1. INTRODUCTION

1.1. Project Overview

AutoSage is an AI-powered application that provides detailed information about two-wheeler and four-wheeler vehicles using image-based analysis. The system uses Google's Gemini Flash model to analyze vehicle images and generate structured details such as brand, model, mileage, price range, and resale value. AutoSage simplifies the vehicle selection process by delivering real-time insights through an easy-to-use Streamlit interface.

- **Scenario 1: Buying a New Motorcycle**
  Sarah uses AutoSage to compare motorcycle specifications, features, and prices within her budget, helping her make an informed purchase decision.
- **Scenario 2: Vehicle Maintenance Tips**
  AutoSage provides seasonal maintenance suggestions, such as checking tire pressure and battery health, to help users maintain vehicle safety and performance.
- **Scenario 3: Finding Eco-Friendly Vehicles**
  Emma uses AutoSage to explore electric and hybrid vehicles by understanding efficiency, environmental impact, and available incentives.

1.2. Objectives

The primary purpose of the **AutoSage project** is to develop an intelligent Generative AI–based system that can automatically analyse vehicle images and provide detailed vehicle information. It aims to assist users such as vehicle buyers, owners, and eco-conscious consumers by enabling quick and accurate understanding of two-wheeler and four-wheeler details reducing manual research and improving decision-making efficiency.

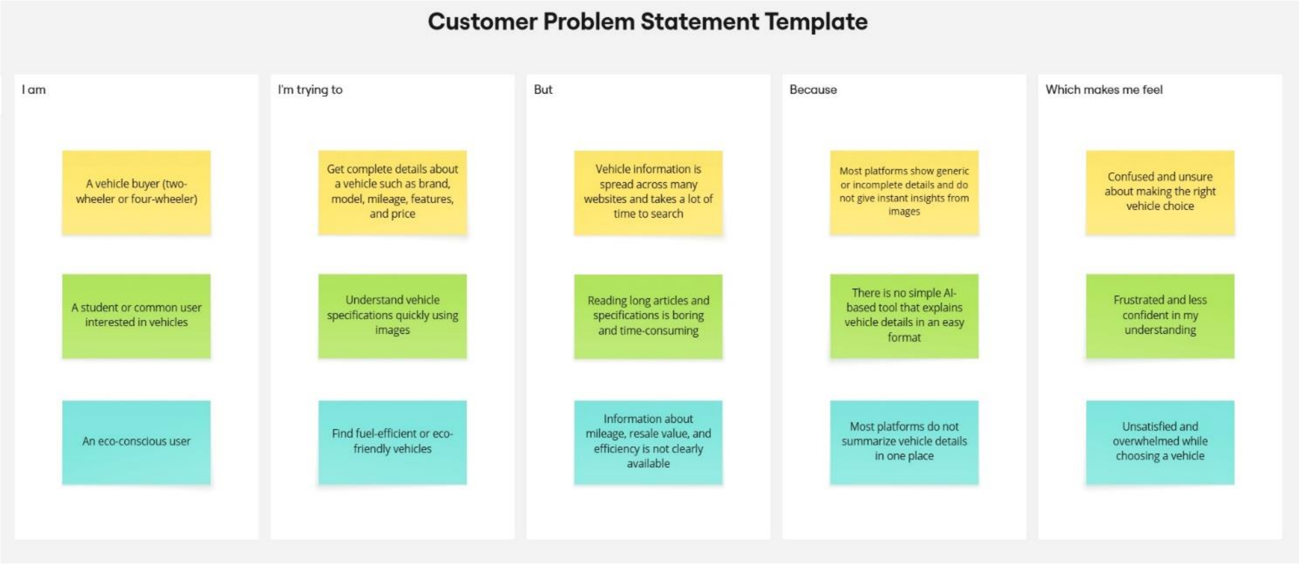
Key Objectives:

- To analyse vehicle images using a multimodal Generative AI model.
- To generate structured vehicle details such as brand, model, mileage, price and resale value.
- To build a simple user-friendly web application using Streamlit.
- To enable real-time vehicle comparison and information retrieval for practical use cases.

2. IDEATION PHASE

2.1. Problem Statement

Customers who want to buy or compare two-wheelers and four-wheelers often find it difficult to get clear and complete vehicle information in one place. They try to understand details such as brand, model, mileage, features, price, and resale value, but the information is scattered across multiple websites. Most platforms require manual searching and reading long, complex specifications, which is time-consuming and confusing. Existing systems do not use image-based AI to provide instant and structured insights. This makes customers feel frustrated, unsure, and less confident while making vehicle-related decisions.



Customer Problem Statement Template

I am	I'm trying to	But	Because	Which makes me feel
A vehicle buyer (two-wheeler or four-wheeler)	Get complete details about a vehicle such as brand, model, mileage, features, and price	Vehicle information is spread across many websites and takes a lot of time to search	Most platforms show generic or incomplete details and do not give instant insights from images	Confused and unsure about making the right vehicle choice
A student or common user interested in vehicles	Understand vehicle specifications quickly using images	Reading long articles and specifications is boring and time-consuming	There is no simple AI-based tool that explains vehicle details in an easy format	Frustrated and less confident in my understanding
An eco-conscious user	Find fuel-efficient or eco-friendly vehicles	Information about mileage, resale value, and efficiency is not clearly available	Most platforms do not summarize vehicle details in one place	Unsatisfied and overwhelmed while choosing a vehicle

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	A vehicle buyer	Understand vehicle details before buying a bike or car	Searching for vehicle information takes too much time	Vehicle details are spread across many websites and need manual comparison	Confused and unsure about choosing right vehicle
PS-2	A student or general user	Identify and understand a vehicle using its image	Reading ling specifications and reviews	Most platforms do not support image-based vehicle	Frustrated and less confident

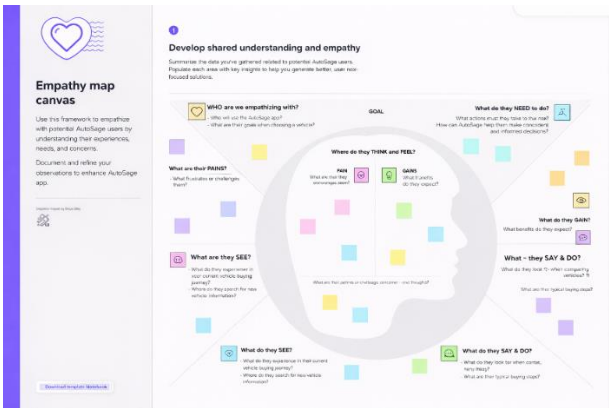
			is difficult	analysis	
PS-3	An eco-conscious user	Find fuel-efficiency or eco-friendly vehicles	It is hard to get clear information about mileage and efficiency	Vehicle information is not summarized in one place	Dissatisfied and overwhelmed

2.2. Empathy Map Canvas

Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes.

