Trip & Ship – Ride Sharing & Goods Sharing App

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Abstract:
Ride-sharing platforms help improve transportation efficiency, reduce travel costs, and ease traffic congestion, but many existing systems lack strong administrative control, real-time coordination, and secure parcel support. This project presents a Ride Share system that integrates a software-driven web platform with limited hardware support to enable live tracking and secure parcel handling. The system supports three users—Admin, Driver, and Passenger—where the Admin manages driver approvals, users, and system monitoring through a web dashboard; Drivers register, publish ride details, accept requests, and maintain trip history via a mobile interface; and Passengers search routes, book rides or parcels, make demo online payments, and track trips in real time. GPS technology enables live location tracking, while RFID tagging ensures secure parcel verification and correct delivery. Automated email notifications, real-time status updates, and trip history management further enhance communication and transparency, making the system reliable, secure, and efficient for modern transportation management.

Key Words: Ride Sharing System, Web-Based Platform, GPS Live Tracking, RFID-Based Parcel Security, Admin Dashboard, Mobile Application, Real-Time Monitoring, Online Booking System, Smart Transportation, Software-Hardware Integrated System.

I. INTRODUCTION

Transportation plays a vital role in everyday life by supporting personal mobility, economic activity, and urban development. With rapid urbanization and the growing number of private vehicles, challenges such as traffic congestion, increased fuel consumption, environmental pollution, and rising travel costs have become more severe. Ride sharing has emerged as an effective solution to these issues by enabling multiple passengers to share a single vehicle, thereby improving vehicle utilization, reducing expenses, and lowering environmental impact. Alongside passenger transportation, the demand for fast and flexible parcel delivery has also increased, creating a need for platforms that can efficiently support both ride booking and small parcel transportation in an organized manner.

Traditional ride-sharing and transport coordination methods are often manual or semi-digital, relying on phone calls, informal messaging, or basic applications with limited control and transparency. Many existing platforms primarily focus on ride booking while offering limited administrative oversight, weak parcel security mechanisms, and insufficient real-time coordination between drivers and passengers. Problems such as unverified drivers, lack of structured trip history, delayed status updates, and insecure parcel handling negatively affect user trust and overall system reliability.

With advancements in web technologies, mobile platforms, and real-time communication systems, it is now possible to develop more reliable, interactive, and well-controlled ride-sharing solutions. Web- based dashboards allow centralized management and monitoring, mobile applications provide convenient access for users on the move, and hardware support such as GPS enables continuous live vehicle tracking. Additionally, identification technologies like RFID can significantly enhance parcel security by ensuring that packages are accurately matched to their assigned trips and destinations.

This project presents the design and implementation of a Ride Share system that integrates a software- driven web platform with GPS-based live tracking and RFID-supported parcel verification. The system is structured around three primary users: Admin, Driver, and Passenger. It aims to provide organized ride management, secure parcel booking, real-time trip monitoring, and transparent communication through automated notifications and detailed history records. By combining strong backend control with real-time hardware inputs, the proposed system seeks to improve ride coordination, enhance parcel safety, and support a reliable and user-friendly transportation ecosystem.

II. LITERATURE SURVEY

The paper *“Joint Ride-Sharing and Parcel Delivery Strategy”* published in IEEE Transactions on Intelligent Transportation Systems presents a unified transportation framework where passenger rides and parcel deliveries are managed together. The authors propose a mathematical model for real- time vehicle coordination, showing how centralized control and live data improve transportation efficiency. However, the work remains largely theoretical and optimization-focused, with limited emphasis on user-centric system design or real- world application development.

The study *“Intelligent Carpool Routing Using GPS Trajectories”* focuses on improving ride-sharing efficiency by analyzing historical GPS trajectory data. By identifying frequently shared routes, the system enhances ride matching and routing decisions. While it highlights the importance of GPS data, the research primarily concentrates on routing intelligence rather than complete application-level implementation.
Another IEEE paper, *“Real-Time Operation of High- Capacity Ride-Sharing Fleets,”* examines centralized fleet coordination, live monitoring, and dynamic vehicle management. It emphasizes continuous data flow and real-time supervision in large-scale ride- sharing systems. Although valuable for fleet operations, it does not address parcel transportation or role-based user platforms.

