[Capstone Category]

Project Name **VehID**

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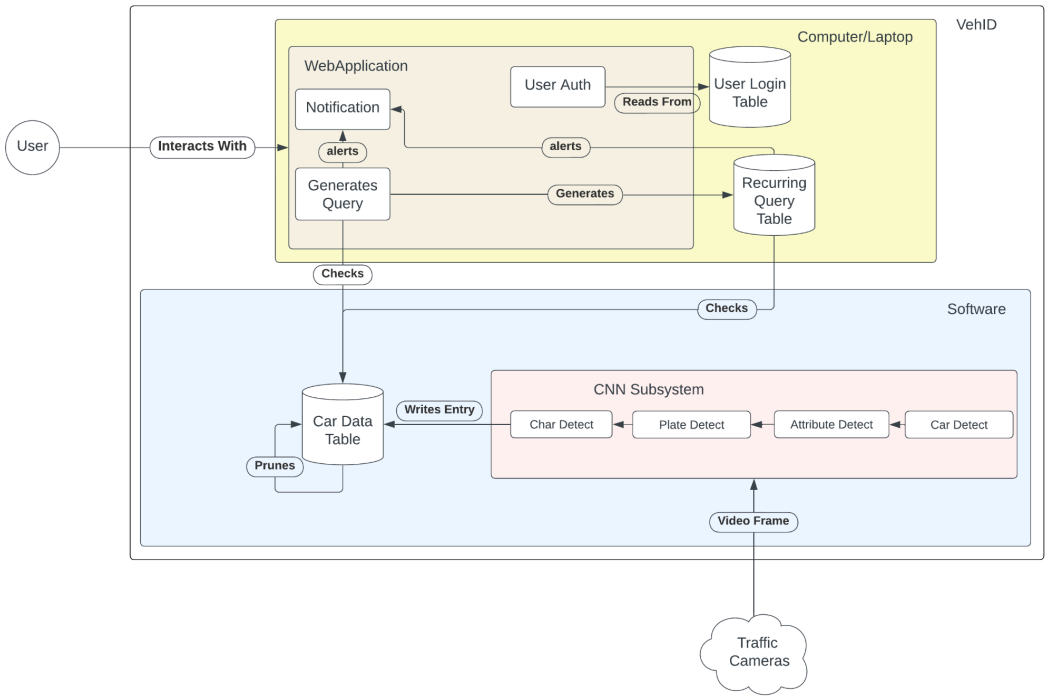
The intention of our project is to improve public safety by utilizing machine learning to recognize vehicles based upon a variety of characteristics such as color, body type, make, and/or license plate. The inspiration of this project was to enhance the current methods of detecting vehicles involved in AMBER alerts, stolen vehicles, and vehicles involved in criminal offenses. The current methods for locating these vehicles often rely on human interaction or utilize license plate readers which are only beneficial when the plate number of the specified vehicle is known.

To approach this problem, we designed the project with three main portions: a neural network subsystem, a backend database, and a web application.

The task of the neural network (NN) subsystem is to take in video footage and return a file containing information of vehicles seen within the video. To complete this task, the program reads in video footage and parses it into individual frames at a given rate that is determined best for the setting the video was taken in. Each frame is then passed through a series of pre-trained neural networks to extract each vehicle and its corresponding information. The neural networks the frames are passed through are in the order as follows: vehicle detection/extraction, color classification, body type classification, vehicle make detection and classification, license plate detection/extraction, and plate characters detection. Once this information is extracted for all the vehicles in each frame of the video, the information is logged in a json file and exported to use within the database.

The task of creating the database was a matter of deciding what information we needed to store in order for our users to access relevant information. The NNs output a full or partial report on each car's information detected by the camera. This means that the database must store incomplete data entries for cars that the NN failed to detect a component of. We established the database with IDs for each entry as well as a column for each data point the NN subsystem provided. The data is outputted and stored in JSON format, allowing for smooth integration with the web application. The second major component of the database is the table that stores user-generated queries that are to be executed to “search” for a car. We decided the best approach to providing the user updates for new entries was to allow them to set these search parameters and have the query execute every “x” minute. This enables the application to continuously query until the car the user was searching for is found/not found.

The task of creating the web application uses the NN subsystem that will parse frames from a video to identify features from a car and create an entry for that car into our database. Users have the ability to create their own queries to find any partial or full matches from our car entry database. If a partial / full match is found the user is told, and the applicable car entry is displayed to the user. Queries created by the user, and car entries created by the NN subsystem will each be displayed in their own respective table on their own web page for easy viewing for the user. Users will have the ability to filter these tables by applicable information such as body type, color, etc. For moderation users have the ability to manually edit, and delete entries in both the queries list, and the car list. This will be to allow for any inaccuracies from the NN subsystem to be fixed. Each frame parsed by the NN subsystem will be saved for manual viewing if the user chooses to.



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