It is a useful tool to helps teams better understand their users.
Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

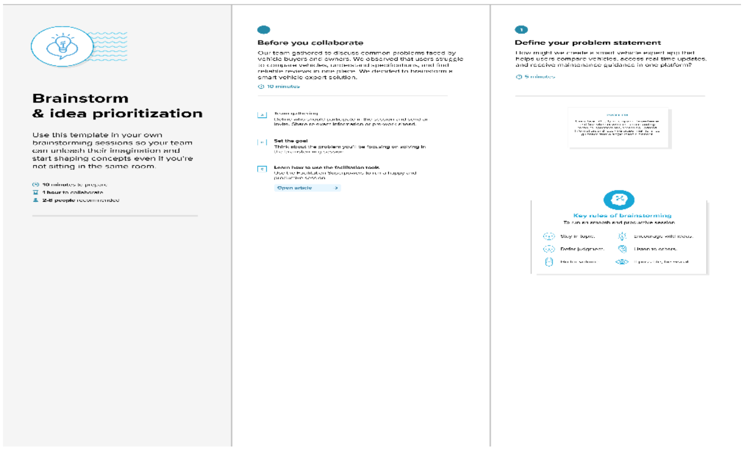

Empathy map canvas
Use this framework to empathize with potential AutoSage users by understanding their experiences, needs, and concerns.
Document and refine your observations to enhance AutoSage app.
Download template Notebook
1
Develop shared understanding and empathy
Summarize the data you've gathered related to potential AutoSage users. Populate each area with key insights to help you generate better, user non-focused solutions.
WHO are we empathizing with?
- Who will use the AutoSage app?
- What are their goals when choosing a vehicle?
GOAL
What do they NEED to do?
What actions must they take to the road?
How can AutoSage help them make consistent and informed decisions?
Where do they THINK and FEEL?
PAIN
GAINS
What benefits do they expect?
What are their PAINS?
- What frustrates or challenges them?
What do they GAIN?
What benefits do they expect?
What are they SEE?
What - they SAY & DO?
What do they SEE?
- What do they experience in their current vehicle buying journey?
- Where do they search for new vehicle information?
What do they SAY & DO?
What are their typical buying steps?

2.3 Brainstorming

Brainstorm & Idea Prioritization:

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

Step-1: Team Gathering, Collaboration and Select the Problem Statement



Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

10 minutes to prepare
1 hour to collaborate
2-8 people recommended

Before you collaborate

Our team gathered to discuss common problems faced by vehicle buyers and owners. We observed that users struggle to compare vehicles, understand specifications, and find reliable reviews in one place. We decided to brainstorm a smart vehicle expert solution.

10 minutes

Team gathering
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

Set the goal
Think about the problem you'll be focusing on solving in the brainstorming session.

Learn how to use the facilitation tools
Use the Facilitation Superpowers to run a happy and productive session.

Open article

1 Define your problem statement

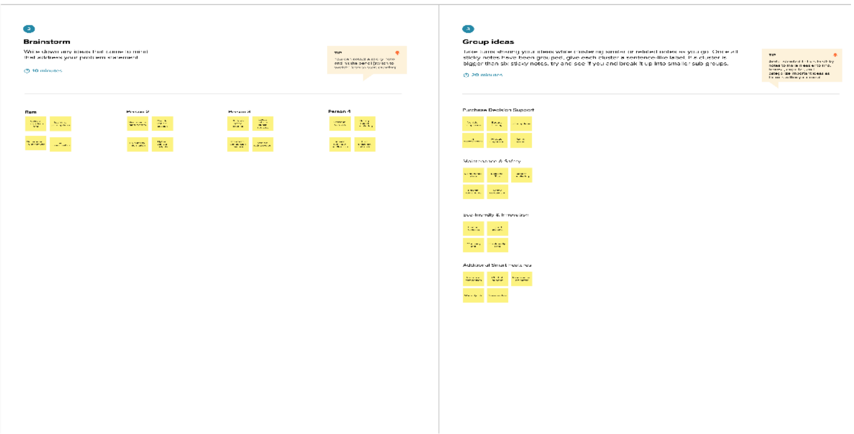
How might we create a smart vehicle expert app that helps users compare vehicles, access real time updates, and receive maintenance guidance in one platform?

5 minutes

Key rules of brainstorming
To run an smooth and productive session

Stay in topic. Encourage wild ideas.
Defer judgment. Listen to others.
Go for volume. If possible, be visual.

Step-2: Brainstorm, Idea Listing and Grouping



2 Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

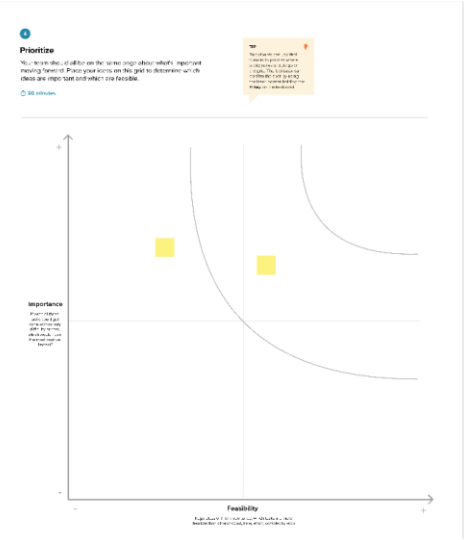
3 Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

20 minutes

Purchase Decision Support
Maintenance & Safety
Eco-friendly & Innovation
Additional Smart Features

Step-3: Idea Prioritization



4 Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

3. REQUIREMENT ANALYSIS

3.1. Solution Requirement

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through email and password Login using registered credentials
FR-2	Vehicle Image Upload	Upload vehicle image (jpg, jpeg, png) Validate uploaded image format
FR-3	AI Vehicle Analysis	Analyze vehicle image using Gemini Flash Generate structured vehicle details (brand, model, mileage, price)
FR-4	Display Results	Display vehicle analysis results clearly on dashboard Show structured output in readable format
FR-5	Web Deployment	Deploy application using Streamlit Access application via web browser

Non-functional Requirements:

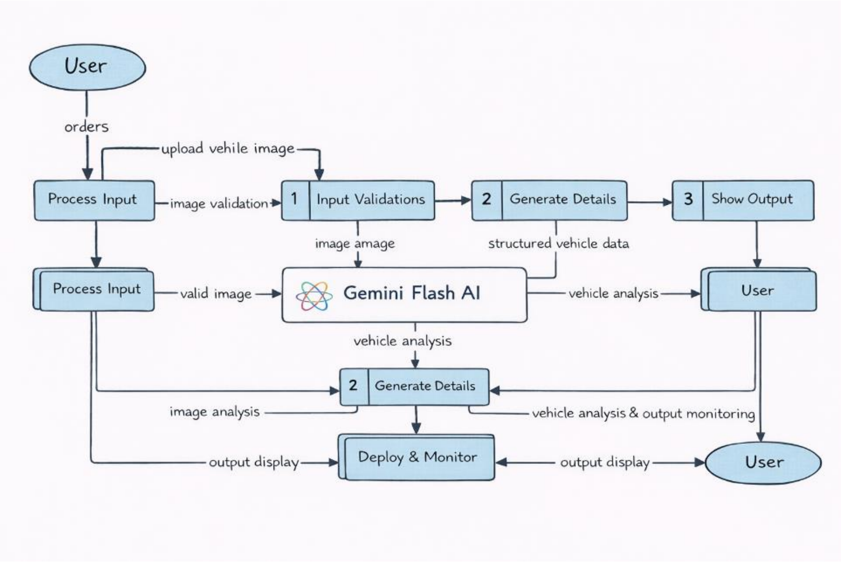
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The system should have a simple and user-friendly interface for easy image upload and result viewing.
NFR-2	**Security**	User login data and inputs must be securely handled and protected.
NFR-3	**Reliability**	The system should consistently generate vehicle details without frequent failures.
NFR-4	**Performance**	Vehicle analysis results should be generated within a few seconds after image upload.
NFR-5	**Availability**	The application should be accessible online whenever users access the deployed link.
NFR-6	**Scalability**	The system should handle multiple users and future feature expansion.

3.2. Data Flow Diagram

Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the AutoSage application using email and password	User can successfully create account and access dashboard.	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	User receives confirmation email and activates account.	High	Sprint-1
		USN-3	As a user, I can register using google account.	User can register and access dashboard via Google login.	Medium	Sprint-2

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
	Login	USN-4	As a user, I can log into the application by entering email & password	User can successfully log in and access dashboard.	High	Sprint-1
	Dashboard	USN-5	As a user, I can upload a vehicle image for analysis.	System accepts valid image formats and processes the image.	High	Sprint-1
		USN-6	As a user, I can enter a vehicle query(brand/model) manually	System accepts input and returns vehicle details.	High	Sprint-1
	Vehicle Analysis	USN-7	As a user, I want the system to analyze vehicle images using Gemini Flash AI	System extracts and displays vehicle details (brand, mileage, fuel type, price).	High	Sprint-2
		USN-8	As a user, I want structured vehicle details to be displayed clearly.	Vehicle details appear in organized readable format.	High	Sprint-1

3.3. Technology Stack

Technical Architecture:

The AutoSage application follows a simple 3-layer architecture:

1. User Interface Layer (Streamlit Web App)
2. Application Logic Layer (Python Backend + Gemini Flash API Integration)
3. Data Layer (Vehicle Data & System Storage)

The system allows users to upload vehicle images, which are validated and processed using the Gemini Flash model to generate structured vehicle details. The results are displayed through a web-based interface.

Table-1 : Components & Technologies:

S.No	Component	Description	Technology

1	User Interface	Web-based interface for users to upload vehicle images and view results	Streamlit (Python)
2	Application Logic-1	Image validation and processing logic	Python
3	Application Logic-2	AI-based vehicle image analysis	Gemini Flash API
4	Application Logic-3	Structured response generation (brand, mileage, price extraction)	Prompt Engineering (Python + Gemini)
5	Database	Storage of vehicle-related information (if applicable)	SQLite / Local Storage
6	File Storage	Temporary storage of uploaded vehicle images	Local File System
7	External API-1	AI model integration for vehicle analysis	Google Gemini Flash API
8	Machine Learning Model	Image-based vehicle understanding and detail generation	Gemini Flash Multimodal Model
9	Infrastructure (Server / Cloud)	Application deployment and hosting	Streamlit Cloud / Local System

Table-2: Application Characteristics:

S.No	**Characteristics**	**Description**	**Technology**
1	Open-Source Frameworks	Frameworks used for building application	Streamlit, Python
2	Security Implementations	Secure API key storage and input validation	Environment Variables, HTTPS
3	Scalable Architecture	Modular design separating UI, Logic, and AI model integration	Layered Architecture
4	Availability	Application accessible via browser once deployed	Streamlit Cloud
5	Performance	Optimized image validation and fast AI response handling	Python Optimization + API Response Handling

4. PROJECT DESIGN

4.1. Problem Solution Fit

Problem – Solution Fit Template:

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem. It helps entrepreneurs, marketers and corporate innovators identify behavioral patterns and recognize what would work and why

