Statement of Work

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AutoClass: AI-Powered Vehicle Classification and Interactive Chatbot for Streamlined Identification and Support

Background

In the automotive industry, the demand for efficient and accurate vehicle identification has become important across different sectors, including insurance, dealerships, and car rental services. Current methods rely on manual processes, leading to delays, errors, and inefficiencies in areas such as claims processing, inventory management, and customer service. This project aims to develop a deep learning-powered vehicle classification system that can identify a car's make, model, and year from an uploaded image. The system will use deep learning techniques to accurately process the image and display the vehicle's information to the user. Additionally, we will integrate a chatbot powered by the Gemini API, enabling users to ask questions about the identified car's features, history, or specifications. This combination of image classification and a conversational interface will enhance operational efficiency for industries like car insurance, where quick and reliable vehicle identification is vital to expedite claims and damage assessments. Dealerships and rental companies can also benefit from improved inventory management and more engaging customer interactions. By reducing manual effort and improving the accuracy of vehicle identification, our solution provides immediate, data-driven insights through a user-friendly interactive experience.

Problem Statement

We aim to develop a deep learning-based vehicle classification system to identify a car's make, model, and year using images, and a chatbot powered by Gemini API for interactive user support. This system will streamline processes across various sectors of the automotive industry. Our project will explore the use of pre-trained models such as ResNet18 for image classification, fine-tuned to optimize vehicle identification accuracy. Accuracy will be used as the primary evaluation metric, measuring the system's ability to correctly classify vehicle information. As a baseline, we will use the performance of ResNet18 trained on the Stanford Cars dataset to establish our model's effectiveness. For further optimization, we will explore other architectures such as VGG16 and MobileNet, which have shown good results in similar image classification tasks (Krizhevsky et al., 2012; Simonyan & Zisserman, 2014). In addition to the classification model, a chatbot powered by the Gemini API will be integrated to allow users to interactively inquire about the vehicle. This feature aims to enhance user engagement and provide immediate insights. The importance of automating vehicle identification processes is underscored by studies showing the inefficiencies and errors in current manual methods. For example, a report by Capgemini highlights that 80% of insurance processes could be automated, significantly improving operational efficiency (Capgemini, 2020). Furthermore, errors in vehicle identification can result in inaccurate claim assessments, costing the industry billions in losses annually (PwC, 2019). By leveraging

deep learning models and integrating a conversational AI interface, this project will address these challenges.

Models:

- We plan to train Resnet18 as the baseline model
- We also plan on testing other models like Vgg16, mobilenet, ghostnet, and shufflenet2
- We plan to finetune the model that has the highest accuracy
- Find tools to handle class imbalance

Resources

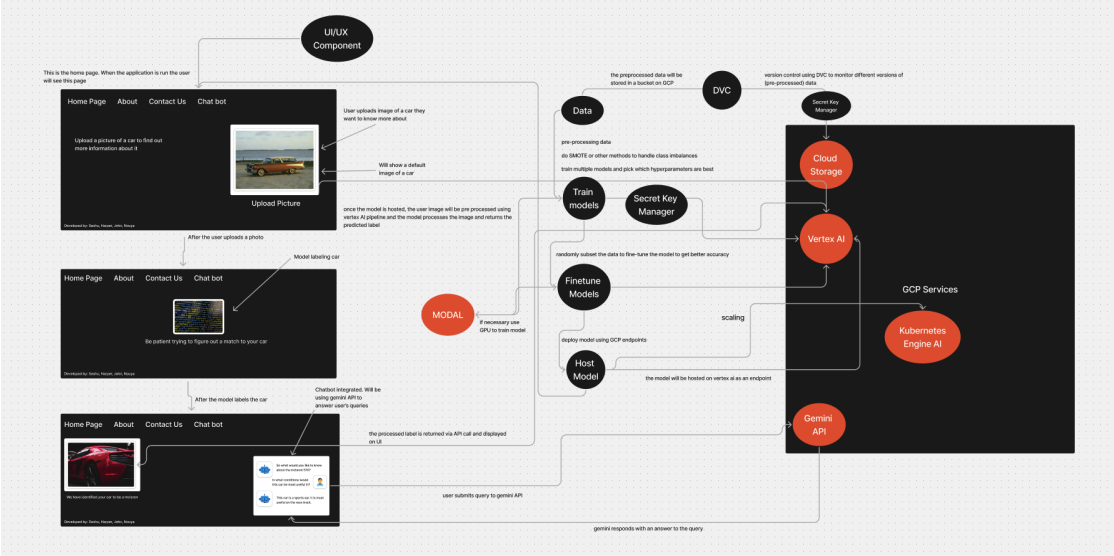
- Tools for data versioning
- GPU to train models for more epochs
- Gemini API
- Model Serving and Deployment
- Kubernetes

High-Level Project Stages

- Obtain car images and labels
- Create containers for each part of ML workflow
- Create baseline models
- Train DL models
- Incorporate Chatbot feature
- Create cloud deployment architecture
- Create and Deploy endpoint (model serving)
- Create UI/UX
- Scale using Kubernetes

UI/UX Design Components:

https://www.figma.com/board/Zp5crxAvXnZ3FyPEo03yCJ/Untitled?node-id=0-1&node-type=canvas&t=SXIN2D7gYuV3dFNo-0



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