

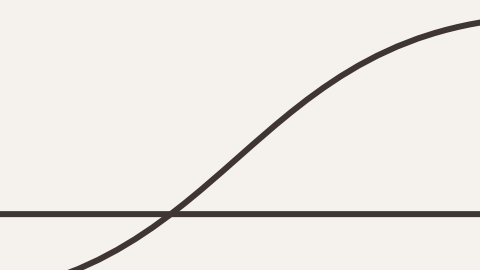


# VehID – Milestone Evaluation

**Members:** Remington Greko, Spencer Hirsch, Thomas Johnson, and Alexis Nagle

**Faculty Advisor:** Dr. Silaghi

**Client:** Clayton Levins





## Milestone 2

# Milestone 2 Progress Matrix

Task	Completion %	Remington	Spencer	Thomas	Alexis	To-do
Split Dataset	100%	20%	30%	20%	30%	NA
Create color recognition Model	100%	25%	25%	25%	25%	NA
Hyper-parameter tuning	100%	30%	30%	20%	20%	NA
Data preprocessing	100%	20%	20%	30%	30%	NA
Sprint Planning	100%	25%	25%	25%	25%	NA
Milestone Evaluation	100%	25%	25%	25%	25%	NA

# Tasks - Data Preparation

- Data Preprocessing
  - Manually revised the dataset
    - Combined like colors
      - Tan & Beige
      - Silver & Grey
    - Removing confusing images
      - Misplaced images
      - Images without a full vehicle
  - Scaled images to a uniform 64x64
- Split Dataset
  - Continued with pre-divided split
    - 70/15/15

# Tasks - Color Recognition CNN Creation

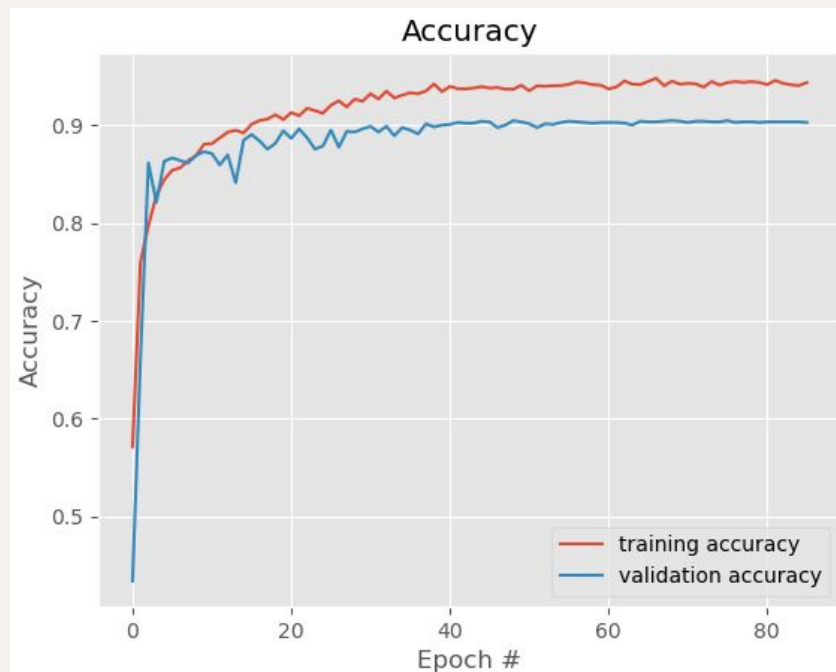
- Tested multiple architectures with various optimizers
  - Single Layer Benchmark - 67% Accuracy
  - Small Convolutional - 69% Accuracy
  - Mini VGGNet
    - With Adam Optimizer - 77% Accuracy
    - With SGD Optimizer - 80% Accuracy
  - AlexNet
    - With Adam Optimizer - 77% Accuracy
    - With SGD OPTimizer - 76% Accuracy