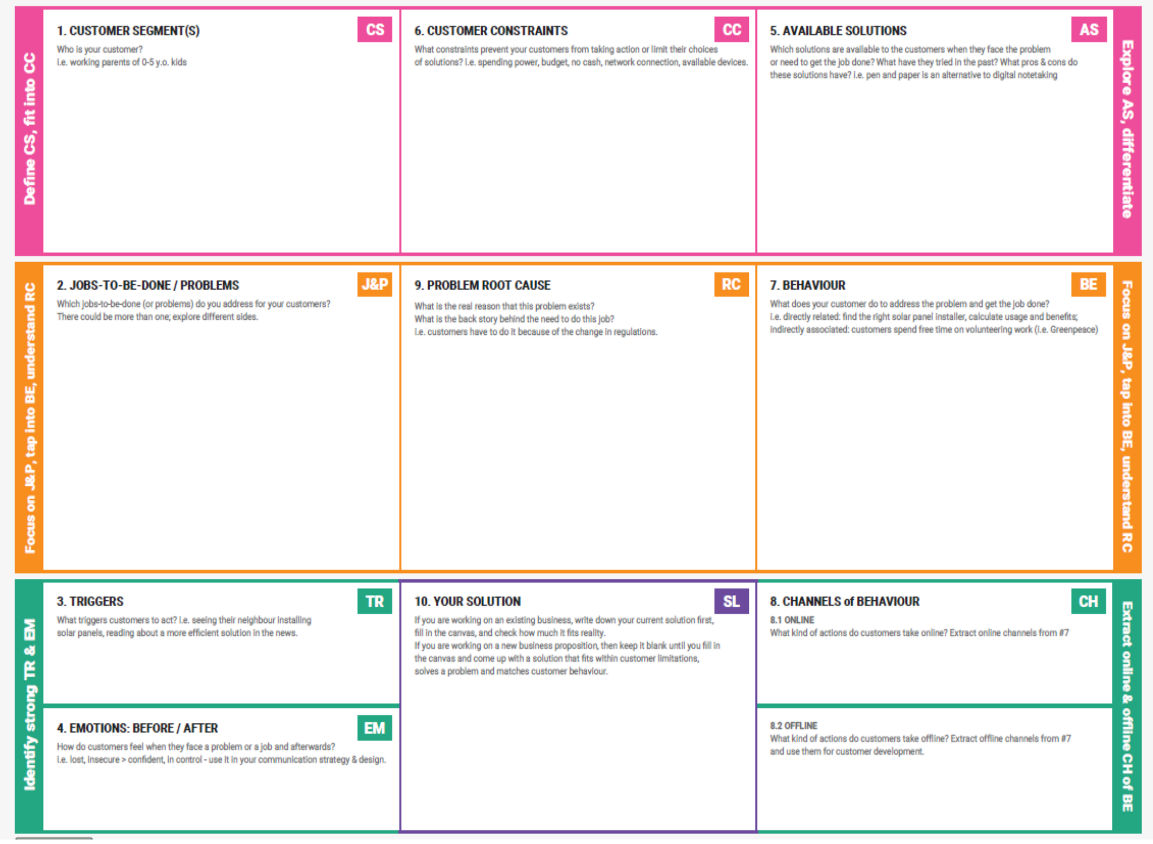
Problem – Solution Fit Template:

The Problem-Solution Fit means identifying the real problems faced by vehicle buyers and ensuring that the AutoSage solution effectively addresses those issues using AI-powered vehicle analysis.

Purpose:

☑ Solve vehicle comparison and information access problems efficiently.
☑ Help users make informed vehicle purchase decisions.
☑ Provide AI-based insights using Gemini Flash.
☑ Improve user confidence while selecting vehicles.
☑ Simplify vehicle analysis through image-based processing.

Template:



Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS
Who is your customer?
i.e. working parents of 0-5 y.o. kids

6. CUSTOMER CONSTRAINTS CC
What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

5. AVAILABLE SOLUTIONS AS
Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P
Which jobs-to-be-done (or problems) do you address for your customers?
There could be more than one; explore different sides.

9. PROBLEM ROOT CAUSE RC
What is the real reason that this problem exists?
What is the back story behind the need to do this job?
i.e. customers have to do it because of the change in regulations.

7. BEHAVIOUR BE
What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TR
What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

4. EMOTIONS: BEFORE / AFTER EM
How do customers feel when they face a problem or a job and afterwards?
i.e. lost, insecure > confident, in control - use it in your communication strategy & design.

10. YOUR SOLUTION SL
If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

8. CHANNELS of BEHAVIOUR CH
8.1 ONLINE
What kind of actions do customers take online? Extract online channels from #7

8.2 OFFLINE
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

Extract online & offline CH of BE

4.2. Proposed Solution

Proposed Solution Template:

Project team shall fill the following information in the proposed solution template.

S.No.	Parameter	Description
1	Problem Statement (Problem to be solved)	Vehicle buyers face difficulty in comparing models, understanding specifications, and accessing reliable vehicle information from a single platform.
2	Idea / Solution Description	AutoSage is an AI-powered vehicle expert application that allows users to upload vehicle images and receive structured vehicle details using Gemini Flash AI. It simplifies vehicle comparison and decision-making.
3	Novelty / Uniqueness	The system uses image-based AI analysis instead of only manual search. Users can upload a vehicle image and instantly get structured details like brand, mileage, and price.
4	Social Impact / Customer Satisfaction	AutoSage helps users make confident vehicle purchase decisions, reduces confusion, saves time, and improves overall customer satisfaction.
5	Business Model (Revenue Model)	Freemium model: basic vehicle analysis is free, advanced comparison features and premium insights can be subscription-based.
6	Scalability of the Solution	The system can be expanded to include more vehicle categories, cloud database integration, real-time market pricing, and mobile app deployment in the future.

4.3 Solution Architecture

Solution Architecture:

Solution architecture for AutoSage bridges the gap between the problem of unstructured vehicle information and the AI-based technological solution.

The architecture is designed to:

- Find the best AI-based solution for vehicle analysis and comparison.
- Define the structure and interaction between UI, backend logic, and AI services.
- Clearly describe how vehicle images are processed and analyzed.
- Provide specifications for deployment and system management.

Solution Architecture Diagram:

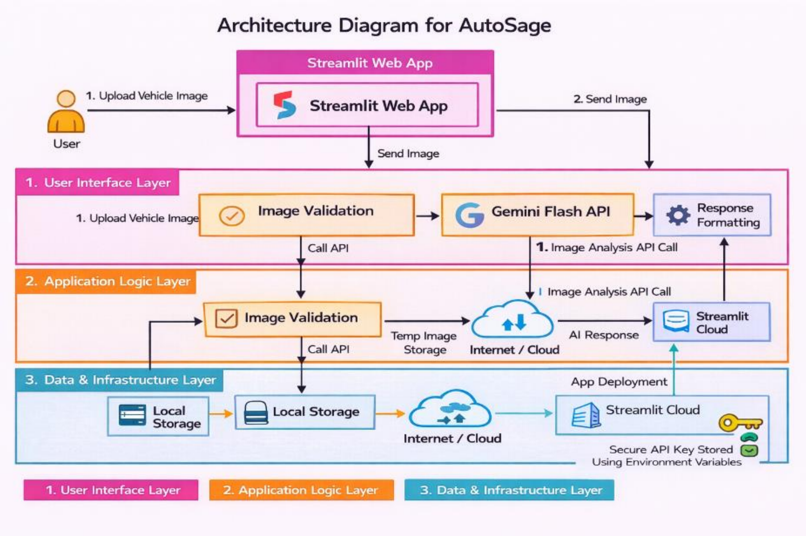


Figure 1 – Architecture Diagram for AutoSage app

5. PROJECT PLANNING & SCHEDULING

5.1. Project Planning

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

The following table represents the product backlog and sprint-wise planning for the **AutoSage** project.

