section with a sub-section for 'Frequently Asked Questions' containing five expandable questions.

## Contact us

Have a question, suggestion, or just want to connect? We'd love to hear from you!

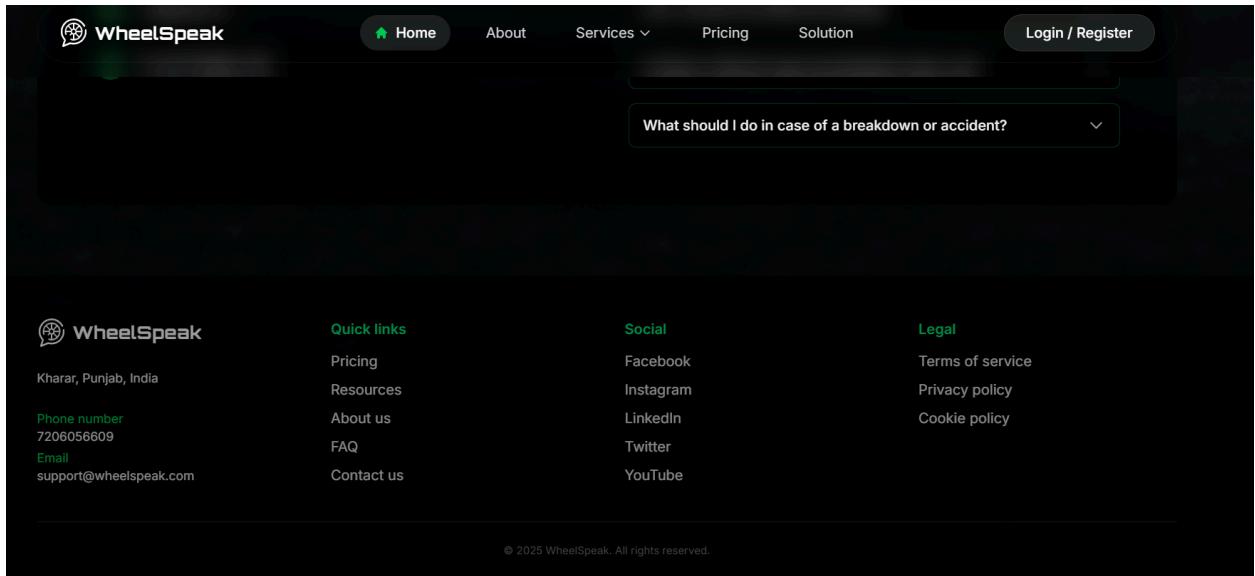
 support@wheelspeak.com

 7206056609

 Kharar, Punjab, India

### Frequently Asked Questions

- How do I book a car with WheelSpeak?
- What documents are required for car rental?
- Can I cancel or modify my booking?
- Is there a minimum age requirement to rent a car?
- What should I do in case of a breakdown or accident?



The screenshot shows the footer section of the WheelSpeak website. It includes the company logo, address, phone number, and email. There are also links for quick navigation, social media, and legal information.

 **WheelSpeak**

Kharar, Punjab, India

Phone number  
7206056609

Email  
support@wheelspeak.com

**Quick links**

- Pricing
- Resources
- About us
- FAQ
- Contact us

**Social**

- Facebook
- Instagram
- LinkedIn
- Twitter
- YouTube

**Legal**

- Terms of service
- Privacy policy
- Cookie policy

© 2025 WheelSpeak. All rights reserved.

# Welcome back

Don't have an account? [Create one now](#)

Email address

john@example.com

Password

.....

Remember me

[Forgot your password?](#)

Sign in

Or continue with



Continue with Google

# Welcome back

Don't have an account? [Create one now](#)

Successfully logged in! Redirecting...

Email address

sumanyas758@gmail.com

Password

.....

