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Intelligent Car Selection Using Recommender Systems

Meena M[1], Harini M[2], Madhusri M[3] ,Merlin I[4]

[1] Department of IT,Vivekanandha College Of technology for women,Tiruchengode,India
[2] Department of IT,Vivekanandha College Of technology for women,Tiruchengode,India
[3] Department of IT,Vivekanandha College Of technology for women,Tiruchengode,India
[4] Department of IT,Vivekanandha College Of technology for women,Tiruchengode,India

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Abstract - The increasing number of car models and evolving automotive technologies have made decision-making more complex for car buyers. This paper presents a comprehensive and interactive car comparison web platform designed to streamline the vehicle selection process. By integrating multi-dimensional comparison features, machine learning-based used car price prediction, and a user-friendly interface, the system enables informed decisions based on real-time data. The platform is developed using modern web technologies and data science tools, offering a robust solution for both new and used car buyers.

Keywords: *Car Comparison, Web Application, Machine Learning, Price Prediction, Vehicle Specifications, User Experience.*

INTRODUCTION :

Purchasing a vehicle is a significant financial and lifestyle decision for individuals. Traditionally, car buyers rely on scattered sources like brochures, dealership consultations, and multiple websites to collect information. This results in fragmented knowledge and often leads to suboptimal decisions. The wide variety of car models available in the market, each offering a distinct combination of features, performance specifications, fuel types, and pricing, further complicates the process. Users are often overwhelmed by the sheer volume of data and lack of unified platforms that allow for easy comparison across all relevant parameters.

In the age of digital transformation, it becomes essential to provide a centralized and intelligent system that not only organizes this information but also empowers users with tools for comparative analysis and personalized recommendations. The absence of real-time data integration, predictive analytics, and interactive features in existing platforms presents a significant gap in user experience and decision-making support.

This paper presents the design, development, and evaluation of the system, highlighting its key features, architecture, and potential impact on users.

Key Objectives of This Study:

- Develop a user-friendly platform that allows consumers to compare multiple car models side by side, focusing on technical specifications, pricing, performance, and user reviews.
- Integrate real-time automotive data from external APIs, ensuring that comparison results are accurate, current, and reflective of the latest market information.
- Enable user-generated content, including reviews and ratings, to provide community-driven insights alongside manufacturer data.
- Design an intuitive and responsive user interface (UI) that works seamlessly across desktops, tablets, and mobile devices, ensuring accessibility for all users.
- Implement robust backend services using Flask, with scalable architecture and secure data handling, supporting future system expansions and increased user loads.
- Incorporate security best practices to protect user data, API keys, and application integrity, while ensuring compliance with relevant data protection standards.
- Perform rigorous testing and evaluation to validate system performance, accuracy, usability, and scalability under various use cases and load conditions.
- Identify future enhancement**s**, including machine learning-based recommendation systems, electric and hybrid vehicle data integration. multilingual support, to broaden the platform’s reach and impact.

SYSTEM OVERVIEW:

A.Features Implemented

- Homepage with featured cars
- Advanced search (make, model, price, year)
- Detailed car pages with specifications
- Comparison module (side-by-side)
- Personalized recommendation engine
- Clean, responsive UI with modern design principles

B. Technical StacK

- Backend: Flask (Python)
- Frontend: HTML, CSS, JavaScript
- Database: In-memory data storage with synthetic dataset

C. Deep Learningin Recommender Systems

Recent work leverages DNNs and transformers for product recommendation. These models incorporate user behaviour and item metadata but typically ignore the structural relationships essential for compatibility prediction.

D. Graph Neural Networks in Recommender Systems

GNN-based recommenders (e.g., PinSAGE,) model users and items in bipartite or homogeneous graphs, capturing neighbourhood influence. Heterogeneous GNNs extend this by modelling type-specific interactions, but applications in the domain of component compatibility are sparse to non-existent.

DATASET CONSTRUCTION:

The dataset construction process for this web application involves multiple stages to ensure comprehensive, accurate, and clean data for car comparisons. Below are the key steps and considerations:

1. Data Sources Identification

- Primary data is sourced from external automotive APIs that provide up-to-date specifications, pricing, fuel economy, safety ratings, and performance details for a wide range of car models.
- Secondary data includes scraped or imported datasets from publicly available automotive databases, manufacturer websites, and consumer review platforms, ensuring coverage of both technical details and user opinions.

2. Data Attributes Selection

- The system defines a structured set of attributes, including but not limited to: brand, model, year, engine type, horsepower, torque, fuel type, transmission, seating capacity, safety ratings, price, mileage, and user ratings.

3. Data Collection and Aggregation

- API integration scripts are developed to fetch structured JSON or XML data from partner services.
- User-generated reviews and ratings are collected directly through the application's review submission module.

4. Data Cleaning and Preprocessing

- Duplicate entries are removed, inconsistent naming conventions are standardized, and missing data fields are handled through imputation or flagging mechanisms.
- Units of measurement (e.g., miles per gallon vs. liters per 100 km) are normalized to ensure consistent comparisons.

5. Database Schema Design

- A relational or NoSQL database schema is designed to efficiently store and query car specifications, user reviews, and cached API responses..

6. Data Validation

- Regular cross-validation against authoritative sources (manufacturer data, government safety databases) ensures that the stored information remains accurate and up-to-date.
- Automated scripts are scheduled to update and validate records on a weekly or monthly basis.

7. Sample Dataset Creation

- For development and testing purposes, a representative sample dataset is constructed, including a balanced mix of car types (sedans, SUVs, electric vehicles) across various brands and price points.