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members	Sprint Start Date	Sprint End Date (Planned)
Sprint-1	User Interface Setup	USN-1	As a user, I want a Streamlit-based interface to upload vehicle images easily.	2	High	All Team members	5 February 2026	7 February 2026
Sprint-1	Image Upload Validation	USN-2	As a user, I want the system to validate the uploaded image format (jpg, jpeg, png).	1	High	All Team members	5 February 2026	7 February 2026
Sprint-2	AI Model Integration	USN-3	As a user, I want the system to analyze vehicle images using the Gemini Flash model.	3	High	All Team members	8 February 2026	14 February 2026
Sprint-2	Prompt Engineering	USN-4	As a user, I want the system to generate structured vehicle details like brand, mileage, and price.	2	High	All Team members	08 February 2026	14 February 2026
Sprint-3	Output Display	USN-5	As a user, I want to view the generated vehicle details clearly on the screen.	2	High	All Team members	15 February 2026	18 February 2026
Sprint-3	Deployment	USN-6	As a user, I want the AutoSage application to be deployed and accessible through the browser.	2	Medium	All Team members	15February 2026	18 February 2026

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint 1	20	4 Days	5 February 2026	7 February 2026	20	7 February 2026
Sprint 1	20	4 Days	5 February 2026	7 February 2026	20	7 February 2026
Sprint 2	20	8 Days	08 February 2026	14 February 2026	20	14 February 2026
Sprint 2	20	8 Days	08 February 2026	14 February 2026	20	14 February 2026
Sprint 3	20	7 Days	15 February 2026	18 February 2026	20	18 February 2026
Sprint 3	20	7 Days	15 February 2026	18 February 2026	20	18 February 2026
Sprint 1	20	4 Days	5+ February 2026	7 February 2026	20	7 February 2026

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

Test Scenarios & Results

Test Case ID	Scenario (What to test)	Test Steps (How to test)	Expected Result	Actual Result	Pass/Fail
FT-01	Image Upload Validation	Upload valid (jpg, png) and invalid (pdf, txt) files	Valid image formats accepted, invalid formats rejected with error message	System accepted valid images and rejected invalid formats correctly	Pass
FT-02	Image Size Validation	Upload large size image beyond limit	System should restrict large file or process without crash	System handled image without crashing	Pass
FT-03	Vehicle Analysis Generation	Upload vehicle image and click "Analyze"	Structured vehicle details (brand, model, mileage, price) generated	Vehicle details generated correctly	Pass
FT-04	API Connection Check	Use valid and invalid Gemini API key	Valid key connects successfully; invalid key shows error	API responded correctly; error shown for invalid key	Pass
FT-05	Output Display	Check if generated details are clearly displayed	Structured, readable output visible on screen	Output displayed in organized format	Pass
PT-01	Response Time Test	Upload image and measure processing time	Response time should be under 5 seconds	Response generated within acceptable time	Pass

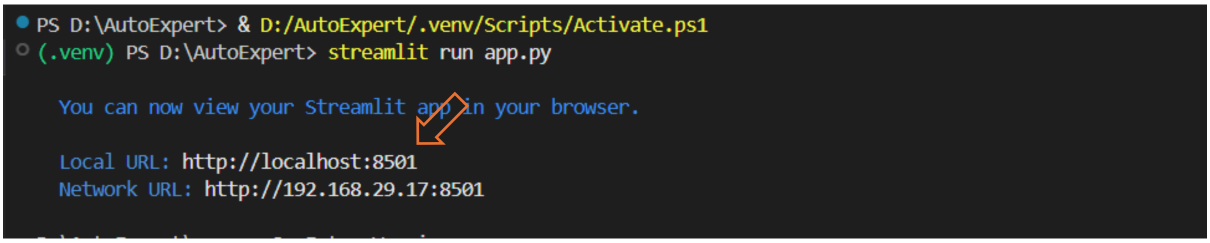
PT-02	Multiple Request Test	Upload images multiple times sequentially	System should not crash or freeze	Application handled repeated requests smoothly	Pass

7. RESULTS

7.1 Output Screenshots

The complete execution of the AutoSage application is shown in the images step by step as shown below.

Step 1: Run the app.py code using **streamlit run app.py** and you will get a link in terminal http://localhost:8501 which opens automatically in the browser.



```
PS D:\AutoExpert> & D:/AutoExpert/.venv/Scripts/Activate.ps1
(.venv) PS D:\AutoExpert> streamlit run app.py

  You can now view your Streamlit app in your browser.

  Local URL: http://localhost:8501
  Network URL: http://192.168.29.17:8501
```

Fig 7.1.1: Code running in Terminal

Step 2: The link automatically opens to display the application.

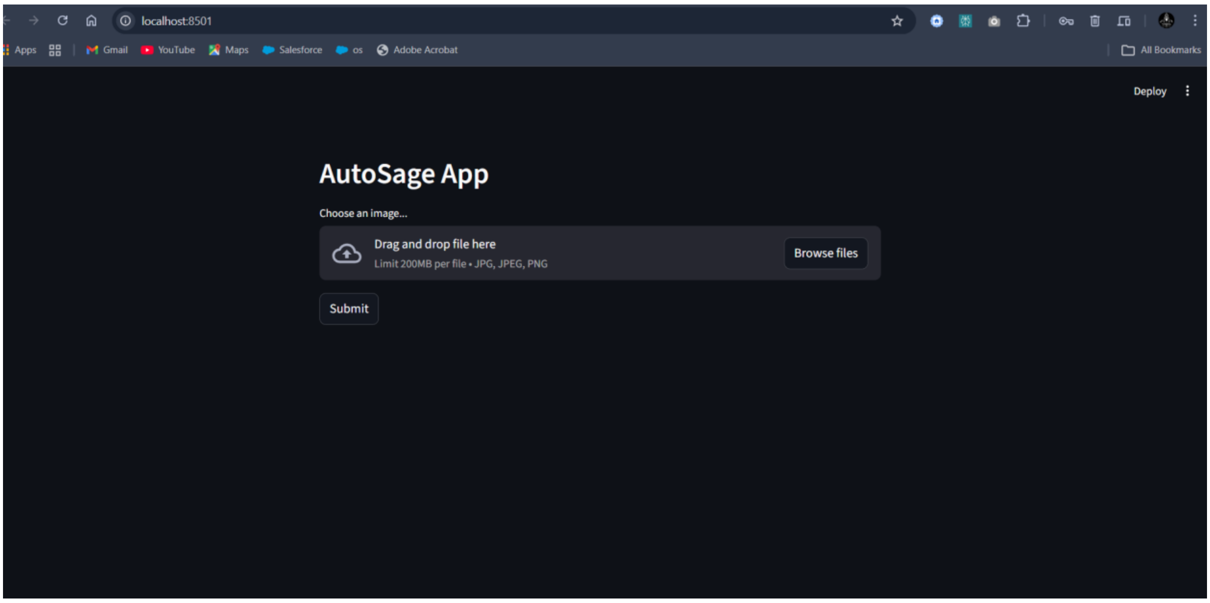


Fig 7.1.2: AutoSage App Page

Step 3: Click on **Browse Files** option to predict the vehicle details.