Remember me

[Forgot your password?](#)

[Sign in](#)

Or continue with



[Continue with Google](#)

**WheelSpeak**

**Dashboard**

Cars Rented: 0 This Month

Income: ₹0 This Month

Profit: ₹0 vs Last Month

**Add Your Car**  
List your car and start earning

**Live Map**

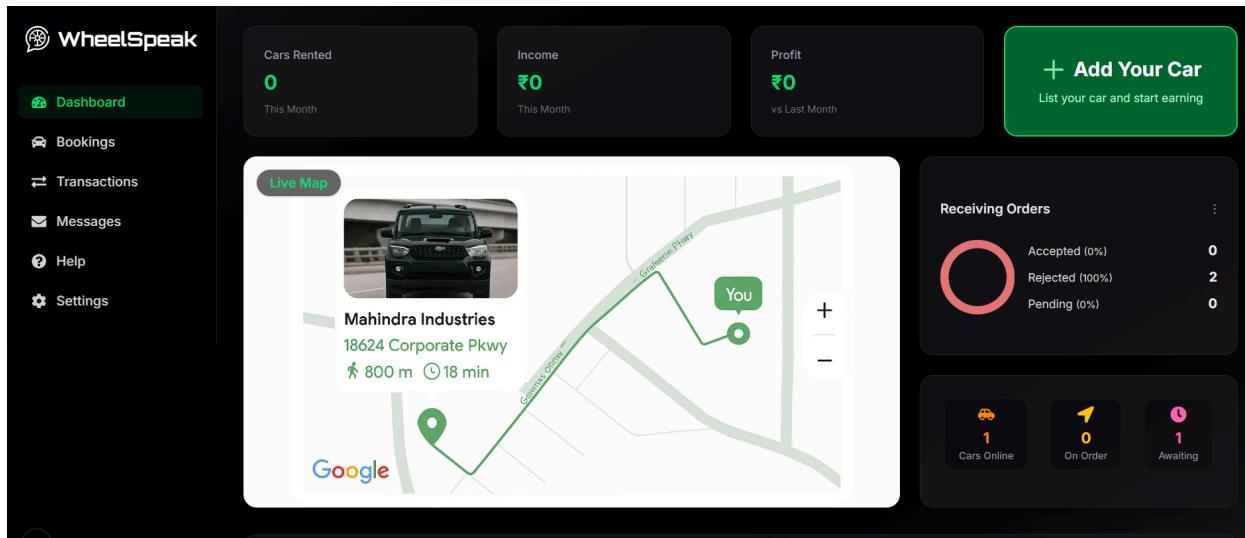
Mahindra Industries  
18624 Corporate Pkwy  
800 m 18 min