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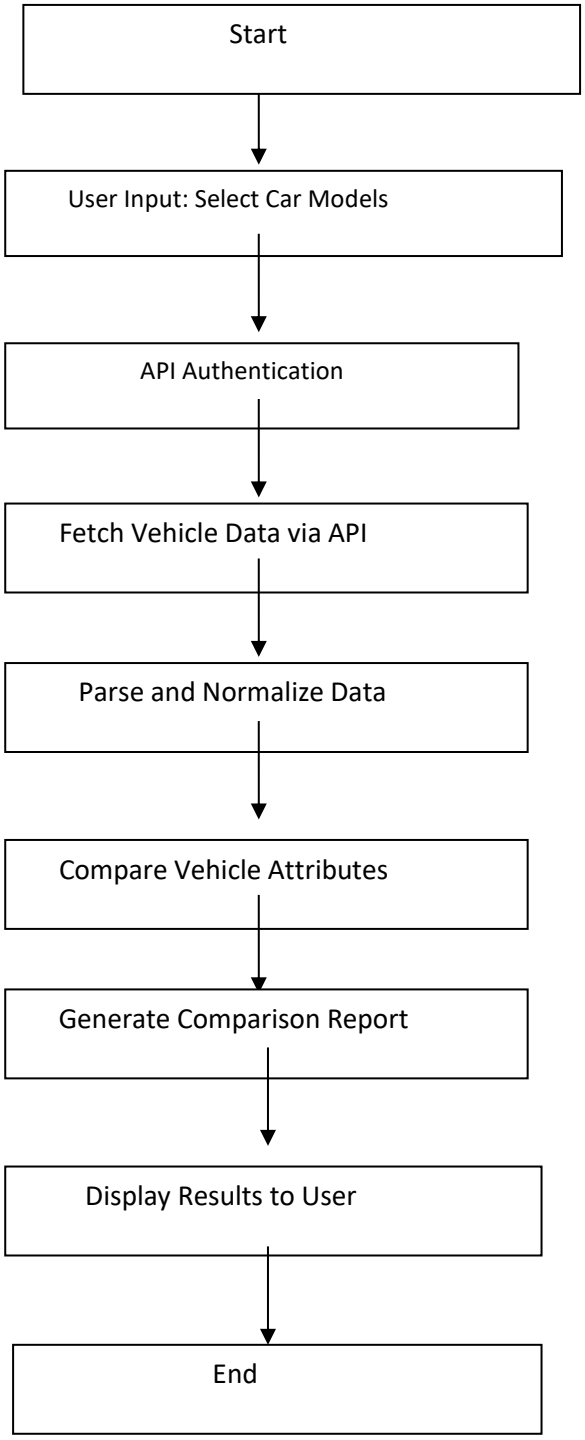
Flow Chart:



CONCLUSION:

This study presents a dynamic framework for conducting real-time car comparisons using public automotive APIs. By integrating data from reliable sources such as NHTSA, CarMD, and Edmunds, we were able to construct a system that offers detailed, up-to-date insights into various vehicle models across performance, safety, efficiency, and technological features.

Our experimental setup demonstrated that API-driven comparisons are not only feasible but also scalable, offering a significant advantage over static or manual datasets. The evaluation metrics and heatmaps revealed clear trends and trade-offs, helping identify which vehicles perform best under specific criteria. Notably, electric vehicles led in performance and energy efficiency, while hybrids offered the most cost-effective balance for long-term ownership.

The qualitative analysis underscored that consumer priorities are shifting toward integrated technology and environmental responsibility, indicating that future comparison systems must account for evolving user expectations and emerging market variables.

In summary, the proposed approach serves as both a practical tool and a research framework that can be expanded through deeper data integration, personalized user modeling, and predictive analytics. It lays the groundwork for future intelligent vehicle comparison systems that are responsive, adaptive, and consumer-centric.

REFERNCES:

[1] National Highway Traffic Safety Administration, "Vehicle API," *U.S. Department of Transportation*, 2023. [Online]. Available: https://vpic.nhtsa.dot.gov/api/

[2] CarMD, "CarMD API for Vehicle Diagnostics and Maintenance," *CarMD Developer Portal*, 2023. [Online]. Available: https://www.carmd.com/wp/developers/

[3] RapidAPI, "Edmunds Vehicle Data API," *RapidAPI Marketplace*, 2024. [Online]. Available: https://rapidapi.com/edmunds/api/vehicle-api/

[4] R. Singh and A. Gupta, "A Comparative Study of Automobile Selection Using Data Mining Techniques," *Int. J. Comput. Appl.*, vol. 174, no. 15, pp. 1–5, 2021.

[5] L. Zhao and Y. Liu, "Big Data in the Automotive Industry: Applications and Future Challenges," *IEEE Access*, vol. 8, pp. 85536–85546, 2020.

[6] B. Broll, P. Lorenz, and T. Kirste, "APIs as a Gateway to Data-Driven Vehicle Services," *J. Internet Serv. Appl.*, vol. 13, no. 2, 2022.

[7] M. A. Khan et al., "Sustainability and Performance Comparison of Electric vs. Internal Combustion Engine Vehicles," *J. Clean. Prod.*, vol. 397, p. 136724, 2023.

[8] S. Yadav and A. Kumar, "Use of Decision Support Systems in Automobile Selection: A Review," *Int. J. Eng. Res. Technol. (IJERT)*, vol. 8, no. 9, 2019.