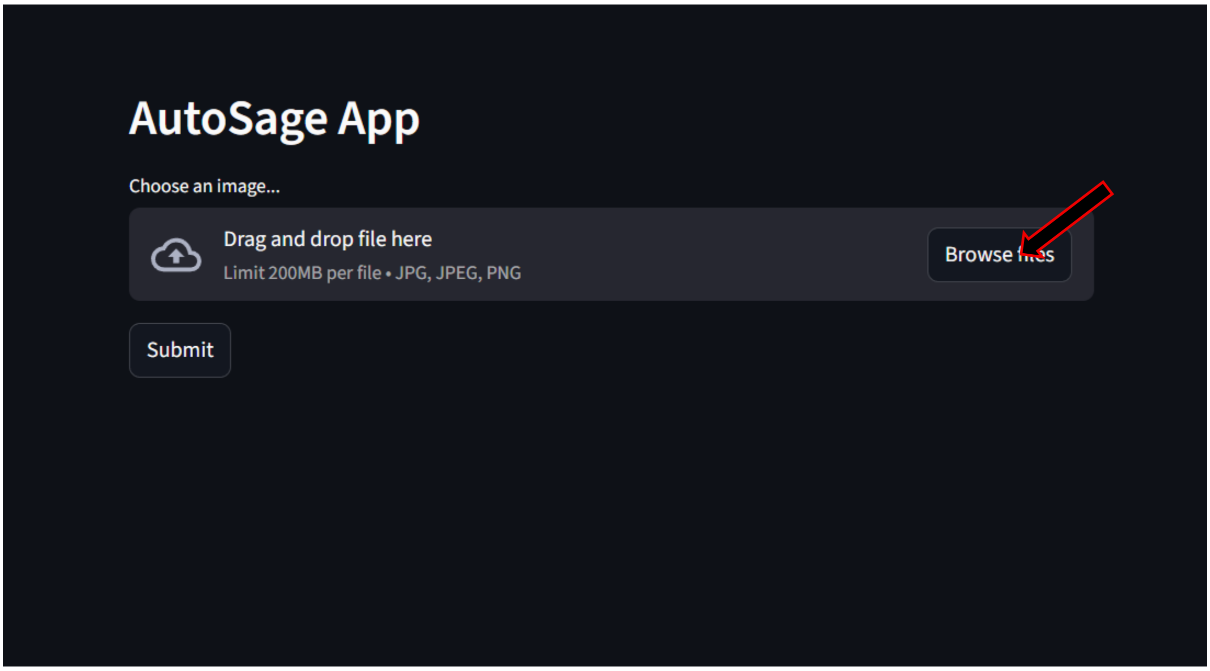


Fig 7.1.3: Prediction Page of AutoSage App

Step 4: Click on choose file option to choose the images that need to predict.

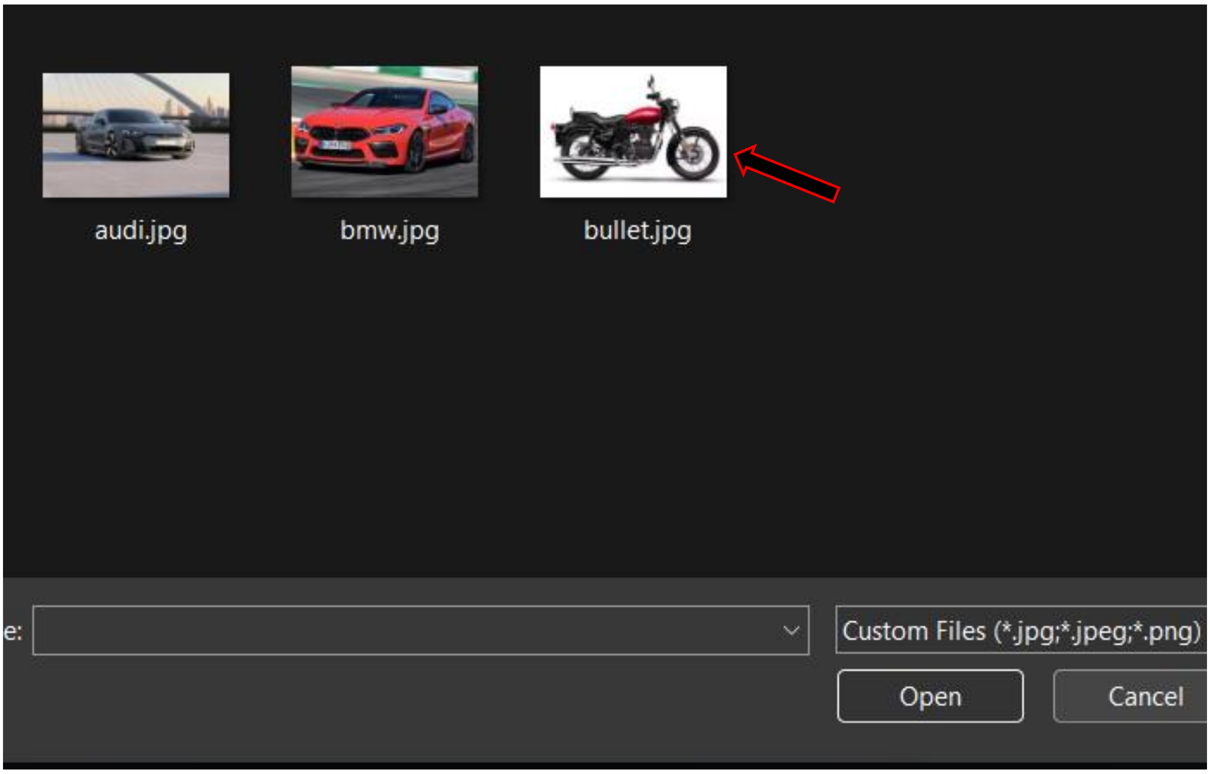
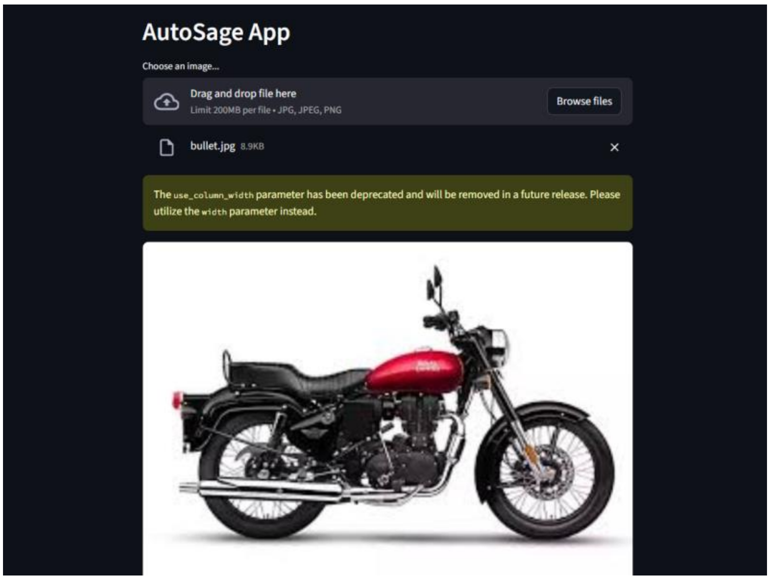