The IEEE INFOCOM paper *“PPtaxi: Non-Stop Package Delivery via Multi-Hop Ridesharing”* introduces a framework where ride-sharing vehicles deliver parcels through multiple handovers. The study demonstrates the feasibility of using ride- sharing networks for parcel logistics. However, its focus remains on scheduling and routing strategies rather than application design or user interaction models.
Similarly, *“Non-Stop / Last-Mile Parcel Delivery Through Intelligent Trip Sharing”* explores integrating parcel delivery into ride-sharing by assigning packages based on drivers’ planned routes. The research evaluates feasibility, timing constraints, and incentive mechanisms, proving efficiency, but remains largely analytical and simulation-driven.

The Elsevier paper *“Integrating Parcel Deliveries into a Ride-Pooling Service”* presents an agent-based simulation of a joint passenger–parcel system. The authors analyze system performance and delivery impact, supporting operational feasibility. However, the study emphasizes performance evaluation over secure parcel verification or application-level architecture.

The paper *“A Uniform Parcel Delivery System Based on IoT”* proposes an IoT-driven parcel management framework using sensors and RFID technology. It highlights how RFID improves parcel identification, monitoring, and delivery verification, supporting its use as a reliable security mechanism. However, the system is designed mainly for logistics and warehouse environments and is not integrated with ride-sharing platforms.
The study *“Vehicle-Oriented Ride Sharing Package Delivery System”* (ScienceDirect, 2024) explores secure package transportation using ride-sharing vehicles, with an emphasis on transaction handling and package association. While it contributes to parcel security concepts, it does not address real- time GPS-based tracking dashboards or multi-user application environments.
Finally, research such as *“Multi-Modal TinyML for Livestock and Mobility Monitoring”* and *“Deep Learning-Based Activity and Transport Monitoring Systems”* emphasizes lightweight real-time monitoring and continuous data pipelines. Although applied to different domains, these studies reinforce the importance of efficient real-time data processing relevant to GPS-based tracking platforms.

Review Findings and Identified Research Gap

The reviewed literature highlights extensive research on ride-sharing systems, parcel delivery integration, and real-time transportation monitoring. Existing studies primarily focus on optimization models, routing strategies, and fleet-level coordination to improve operational efficiency. Several works demonstrate the effectiveness of GPS-based trajectory analysis for ride matching and real-time monitoring, while IoT-based systems and RFID technologies are shown to enhance parcel identification and delivery verification. Collectively, these studies establish the feasibility and benefits of integrating passenger transportation with parcel delivery using real-time data and identification technologies.

However, most existing works remain theoretical, simulation-based, or limited to specific components such as routing, scheduling, or logistics verification. There is a lack of practical, end-to-end implementations that combine role-based administrative control, driver and passenger applications, real-time GPS tracking, and RFID- supported parcel security within a single unified platform. This gap between conceptual research and deployable systems motivates the development of the proposed Ride Share system, which aims to bridge this divide through an integrated software– hardware solution.

III. THEORETICAL BACKGROUND

A. Multi-User Ride Sharing Platform Architecture

At the core of the system is a multi-user software architecture that supports three different roles: Admin, Driver, and Passenger. Each user type interacts with the system through dedicated interfaces and controlled functionalities. The Admin module is responsible for platform management, driver approval, user monitoring, and database control. The Driver module handles ride creation, trip acceptance, live status updates, and trip history. The Passenger module supports ride search, booking, payment, tracking, and history viewing.

This role-based architecture ensures clear separation of responsibilities, improves security, and allows structured control over system operations. Theoretically, this design follows the principles of modular system development, where each module performs specific tasks while communicating through centralized backend services.

B. Real-Time GPS-Based Tracking Framework

Real-time tracking is a fundamental theoretical component of modern ride sharing systems. GPS technology provides continuous latitude and longitude data, allowing the system to monitor vehicle movement dynamically. The tracking framework consists of a data source (GPS), a communication layer (internet/network), and a visualization layer (mobile/web interface).

The backend server receives periodic location updates from the driver's device and stores them in the database. These live coordinates are then transmitted to the passenger interface, enabling realtime trip visualization. This theoretical model supports transparency, improves coordination, and increases user trust by allowing continuous monitoring of trip progress.