# Hyper-parameter Tuning

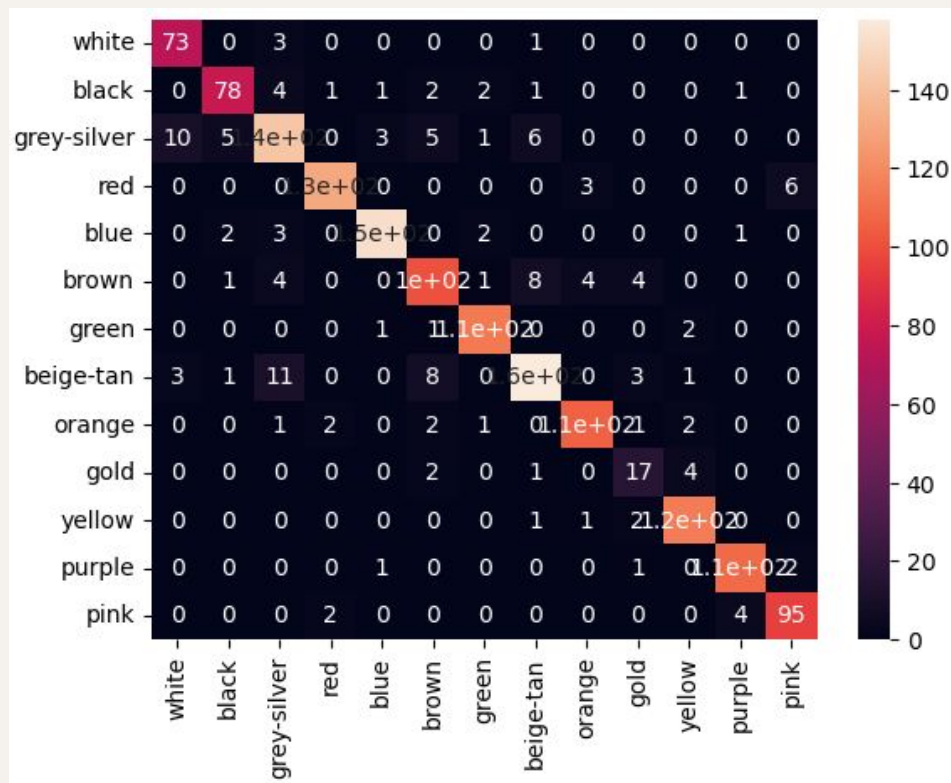
- Hyper-parameter tuning on Mini VGGNet w/ SGD
  - Learning Rate (LR)
  - L1 & L2 Regularization
    - Used to prevent overfitting model
      - L1 (Lasso): Useful for feature selection
      - L2 (Ridge): Distributing influence of features in the model
  - Random Weight Initialization
  - Early Stopping and Reduce LR on Plateau

# Accuracy Results

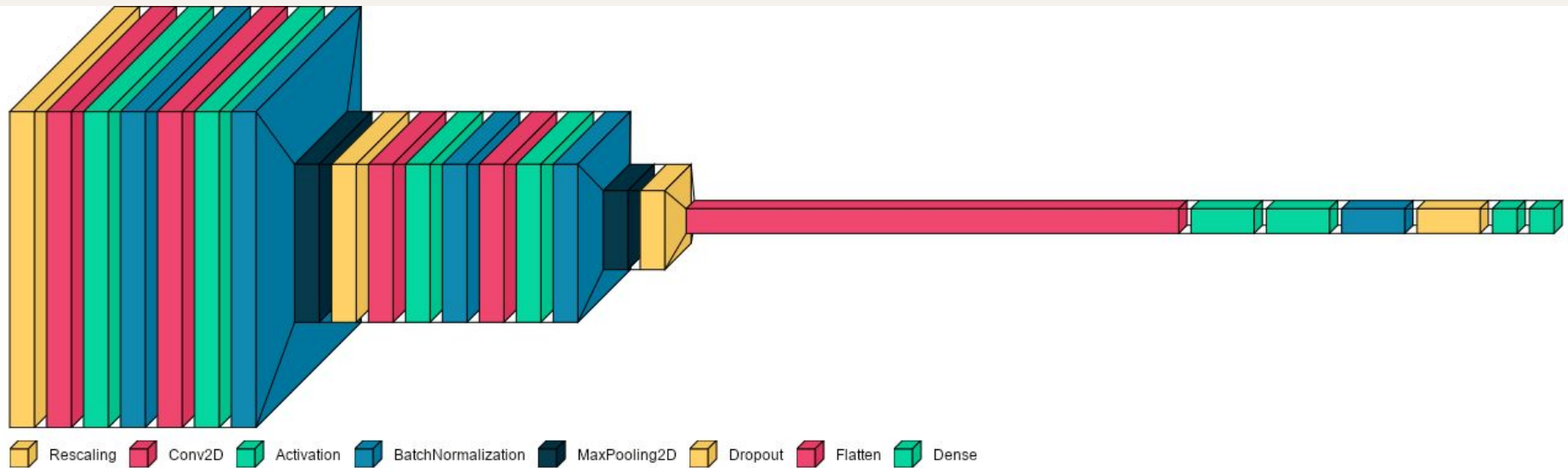
	precision	recall	f1-score	support
white	0.85	0.95	0.90	77
black	0.90	0.87	0.88	90
grey-silver	0.85	0.83	0.84	172
red	0.96	0.94	0.95	140
blue	0.96	0.95	0.96	161
brown	0.83	0.82	0.83	123
green	0.94	0.97	0.95	118
beige-tan	0.90	0.85	0.88	185
orange	0.93	0.92	0.93	115
gold	0.61	0.71	0.65	24
yellow	0.93	0.97	0.95	119
purple	0.95	0.96	0.96	113
pink	0.92	0.94	0.93	101
accuracy			0.91	1538
macro avg	0.89	0.90	0.89	1538
weighted avg	0.91	0.91	0.91	1538