Google

**Receiving Orders**

Accepted (0%)	Rejected (100%)	Pending (0%)
0	2	0

**Cars Online:** 1    **On Order:** 0    **Awaiting:** 1



### Add New Car

**Car Name**

**Category**

Economy / Hatchbacks

**Model**

Maruti Suzuki Alto

**Year**

2025

**Color**

Black

**Price per day (₹)**

1000

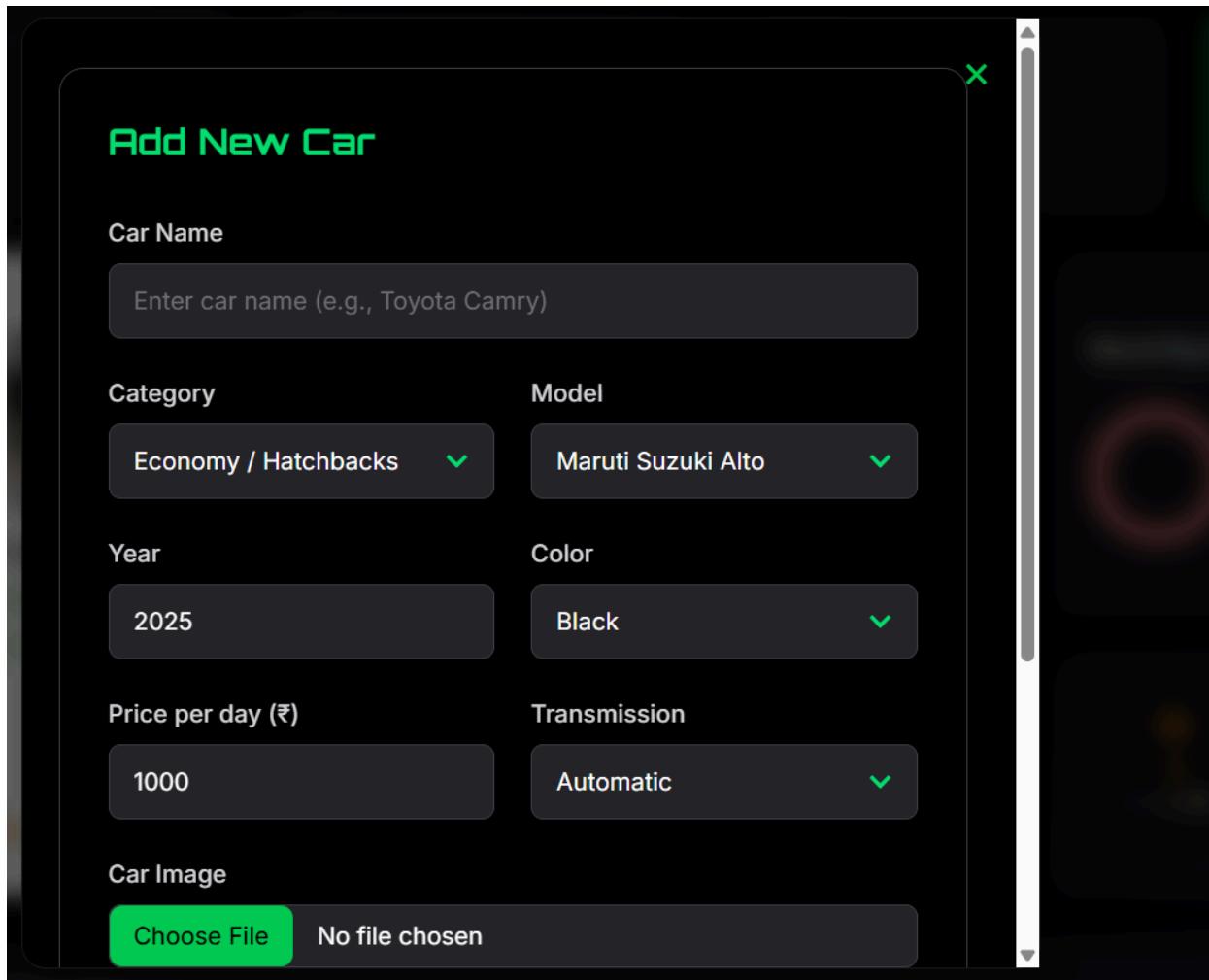
**Transmission**

Automatic

**Car Image**

Choose File

No file chosen



Economy / Hatchbacks 

Maruti Suzuki Alto 

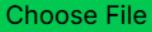
Year  Color 

2025 Black

Price per day (₹) Transmission 

1000 Automatic

Car Image

 Choose File No file chosen

Car Details

Enter car details

 Post Car

### Recent Bookings

Booking Number	Passenger Name	Date	Car Type	Destination	Amount	Status
#1		Jul 26, 2025	Hyundai Grand i10	l;kj	\$2000.00	 Failed
#2		Jul 21, 2025	Hyundai Grand i10	98y	\$2000.00	 Failed