C. RFID-Based Parcel Identification and Verification Model

RFID technology is used in the system as a theoretical security mechanism for parcel transportation. Each parcel is associated with a
unique RFID tag number, which is stored in the system at the time of booking. This RFID value acts as a digital identity for the parcel and is linked to the specific trip, driver, and destination.

The verification process ensures that the parcel collected at the source and delivered at the destination matches the registered RFID number. Theoretically, this approach reduces the risk of parcel mismatch, loss, or incorrect delivery. It introduces a lightweight but effective identification layer into the ride sharing workflow, strengthening parcel handling reliability.

D. Backend-Centered Data Processing and Communication Model

The system follows a centralized backend processing model. All user requests, ride details, booking data, GPS coordinates, and parcel information are routed through a central server. This backend performs authentication, data validation, status updates, and communication between different modules.

The database serves as persistent storage for user records, ride information, parcel data, and trip history. Real-time features such as live tracking and notifications are supported through continuous data exchange between devices and the server.

Theoretically, this model ensures data consistency, system scalability, and smooth coordination between hardware inputs and software services.

E. Summary

The theoretical background of the proposed Ride Share system is built on four main concepts: rolebased multi-user system design, real-time GPS tracking, RFID-supported parcel verification, and centralized backend data processing. Together, these principles enable the system to manage rides effectively, ensure parcel security, support real-time monitoring, and provide structured administrative control. This theoretical foundation supports the development of a reliable, scalable, and user- oriented ride sharing platform.

IV. SYSTEM OVERVIEW

The proposed Ride Share system is designed as a software-driven platform supported by limited hardware components to enable real-time tracking and secure parcel handling. The system integrates web and mobile interfaces with a centralized backend server, GPS-based live location services, and RFID supported parcel verification. The overall workflow focuses on efficient ride coordination, secure parcel booking, structured user management, and continuous trip monitoring.

The architecture of the system is organized into multiple functional layers, where each layer performs a specific role and communicates with others through the backend server.

A. User Interaction and Application Layer

This layer consists of three main user modules: Admin, Driver, and Passenger.

The Admin accesses the system via a web-based dashboard to approve drivers, manage users, monitor trips and parcels, and perform CRUD operations. This module ensures platform supervision, data integrity, and controlled system operations.

The Driver uses a mobile-based interface to register, obtain admin approval, manage ride details, accept ride or parcel requests, update trip status, and complete trips. The module also maintains a complete history of the driver's past trips.

The Passenger uses a mobile-based interface to register, log in, view available rides, book seats or parcels, make demo online payments, track live trips, receive trip confirmation through email, and view past trip history. This layer focuses on usability, accessibility, and real-time interaction.

B. Backend Server and Data Management Layer

The backend server acts as the central control unit of the system. It handles all user requests, authentication processes, ride coordination, booking workflows, and parcel data management. All data from the admin panel, driver interface, and passenger interface is processed through this server.

The database

connected to the backend stores user profiles, driver verification records, ride details, booking information, parcel data including RFID numbers, GPS coordinates, and trip history. This centralized data management enables structured storage, fast retrieval, and long-term record maintenance.

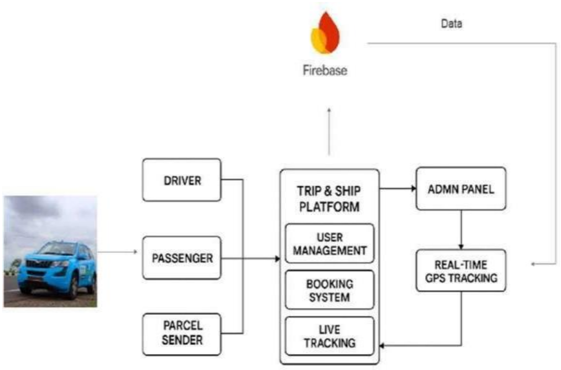

Fig. 1 - System Architecture

C. GPS-Based Live Tracking Module
The GPS module provides real-time latitude and longitude values from the driver's device. These location updates are periodically transmitted to the backend server, where they are processed and forwarded to the passenger interface. This enables live visualization of the driver's movement throughout the trip.
The tracking module improves transparency, enhances coordination between users, and supports continuous monitoring of trip progress. It forms the real-time operational core of the system.

