# VehID First Semester Plan

Project Title: Vehicle Recognition for Public Safety (VehID)

**Group Members:**

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**Faculty Advisor:**

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**Client:** Clayton Levins, Executive Director of Smart North Florida

**Date(s) of Meeting(s) with the Client:** Wednesday, September 6, 2023

**Goal and Motivation:**

We plan on utilizing machine learning to recognize vehicles based upon a variety of characteristics such as color, make, model, and/or license plate. This technology will be used to aid in public safety in a variety of situations such as AMBER alerts, stolen vehicles, and criminal offenses. This will be an improvement upon the current systems used in these situations which often rely on pure human interaction to spot and report the specified vehicles.

**Approach:**

1. Identify Vehicles based upon a given criteria

   Using machine learning we plan to develop a system to efficiently, and accurately categorize vehicles based on, color, make, model, and/or license plate information. Institutions such as law enforcement will benefit from our project as it will aid with the process of tracking, and identifying vehicles. Current measures are purely reliant on human perception, which may not be able to accurately log all the necessary details about targeted vehicles. Alert systems such as AMBER provide information about target vehicles that create a situation that is wholly reliant on civilian due-diligence. Our system will instead be autonomous in its monitoring, and aid civilians, and law enforcement alike.We hope our product will greatly improve the quality of life of law enforcement, and create safer, more lawful communities for all to enjoy.

2. Identify numerous vehicles in real-time

   The system will be able to extract individual images of all vehicles in the frame of the camera. This will allow the system to operate on roads regardless of the volume of cars present. In some locations it may be difficult for an officer to monitor all lanes of traffic alone whereas a few cameras allow for a much broader view of the roadway as a whole. Multiple-vehicle tracking may also allow for prediction of the target vehicles

future movement based off traffic patterns. This enables responders to be prepared for a potential confrontation rather than having to react when a situation arises. There is a multitude of further developments which can be made which utilize data from the system, even with the possibility to refine the detection parameters.

3. Report vehicles when full or partial matches are found

   The system will have a database of current vehicles to continuously look for. As the system looks for these vehicles, it will report any full or partial matches so that correct actions can be taken. If a license plate was given, when the complete match is found the system will report the location spotted as well as the direction of movement. If a license plate was not provided, partial matches will be made when the physical description (color, make, and/or model) are identified. The system will report both the license plate on the partial matches along with a current location and direction of movement.

**Novel Features/Functionalities:**

1. Convolutional Neural Network (CNN) used to identify a vehicle based on specified criteria. Offering a constant search to aid in law enforcement expeditions and other vehicle safety concerns.

2. Utilizing the existing network of traffic cameras to monitor roads and highways.

3. Using vehicles themselves as identifiers rather than purely license plate recognition as similar existing technologies currently utilize.

**Technical Challenges:**

1. Training neural network(s) to identify color, make, model, and license plate of a vehicle. This may prove difficult to combine the different classifications with our limited knowledge of neural networks.

2. The ability to recognize and identify multiple vehicles within a single frame from the camera. This may prove difficult as it will require some computer vision concepts to be able to detect the individual objects from a video feed.

3. Working with unfamiliar Python packages/frameworks for both the neural network and computer vision aspects.

**Milestone 1 (Oct 2) Itemized Tasks:**

- Familiarize ourselves with OpenCV and TensorFlow
- Work on validating our dataset, and ensure it will work with our model
- Find collaboration tools for software development, communication, and documentation.
- Create Requirements Documentation

- Create Design Document
- Create a testing plan for future features.
- Agile sprint planning

**Milestone 2 (Oct 30) Itemized Tasks:**

- Split dataset into training and test groups
- Implementation of color recognition
- Implementation of make/model recognition
- Agile sprint planning

**Milestone 3 (Nov 27) Itemized Tasks:**

- Implement text recognition for license plate identification
- Determine hardware (camera) necessary to produce high resolution images/data.
- Familiarize with computer vision framework used to track vehicles
- Adjusting parameters based on milestone 2 results
- Agile sprint planning

**Task Matrix - Milestone 1:**

| **Task** | **Remington** | **Spencer** | **Thomas** | **Alexis** |
|---|---|---|---|---|
| Familiarize with OpenCV and TensorFlow | 25% | 25% | 25% | 25% |
| Sprint planning | 20% | 20% | 40% | 20% |
| Work on training dataset | 20% | 40% | 20% | 20% |
| Determine collaboration tools | 20% | 20% | 40% | 20% |
| Create requirements document | Write 30% | Write 20% | Write 30% | Write 20% |
| Create design document | Write 20% | Write 20% | Write 20% | Write 40% |
| Create testing plan | Write 20% | Write 30% | Write 20% | Write 30% |

**Approval From Faculty Advisor:**

"I have discussed with the team and approved this project plan. I will evaluate the progress and assign a grade for each of the three milestones."

Signature: _____ Date: _____