### WheelSpeak Book a Car

**Filters**

**Category:** All categories

**Model:** All models

**Price range per day:** ₹1000

**Rental type:** 12 hours / Per day

**Vehicle Details:**

- jl (2025)**
- Model: lkjn
- Color: mnj
- Price: ₹0
- Status: Booked

**Customer:** ;kjhbgv (2026)

Model: Hyundai Grand i10  
Color: grey  
Price: ₹1,000  
Status: Available

**Book Now**

### WheelSpeak Transactions

**Search by ID, name, car, or location...**

**All Statuses**

TRANSACTION ID	CAR	CUSTOMER	BOOKING DETAILS	PAYMENT INFO	AMOUNT	STATUS
6884afb4745d92f5a28ecd4	[Car Icon]	;kjhbgv	2 days kol 2025-07-26 10:00 - 2025-07-27 10:00	Payment ID: pay_0xf1acYlliniX Order ID: order_0xf1fqfmlI1LSDo	+₹2,000	Rejected
687e3e5dbfb07446ef4e7108	[Car Icon]	;kjhbgv	2 days iou 2025-07-21 10:00 - 2025-07-22 10:00	Payment ID: pay_0vDyadVkm58I Order ID: order_QvjJdd6br7i5VHg	+₹2,000	Rejected

### WheelSpeak Messages

**Search username...**

**Search**

**khush**  
what about you

**anvi**  
nkjj

**hey**  
12:43:18 PM

**how r u**  
12:51:38 PM

**hiooo**  
12:47:14 PM ✓

**i am fine**  
6:30:07 PM ✓

**what about you**  
6:30:13 PM ✓

**Type your message...**

**Send**



Dashboard

Bookings

Transactions

Messages

Help

Settings

N

## Help & Support

Need help? Report an issue or contact support below.

### Report an Issue

Name

Email

Describe your issue

Submit Issue

### Contact Support

Email: [support@wheelspeak.com](mailto:support@wheelspeak.com)

Phone: [+91 7206056609](tel:+917206056609)

**WheelSpeak**

- Dashboard
- Bookings
- Transactions
- Messages
- Help
- Settings**

**Settings**

Manage your account settings here.

**Profile**

Name

Email

**Update Profile**

**Change Password**

Current Password

New Password

**Change Password**

**Danger Zone**

**Delete Account**

## Limitations

- Limited Real-Time Tracking:**  
The current system does not include full-fledged GPS or IoT-based real-time tracking of vehicles. Car location is updated manually by the admin rather than automatically through live data.
- No AI-Powered Pricing Model:**  
Rental pricing is static and predefined by the admin. The system does not currently adjust prices dynamically based on demand, duration, or season.
- Dependency on Internet Connectivity:**  
The web-based nature of the application means users must have a stable internet connection. Offline access is not supported.

**4. Limited Payment Options:**

The payment integration is basic and may not support all modern gateways such as wallets, EMI, or international cards.

**5. No Mobile Application:**

The platform is optimized for web browsers but lacks a dedicated Android/iOS mobile application for better accessibility.

**6. Single Admin Architecture:**

The system currently allows one primary admin to manage all operations. Multi-admin or sub-admin roles with distributed access control are not yet implemented.

**7. Basic Security Implementation:**

While JWT authentication is in place, advanced security layers such as biometric login, two-factor authentication, and fraud detection are not yet integrated.

**8. Limited Reporting and Analytics:**

The admin dashboard provides basic summaries of bookings and income, but it lacks advanced analytics such as usage trends, customer behavior patterns, and predictive reports.

## Future Scope

Despite the above limitations, the **Wheelspeak** system is built on a scalable architecture that allows easy integration of advanced features and expansion into broader markets.

The following future enhancements can make the platform more intelligent, efficient, and user-centric:

**1. Integration of AI and Machine Learning:**

- Implement AI-based **dynamic pricing** models that adjust rental prices based on factors like demand, car type, and season.
- Use **ML-based recommendation systems** to suggest cars to users based on their preferences and previous bookings.

**2. IoT and GPS Tracking Integration:**

- Incorporate IoT devices in cars for **real-time tracking, mileage monitoring, and fuel consumption analysis**.
- Enable users to view live car locations and route information during rentals.

**3. Mobile Application Development:**

- Develop **Android and iOS apps** for better accessibility, convenience, and push notifications for updates, booking status, and reminders.