D. RFID-Based Parcel Verification Module
The RFID module is integrated as a security feature for parcel booking. Each parcel is associated with a unique RFID tag number at the time of booking. This RFID data is stored in the backend and linked to the specific trip and destination.
During parcel pickup and delivery, the RFID number is used to verify that the correct parcel is assigned to the correct ride and destination. This module reduces the risk of parcel mismatch, loss, and incorrect delivery, thereby improving system reliability.

E. Notification and Monitoring Services
The system also includes automated services such as email notifications, trip status updates, and history logging. When a driver accepts a trip, important details such as driver name, vehicle information, and estimated arrival time are shared with the passenger through email. The system continuously updates ride and parcel status and maintains logs for monitoring and reference.

Summary
The proposed system integrates multi-user software modules with real-time GPS tracking and RFID based parcel verification into a unified architecture. The combination of centralized backend management, live tracking, secure parcel identification, and structured user interfaces enables the platform to provide reliable ride coordination, transparent monitoring, and secure parcel transportation.

Implementation Environment
The system is built using a modern and scalable technology stack:

- Frontend: HTML, CSS, and Bootstrap are used to design responsive web and mobile-view interfaces for Admin, Driver, and Passenger modules.
- Backend: Python based Django framework is used to manage server side logic, authentication, ride coordination, and APIs.
- Database: Firebase is used to store user data, trip details, GPS locations, parcel records, and trip history.
- GPS Technology: GPS services are used to fetch real-time latitude and longitude values for live vehicle tracking.
- RFID Technology: RFID tags are used to verify parcels and ensure correct parcel-to destination matching.
- Communication: HTTP and email services are used for secure data transmission and automated notifications.
- Development Tools: VS Code/Android Studio and are used for development, testing, and version control.

This combination ensures strong performance, easy scalability, and smooth integration for future system expansion.

V. METHODOLOGY
The process begins with the Admin Dashboard, where the admin controls the platform by approving drivers, managing users, and monitoring ongoing trips. This step ensures that only verified drivers are allowed to operate within the system and that overall system activity remains supervised.
Once approved, the Driver accesses the system through the driver application. The driver can add ride details such as source, destination, time, and available seats, and can accept ride or parcel requests sent by the system. All driver actions are communicated to the backend server, which stores ride information and manages coordination between different users.

At the same time, the Passenger books rides or parcels through the mobile interface. Booking requests are handled by the backend server and forwarded to available drivers. When a parcel is booked, the details are passed to the Ride Booking and Parcel Module, where parcel information and the associated RFID number are stored. During parcel pickup, the RFID tag is scanned and verified to ensure that the parcel is correctly matched with the assigned trip and destination.

During an active trip, the GPS Live Tracking module continuously collects latitude and longitude values from the driver's device and sends them to the backend server. The server processes these updates and shares live location data with the passenger interface, enabling real-time tracking of the vehicle.

After reaching the destination, the driver ends the trip using the application. The backend server then updates trip records, stores journey history, and triggers the notification services. Trip completion details, confirmations, and logs are maintained in the system, and email or in-app notifications are sent to the users.
Overall, the diagram shows a structured flow where user actions, backend processing, GPS tracking, and RFID-based parcel verification are integrated into a unified methodology. This ensures secure ride management, continuous monitoring, and reliable parcel handling throughout the system lifecycle

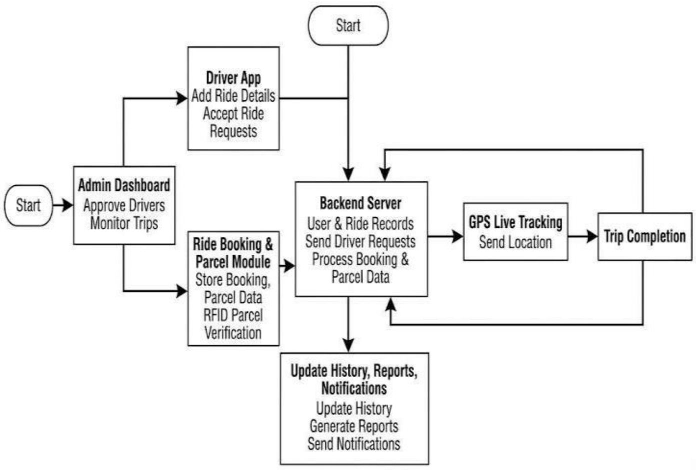

Fig. 2 - Methodology Diagram

VI. MATHEMATICAL MODEL OF THE SYSTEM

The mathematical model defines the functional structure of the Ride Share system by representing inputs, processes, and outputs involved in ride booking, live tracking, and parcel verification.