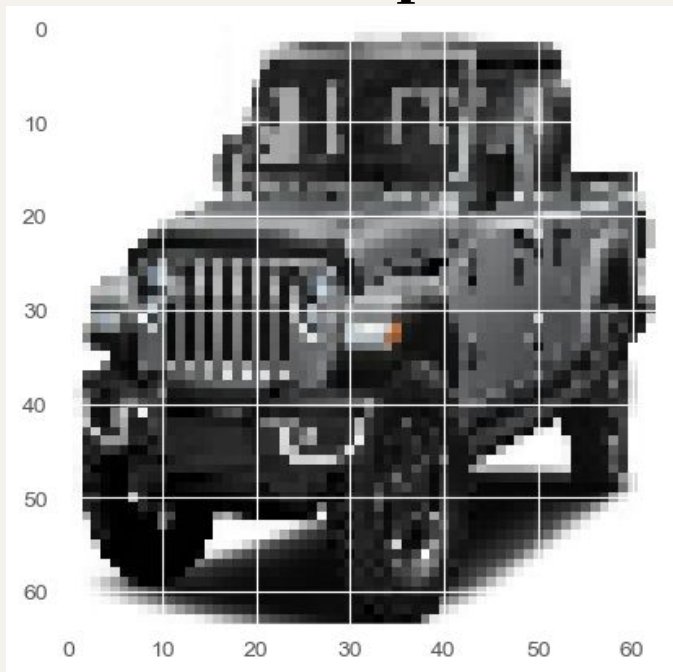
# Model Confusion Matrix



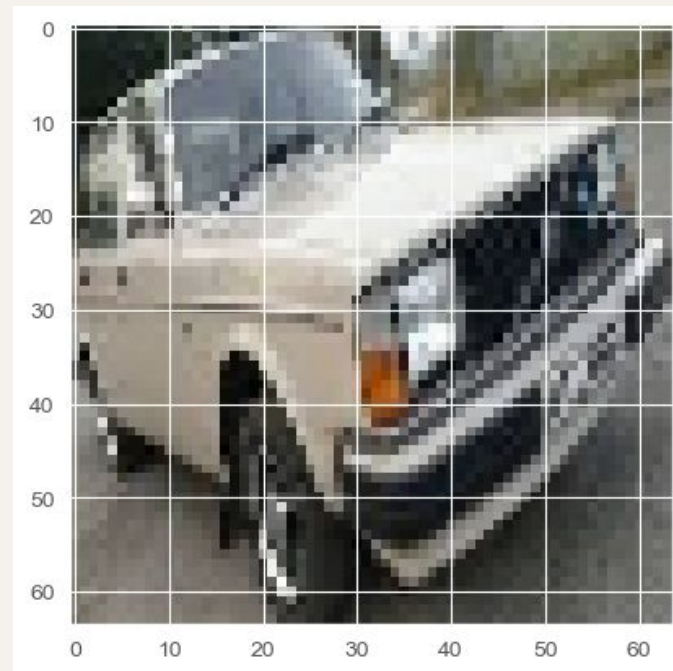




# CNN Example Predictions



The model is 97.30% confident that the image is a grey-silver vehicle.  
The correct color of this car is grey-silver.



The model is 43.16% confident that the image is a brown vehicle.  
The correct color of this car is beige-tan.

# Client Feedback - Clayton Levins

- Expressed satisfaction with the dataset contents and splitting of it.
  - Agreed with our revisions of color classifications (ie. combining tan and beige)
- Expressed satisfaction with the accuracy of our model.
  - Advised that the DOT may have higher standards of model accuracy.
- Overall our client was extremely pleased with our progress so far and hopes to continue to assist and evaluate our project.

# Advisor Feedback – Dr. Silaghi

- Expressed no concern with our data set or the 70-15-15 split it was arranged in.
- Requested we create a visualization of our model along with testing individual decision-making nodes to ensure overfitting did not occur.
- Expressed satisfaction with the hyper-parameter tuning we performed.
- Agreed with our decision to combine very similar color classifications.
- Overall our advisor was satisfied with both the quality of work and progress made so far. We have already made adjustments to many of the areas of concern.



## Milestone 3

# Milestone 3 Tasks

- Review and Revise Dataset
  - 196 classes, 16,185 images, 2 GB
- Split Dataset
- Data Preprocessing
- Create Convolutional Neural Network for Make/Model Recognition
- Hyper-parameter tuning
- Sprint Planning
- Milestone 3 Evaluation

# Task Matrix - Milestone 3

Task	Remington	Spencer	Thomas	Alexis
Split Dataset	20%	30%	20%	30%
Create make/model recognition Model	25%	25%	25%	25%
Hyper-parameter tuning	30%	30%	20%	20%
Data preprocessing	20%	20%	30%	30%
Sprint Planning	25%	25%	25%	25%
Milestone Evaluation	25%	25%	25%	25%

The image features two horizontal lines, one at the top and one at the bottom. Each line has a smooth, curved segment at its left and right ends, creating a frame-like effect. The word "Questions?" is centered between these lines.

Questions?