

Scientiarum: A Multidisciplinary Journal
Vol. 2 No. S1 (2026): Supplement Issue
DOI: 10.54646/SAPARS.2026.68

SMART DIGITAL VEHICLE INSURANCE AND CLAIMS PROCESSING PLATFORM WITH INTELLIGENT FRAUD DETECTION

Ms. Monisha N1, Dr. K. Adisesha2

MCA Student1, Professor and Coordinator2 SEA College of Science, Commerce and Arts1,2

KR Puram, Bangalore

monishan888@gmail.com1, adiseshal@rediffmail.com2

Abstract

The vehicle insurance industry faces several challenges in managing policy administration, premium payments, claim processing, document verification, vehicle damage assessment, and fraudulent activities through traditional manual processes. These challenges can result in delays, increased paperwork, human errors, operational costs, and difficulties in identifying suspicious claims. To address these issues, this project proposes an AI-Powered Digital Vehicle Insurance and Claims Processing Platform with Intelligent Fraud Detection, designed to digitize and streamline major vehicle insurance operations through a centralized web-based system. A major feature of the proposed platform is the integration of Generative Artificial Intelligence using the Google Gemini API for AI-assisted vehicle damage assessment. Customers can select an authorized service partner garage and upload an accident or damaged vehicle image. The AI system analyses the image and generates a damage assessment report along with an estimated repair cost range. The platform calculates an average estimated claim amount from the generated range, which can assist during the claim processing workflow.

The Service Partner Garage Management System allows garage owners to register, submit their details for administrator approval, check application status, complete partner fee payment after approval, and become active service partners. The platform is implemented using Python, Flask, HTML, CSS, JavaScript, and SQLite, providing a lightweight and centralized solution for modern vehicle insurance management.

Keywords: Vehicle Insurance, Claims Processing, Artificial Intelligence, Fraud Detection, Google Gemini API, Vehicle Damage Assessment, Service Partner Garage, Repair Cost Estimation, Insurance Automation, Predictive Analytics

Introduction

Vehicle insurance plays an important role in protecting vehicle owners against financial losses resulting from accidents, theft, natural disasters, and other vehicle-related risks. However, conventional insurance processes often depend on manual documentation, physical verification, and communication between customers, insurance administrators, and repair centers. Such processes can increase claim settlement time, paperwork, operational workload, and the possibility of human errors. The development of web technologies and Artificial Intelligence provides opportunities to improve traditional insurance operations. The proposed AI-Powered Digital Vehicle Insurance and Claims Processing Platform with Intelligent Fraud Detection provides a centralized digital environment for managing vehicle registration, insurance policies, premium payments, service partner garages, vehicle damage assessment, claims, documents, and claim tracking.

Problem Statement

Traditional vehicle insurance systems involve several manual activities such as customer registration, policy management, premium payment, document verification, claim submission, and damage estimation. Customers may experience difficulties in accessing insurance information, locating suitable repair centers, submitting claim documents, and

tracking claim progress. Insurance administrators also face challenges in verifying claims and identifying suspicious or duplicate claim submissions. Manual vehicle damage assessment can further increase processing time and may result in inconsistent repair estimates. In addition, there is often limited integration between insurance providers and authorized service partner garages. Therefore, there is a need for a centralized digital platform that can integrate insurance management, premium payments, claims processing, service partner garage management, AI-assisted vehicle damage assessment, and intelligent fraud detection into a single system.