1. System Representation

The complete system S can be represented as:
$S = \{I, F, O\}$

- S = Ride Share System
- I = Input set
- P = Process set
- O = Output set

2. Input Set

The input set consists of all data provided to the system by users and hardware components.
I = {Ud, Up, Rd, B, G, Rf}

where:
Ud = Driver data (registration, approval details) Up= Passenger data (registration, booking details) Rd= Ride details (source, destination, time, seats) B = Booking and payment information
G = GPS coordinates (latitude, longitude)

Rf = RFID tag number (parcel identification)

3. Process Set (P)
The process set defines all major system operations:
$P = \{P1, P2, P3, P4, P5, P6\}$

P1 = User authentication and admin approval
P2 = Ride creation and availability management
P3 = Ride and parcel booking process
P4 = RFID parcel verification
P5 = Real-time GPS tracking and location updates P6 = Trip completion, history update, and notification

4. Functional Mapping
1. Authentication and Approval: P1(Ud, Up) → Verified users
2. Ride Creation:
P2(Rd) → Available rides
3. Booking:
P3(Up, Rd, B) → Confirmed trip
4. Parcel Verification:
P4(Rf) → Valid / Invalid parcel status
5. Live Tracking: P5(G, t) → L(t)
Where L(t) represents live location at time t
6. Trip Completion:
P6(Trip data) → History + Notifications

5. Output Set (O)
The output set consists of system-generated results: O = {Ct, Lt, H, N, Ps} Where:
Ct = Confirmed trip details
Lt = Live tracking information H = Trip history records
N = Notifications and email alerts
Ps = Parcel status and verification result

VII. RESULTS AND DISCUSSION

A. Observed Results

The *driver and passenger registration modules* successfully created and stored user profiles, ensuring role-based access to system features.
The *admin login and dashboard interface* effectively controlled driver approval, enabling only verified drivers to publish rides.
Ride and parcel booking requests submitted from the *home page* were reflected on the *driver interface* with minimal delay.
The *GPS live tracking module* provided continuous location updates, allowing passengers to track trips in real time.
The *RFID-based parcel verification* correctly validated parcels during booking and delivery, preventing parcel mismatch.
Automated notifications and trip history updates were generated successfully after trip completion.

B. Performance Metrics

The evaluation focused on system-level functional performance rather than large-scale optimization. The following metrics were considered:

- **User Registration & Authentication**: Successful registration and login of drivers and passengers through the registration and login interfaces.
- **Booking Response Time**: Time taken for ride or parcel booking requests to be reflected on the driver interface.

- **GPS Update Delay**: Delay between driver location updates and their visualization on the passenger side.
- **RFID Parcel Verification Accuracy**: Correct association of RFID tag numbers with booked parcels.
- **Admin Control Efficiency**: Driver approval and monitoring actions performed via the admin dashboard.

C. Discussion

The results demonstrate that the proposed system successfully integrates *ride booking, real-time tracking, and secure parcel handling* within a unified platform. The role-based interfaces improved system organization and operational control, while GPS tracking enhanced transparency during trips. RFID integration added a reliable security layer for parcel transportation.

While the system performed efficiently under limited test conditions, scalability under high user load and large geographic deployment remains an area for future evaluation. Overall, the results validate the feasibility and practicality of the proposed ride-sharing and parcel-sharing system.