**4. Enhanced Payment Gateway Integration:**

- Support multiple digital payment modes including **UPI, Wallets, PayPal, Stripe, and Net Banking** for secure global transactions.
- Add features for **refund management** and **automatic invoice generation**.

## 5. Voice-Based and Multilingual Support:

- Integrate **voice commands** (aligning with your “Wheelspeak” brand concept) for booking and search functions.
- Add **multilingual support** for regional and international users.

## 6. Advanced Security and Authentication:

- Implement **two-factor authentication (2FA)** and **encryption layers** for secure login and data transfer.
- Use **AI-powered fraud detection** for monitoring unusual activity.

## 7. Expanded Role Management:

- Introduce **multi-admin or branch-level admin roles** for managing larger fleets or franchises.
- Add **driver and maintenance modules** for extended business operations.

## 8. Advanced Analytics Dashboard:

- Provide **graphical insights** using charts and dashboards for tracking revenue, car utilization, and customer engagement.
- Integrate **data visualization tools** like Chart.js or Recharts for better performance metrics.

## 9. Cloud-Based Infrastructure:

- Deploy on **cloud servers (AWS / Azure / Google Cloud)** for scalability and performance optimization.
- Enable **real-time database synchronization** and **automatic backups**.

## 10. Subscription and Membership Plans:

- Introduce **subscription-based rentals** for corporate clients or long-term users.
- Offer loyalty programs and discounts for repeat customers.

## References

1. Mozilla Developer Network (MDN). “*HTML, CSS, and JavaScript Documentation.*”  
<https://developer.mozilla.org/>
2. React.js Official Documentation. “*Building User Interfaces with React.*”  
<https://react.dev/>
3. Node.js Official Documentation. “*Node.js API Reference and Guides.*”  
<https://nodejs.org/en/docs/>
4. Express.js Official Documentation. “*Express Web Framework for Node.js.*”  
<https://expressjs.com/>
5. MongoDB Documentation. “*Data Modeling and CRUD Operations.*”  
<https://www.mongodb.com/docs/>
6. Tailwind CSS Documentation. “*Utility-First CSS Framework.*”  
<https://tailwindcss.com/docs>
7. Google Maps API Documentation. “*Integrating Maps and Location Services.*”  
<https://developers.google.com/maps/documentation>
8. JWT.io. “*Introduction to JSON Web Tokens.*”  
<https://jwt.io/introduction>
9. GitHub. “*Version Control and Collaborative Development.*”  
<https://github.com/>
10. Canva / Figma Design Documentation. “*Interface Design and Wireframing Tools.*”  
<https://www.figma.com/> | <https://www.canva.com/>

## Bibliography

1. **E. Balagurusamy.** *Programming in Java*, McGraw Hill Education, 2020.
2. **Korth, Henry F., and Abraham Silberschatz.** *Database System Concepts*, McGraw Hill, 7th Edition, 2019.
3. **Yashavant Kanetkar.** *Let Us C*, BPB Publications, 2021.

4. **Herbert Schildt.** *The Complete Reference: Java*, McGraw Hill, 2018.
5. **Andrew S. Tanenbaum.** *Computer Networks*, Pearson Education, 5th Edition, 2019.
6. **Roger S. Pressman.** *Software Engineering: A Practitioner's Approach*, McGraw Hill Education, 8th Edition, 2020.
7. **Ian Sommerville.** *Software Engineering*, Pearson Education, 10th Edition, 2021.
8. **Ramakrishnan and Gehrke.** *Database Management Systems*, McGraw Hill, 3rd Edition, 2018.
9. **W3Schools.** "Web Development Tutorials for HTML, CSS, JS, Node.js." <https://www.w3schools.com/>
10. **Coursera & YouTube Educational Resources.**  
Courses and tutorials related to full-stack web development, React.js, Node.js, and database design principles (various instructors, 2023–2025).