Objectives

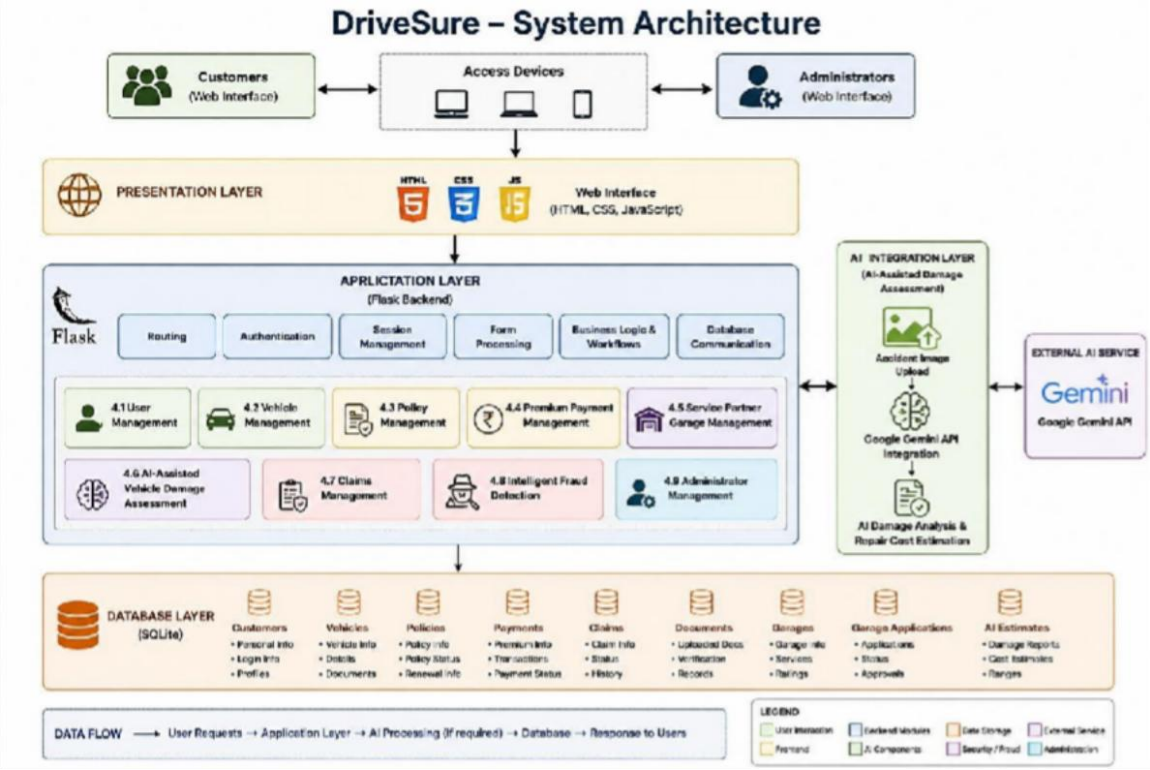
The main objective of the Drive Sure platform is to provide a centralized digital solution for vehicle insurance management by enabling customers to register and manage their vehicles, purchase and renew insurance policies, make premium payments, submit claims, upload supporting documents, and track claims throughout their lifecycle. The system aims to integrate authorized service partner garages into the insurance workflow and provide AI-assisted vehicle damage assessment using the Google Gemini API to analyses accident images and generate preliminary repair cost estimates. It also aims to identify suspicious, duplicate, or inconsistent claim information through intelligent fraud detection and provide administrators with centralized control over customers, policies, claims, garages, payments, and verification activities. Overall, the platform is designed to reduce paperwork, minimize manual effort, improve transparency, enhance claim processing efficiency, and provide a convenient and reliable digital insurance experience.

System Architecture

The Drive Sure platform follows a modular web-based architecture consisting of a presentation layer, application layer, AI integration layer, and database layer. Customers and administrators interact with the system through web interfaces developed using HTML, CSS,

and JavaScript. The Flask backend handles routing, authentication, sessions, form processing, business logic, database communication, and claim workflows. The SQLite database stores customer information, vehicle details, insurance policies, premium payments, claims, uploaded documents, service partner garages, garage applications, AI-generated estimates, and related records. The Google Gemini API is integrated into the AI-assisted damage assessment component to analyses uploaded vehicle damage images and generate repair estimates.

Figure 1: *System Architecture*



1. User Management - Manages customer registration, login authentication, profiles, and personal information within the system.
2. Vehicle Management - Allows customers to register their vehicles, maintain vehicle details, and associate vehicles with insurance policies.