Fig 7.1.4: Window to choose image for prediction

Select any image for prediction and click on Open.

Step 5: The image loads into the application.



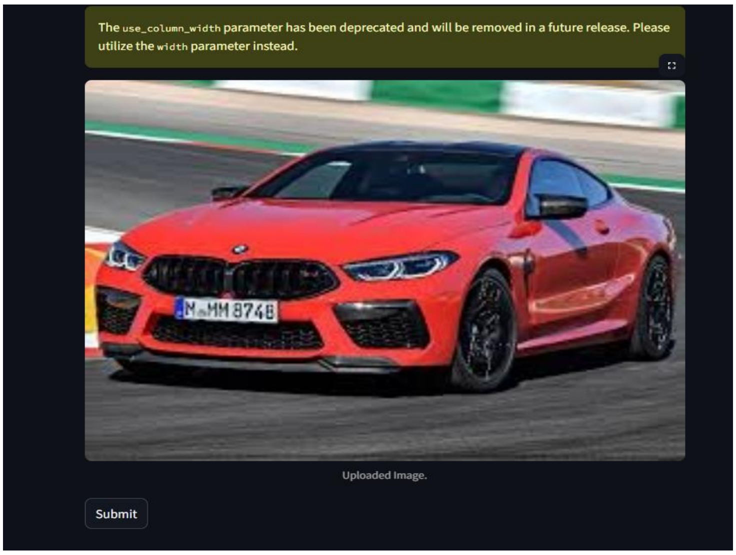
AutoSage App

Choose an image...

The use_column_width parameter has been deprecated and will be removed in a future release. Please utilize the width parameter instead.

Fig 7.1.5: Image loads into the app.

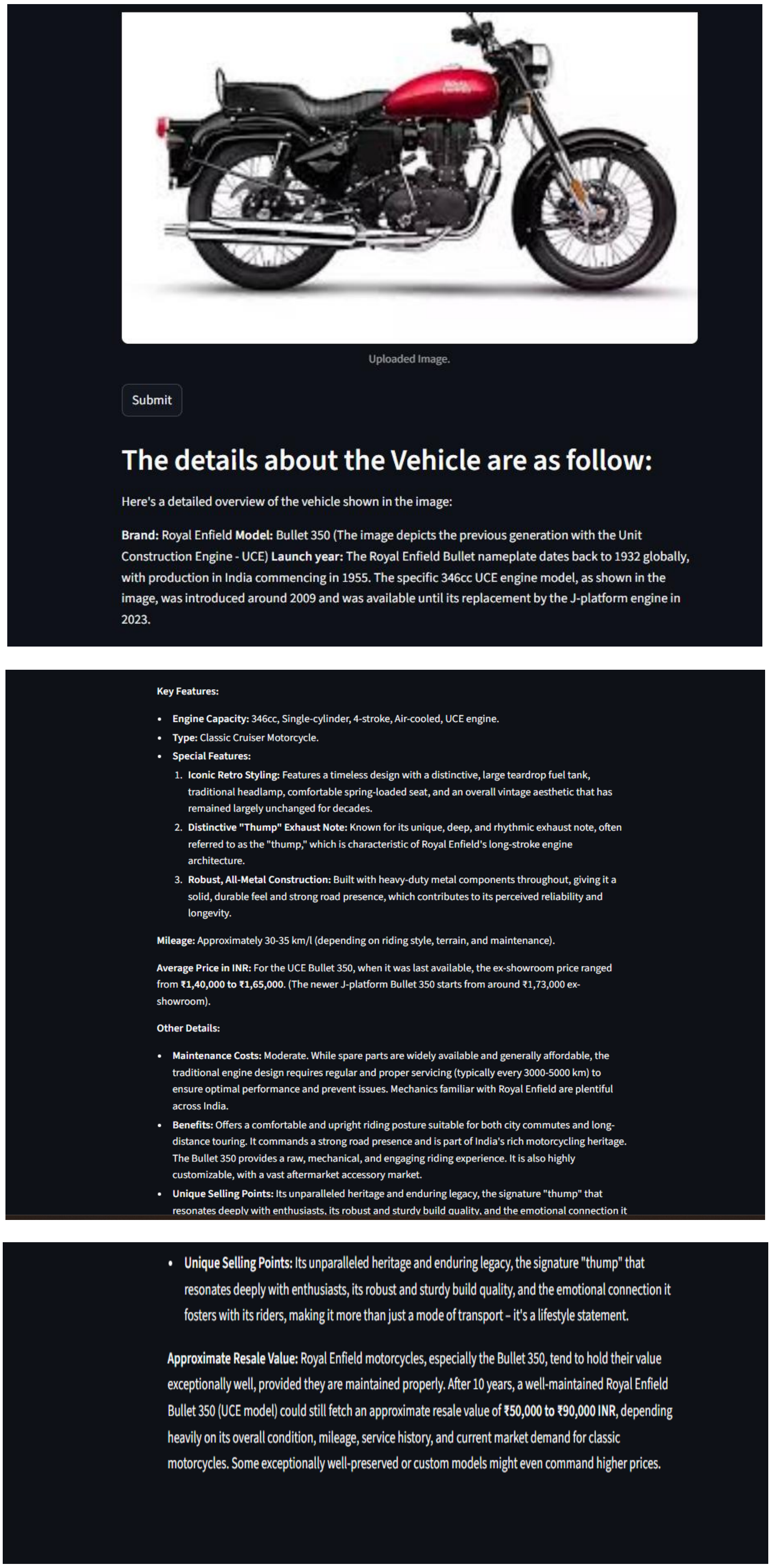
Step 6: Now click on the Submit button to detect the type of vehicle and its details.