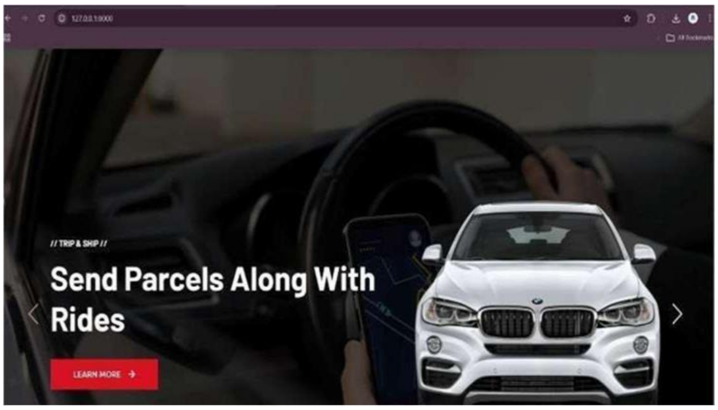

Fig.3 – Home Page

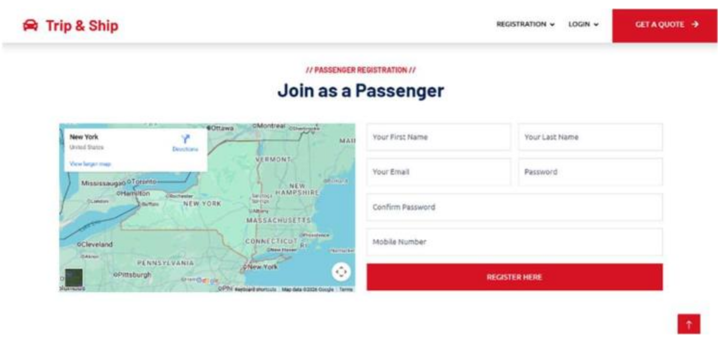

Fig.4 - Driver and passenger registration interface

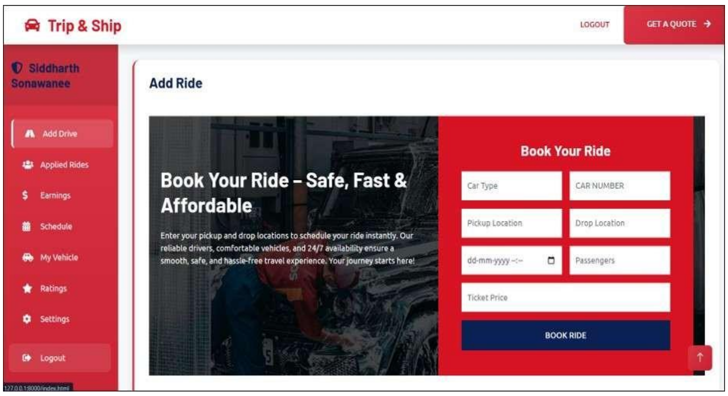

Fig.5 – Driver Interface for Creating Trip

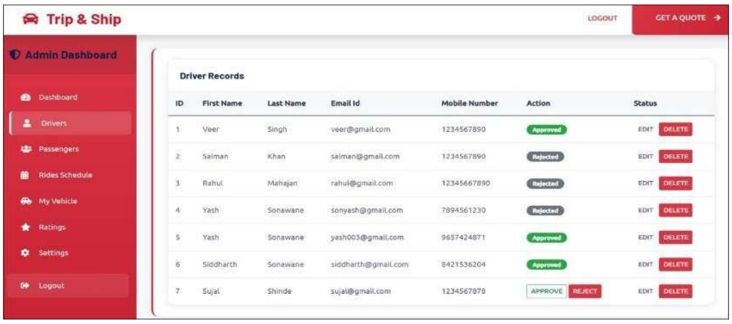

Fig. 6. Admin dashboard

VIII. CONCLUSION AND FUTURE WORK

This project presented the design and implementation of a system that integrates software- based ride management with GPS-based live tracking and RFID-supported parcel verification. The system supports three primary users—Admin, Driver, and Passenger—and offers structured features such as ride booking, real-time trip monitoring, secure parcel handling, and automated notifications. By combining centralized backend control with real-time data acquisition, the proposed platform enhances transparency, coordination, and security in ride-sharing operations. The system demonstrates how a largely software-driven solution, supported by limited hardware components such as GPS and RFID, can effectively improve ride coordination and parcel safety in modern transportation systems. Despite successful implementation, the current system is evaluated on a limited-scale deployment. Performance under high concurrency and large geographic regions remains an area for further investigation.

Future Scope

The proposed system can be significantly enhanced by incorporating intelligent features such as automated route optimization, dynamic pricing strategies, and machine learning–based demand prediction. Future developments may include full-scale mobile application deployment, real-time chat support between users, advanced security mechanisms like biometric authentication, and seamless digital payment gateway integration. Additionally, the platform can be scaled to support smart city transportation services and larger user populations, making it more robust, intelligent, and suitable for real-world commercial deployment.

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