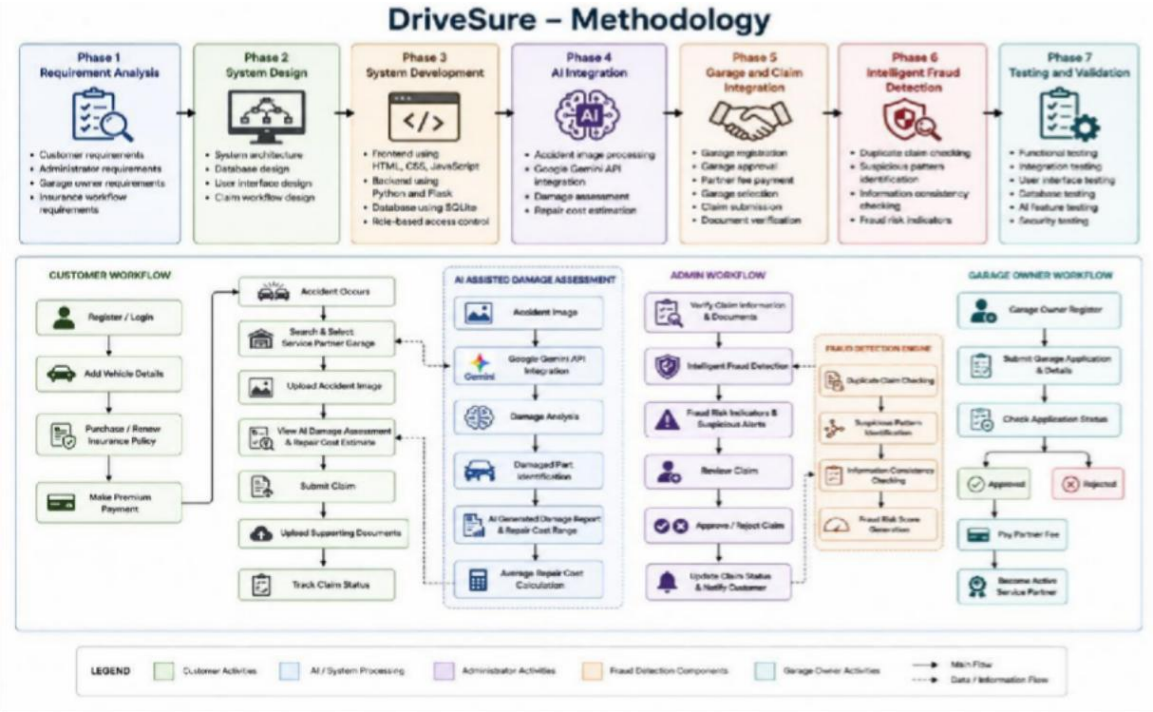
3. Policy Management - Handles insurance policy purchase, premium calculation, policy generation, renewal, and policy status tracking.
4. Premium Payment Management - Manages insurance premium payments, transaction details, payment status, and payment history.
5. Service Partner Garage Management - Manages garage partner registration, applications, approvals, service information, filtering, and partner-related activities.
6. AI-Assisted Vehicle Damage Assessment - Uses the Google Gemini API to analyze accident images, identify vehicle damage, generate damage reports, and estimate repair cost ranges.
7. Claims Management - Provides functionality for submitting insurance claims, uploading documents, verifying claims, tracking progress, and processing claim decisions.
8. Intelligent Fraud Detection - Helps identify duplicate, suspicious, or inconsistent claims by analyzing claim information and historical records.
9. Administrator Management - Provides administrators with centralized control over customers, vehicles, policies, garages, claims, payments, and system reports.

Methodology

The methodology begins with identifying the requirements of customers, administrators, and service partner garages. The system is then designed using a modular approach so that each major insurance operation can be developed and tested independently. The customer registers on the platform and provides the required personal and vehicle information. After authentication, the customer can purchase an insurance policy and complete premium payment. When an accident occurs, the customer can select an authorized service partner garage and upload an accident image. The uploaded image is processed using

the Google Gemini API to generate an AI-assisted damage assessment and estimated repair cost range. After reviewing the generated estimate, the customer can proceed with the claim submission process and provide the required supporting documents. Administrators verify the submitted information and documents before making the final claim decision. The intelligent fraud detection component can assist the administrator by identifying duplicate submissions, suspicious patterns, and inconsistencies in claim information. The service partner garage component follows a separate workflow. Garage owners submit their details for registration, after which administrators review the application. Approved garage owners complete the required partner fee payment and become active service partners. Customers can then search and select suitable garages according to their location and required services.