The use_column_width parameter has been deprecated and will be removed in a future release. Please utilize the width parameter instead.

Fig 7.1.6: Click on submit to predict

Step 7: The model then predicts the type of the vehicle and provides its specifications as given below.



Uploaded Image.

The details about the Vehicle are as follow:

Here's a detailed overview of the vehicle shown in the image:

Brand: Royal Enfield **Model:** Bullet 350 (The image depicts the previous generation with the Unit Construction Engine - UCE) **Launch year:** The Royal Enfield Bullet nameplate dates back to 1932 globally, with production in India commencing in 1955. The specific 346cc UCE engine model, as shown in the image, was introduced around 2009 and was available until its replacement by the J-platform engine in 2023.

Key Features:

- **Engine Capacity:** 346cc, Single-cylinder, 4-stroke, Air-cooled, UCE engine.
- **Type:** Classic Cruiser Motorcycle.
- **Special Features:**
  1. **Iconic Retro Styling:** Features a timeless design with a distinctive, large teardrop fuel tank, traditional headlamp, comfortable spring-loaded seat, and an overall vintage aesthetic that has remained largely unchanged for decades.
  2. **Distinctive "Thump" Exhaust Note:** Known for its unique, deep, and rhythmic exhaust note, often referred to as the "thump," which is characteristic of Royal Enfield's long-stroke engine architecture.
  3. **Robust, All-Metal Construction:** Built with heavy-duty metal components throughout, giving it a solid, durable feel and strong road presence, which contributes to its perceived reliability and longevity.

Mileage: Approximately 30-35 km/l (depending on riding style, terrain, and maintenance).

Average Price in INR: For the UCE Bullet 350, when it was last available, the ex-showroom price ranged from **₹1,40,000 to ₹1,65,000**. (The newer J-platform Bullet 350 starts from around ₹1,73,000 ex-showroom).

Other Details:

- **Maintenance Costs:** Moderate. While spare parts are widely available and generally affordable, the traditional engine design requires regular and proper servicing (typically every 3000-5000 km) to ensure optimal performance and prevent issues. Mechanics familiar with Royal Enfield are plentiful across India.
- **Benefits:** Offers a comfortable and upright riding posture suitable for both city commutes and long-distance touring. It commands a strong road presence and is part of India's rich motorcycling heritage. The Bullet 350 provides a raw, mechanical, and engaging riding experience. It is also highly customizable, with a vast aftermarket accessory market.

- **Unique Selling Points:** Its unparalleled heritage and enduring legacy, the signature "thump" that resonates deeply with enthusiasts, its robust and sturdy build quality, and the emotional connection it

- **Unique Selling Points:** Its unparalleled heritage and enduring legacy, the signature "thump" that resonates deeply with enthusiasts, its robust and sturdy build quality, and the emotional connection it fosters with its riders, making it more than just a mode of transport – it's a lifestyle statement.

Approximate Resale Value: Royal Enfield motorcycles, especially the Bullet 350, tend to hold their value exceptionally well, provided they are maintained properly. After 10 years, a well-maintained Royal Enfield Bullet 350 (UCE model) could still fetch an approximate resale value of **₹50,000 to ₹90,000 INR**, depending heavily on its overall condition, mileage, service history, and current market demand for classic motorcycles. Some exceptionally well-preserved or custom models might even command higher prices.

Fig 7.1.7: Output (Details of the vechicle)

8. ADVANTAGES & DISADVANTAGES

8.1 Advantages of AutoSage Project

Advantage	Description
Automated Vehicle Analysis	Automatically analyzes vehicle images and generates detailed information, reducing the need for manual research.
Fast & Real-Time Results	Gemini Flash provides quick responses, allowing users to get vehicle details instantly.
User-Friendly Interface	The Streamlit-based web application allows users to upload images and view results easily without technical knowledge.
Multimodal AI Capability	Supports both image and text input, enabling accurate understanding of vehicle visuals and descriptions.
Scalability	The application can be extended to support more vehicle types, brands, and additional features in the future.
Data-Driven Decisions	Helps users make informed vehicle purchase and maintenance decisions based on structured AI-generated insights.
Cost & Time Saving	Eliminates the need to visit multiple websites or consult experts, saving time and effort for users.

Table 8.1: Advantages

8.2 Disadvantages / Limitations

Disadvantage	Description
Dependence on Image Quality	Low-quality or unclear vehicle images may reduce the accuracy of generated information.
Internet Dependency	The application requires an active internet connection to access the Gemini API.
API Usage Limits	Free-tier API usage is limited and may cause temporary restrictions under heavy usage.
No Physical Inspection	The system cannot detect hidden mechanical issues or internal vehicle defects.
Requires API Key Security	Improper handling of API keys may lead to security or quota issues.

Table 8.2: Disadvantages

9. CONCLUSION

The AutoSage project successfully demonstrates the use of Generative AI to analyze vehicle images and generate structured vehicle information using the Gemini Flash model. By integrating a user-friendly Streamlit interface, the system allows users to upload vehicle images and instantly receive details such as brand, model, features, mileage, price range, and resale value. This approach reduces manual research, saves time, and supports informed decision-making for vehicle buyers and owners. Overall, AutoSage highlights the practical application of AI in the automotive domain and provides a strong foundation for future enhancements.

10. FUTURE SCOPE

The **AutoSage** project can be further enhanced by integrating additional features and technologies. In the future, the application can support video-based vehicle analysis to provide more accurate insights. Integration with official vehicle databases can improve data accuracy and reliability. The system can also be extended to include a mobile application for wider accessibility. Additionally, multi-language support and cloud deployment can be implemented to improve scalability and reach a larger user base.

11. APPENDIX

11.1 Source Code

The complete source code for the **AutoSage** project is implemented using Python, Streamlit, and the Google Gemini API. The code includes modules for image upload, AI model integration, prompt handling, and output display.

10.2 GitHub & Project Demo Link

The source code and project demonstration video are hosted on GitHub. The repository contains all required files, including the application code, documentation, and setup instructions.

- **GitHub Repository:** https://github.com/Navya-2623
- **Project Demo Video:** https://drive.google.com/file/d/1dsvs2SKGVSIILKLkgcdIV6dkoPW2q7kt/view?usp=drivesdk