Figure 2: *Methodology*



Phase 1: Requirement Analysis - Identifies and documents the requirements of customers, administrators, garage partners, and the overall insurance claim workflow.

Phase 2: System Design - Defines the system architecture, database structure, user interface, and overall claim processing workflow.

Phase 3: System Development - Implements the frontend, Flask-based backend, SQLite database, and role-based access control required for the system.

Phase 4: AI Integration - Integrates the Google Gemini API to analyze accident images, assess vehicle damage, and estimate repair costs.

Phase 5: Garage and Claim Integration - Connects garage partner services with the insurance claim process, including garage approval, selection, document verification, and claim submission.

Phase 6: Intelligent Fraud Detection - Analyzes claim information to identify duplicate claims, suspicious patterns, inconsistencies, and potential fraud risks.

Phase 7: Testing and Validation - Tests the system's functionality, integration, user interface, database, AI features, and security to ensure reliable operation.

Results and Discussion

The developed Drive Sure platform successfully integrates major vehicle insurance activities into a centralized web-based application. Customers can manage vehicles, policies, premium payments, garages, claims, documents, and claim tracking through a single interface. The integration of Google Gemini AI provides an additional level of automation by analyzing vehicle damage images and generating preliminary repair cost estimates. The service partner garage module provides a structured connection between customers and authorized repair centers. The administrator interface allows garage applications, claims, documents, policies, and other insurance records to be managed centrally. The intelligent fraud detection component provides support for identifying duplicate and suspicious claim conditions, helping administrators perform more informed claim verification. Overall, the developed

system demonstrates that combining digital insurance management with Artificial Intelligence can improve the efficiency and transparency of vehicle insurance operations.

Advantages

- Reduced paperwork and manual effort.
- Faster claim processing workflow.
- AI-assisted vehicle damage assessment.
- Automated repair cost estimation.
- Service partner garage integration.
- Centralized claim and document management.
- Intelligent identification of suspicious claims.

Disadvantages

- AI-generated estimates depend on the quality of uploaded images.
- AI analysis may not always replace professional physical inspection.
- Internet connectivity is required for AI-based analysis.
- AI services may involve API usage limitations or costs.
- Fraud detection effectiveness depends on the quality and completeness of available claim information.
- Data privacy and security must be maintained carefully.

Applications

- Vehicle Insurance Companies
- Insurance Brokers
- Insurance Claim Processing Centers
- Authorized Service Partner Garages
- Digital Insurance Platforms
- Vehicle Repair and Inspection Centers

- Insurance Administration Departments

Future Scope

The system can be enhanced in the future by incorporating advanced Machine Learning models trained on larger insurance claim datasets for more sophisticated fraud detection and risk prediction. Other possible enhancements include mobile application support, real-time location-based garage recommendations, online payment gateway integration, cloud deployment, blockchain-based document verification, IoT-based accident detection, advanced vehicle damage detection, integration with government vehicle databases, automated notification systems, and predictive customer analytics.

Conclusion

The AI-Powered Digital Vehicle Insurance and Claims Processing Platform with Intelligent Fraud Detection provides a centralized and modern approach to vehicle insurance management and claim processing. The integration of Google Gemini AI provides automated preliminary vehicle damage analysis and repair cost estimation, while the Service Partner Garage Management System improves coordination between customers and authorized repair centers. The intelligent fraud detection component further supports administrators in identifying suspicious claim conditions. By combining web technologies, centralized database management, Artificial Intelligence, and structured insurance workflows, the proposed system reduces manual effort, improves transparency, enhances customer convenience, and provides a foundation for future intelligent insurance applications.

References

Ding, N., Ruan, X., Wang, H., & Liu, Y. (2025). Automobile insurance fraud detection based on PSO-XGBoost model and interpretable machine learning method. *Insurance: Mathematics and Economics*.

Image based classification for vehicle accident detection and insurance claim using artificial intelligence. (2024). *2024 International Conference on Emerging Systems and Intelligent Computing*.

Schrijver, G., Sarmah, D. K., & El-hajj, M. (2024). Automobile insurance fraud detection using data mining: A systematic literature review. *Intelligent Systems with Applications*.

Vorobyev, I. (2024). Fraud risk assessment in car insurance using claims graph features in machine learning. *Expert Systems with Applications*.