Multi-Perspective Automotive Labeling for AI@Edge

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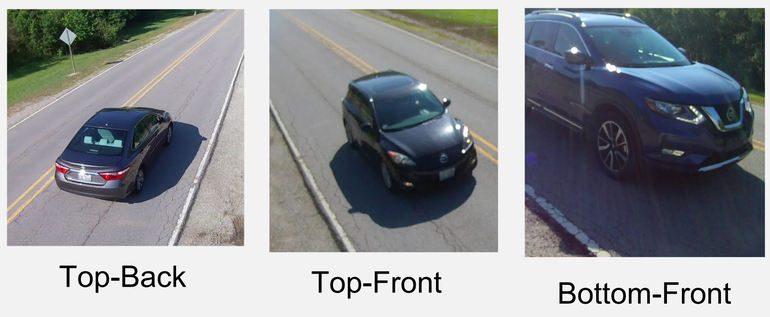
Background

With Deep Learning becoming more of a prevalent part of our society, data is becoming increasingly important. Currently, most of the data available for public consumption of cars are in three different perspectives: the back, front, and side of a car. In order to implement a deep learning neural network into a sensor or other devices, the model should be able to recognize the make and model of a car from multiple different perspectives. **The goal of our project is to make a dataset with three new perspectives: Top-Front, Top-Back, and Bottom-Front.**

Traditional Perspectives

Our Perspectives



Top-Back | Top-Front | Bottom-Front

Experiment Setup

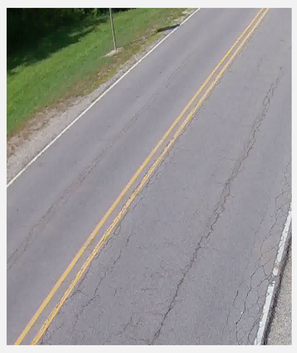
- Two poles
- One pole has one camera to record the top back perspective
- Other pole has two camera to capture top-front and bottom-front perspective
- All cameras took eight 10-minute videos in total

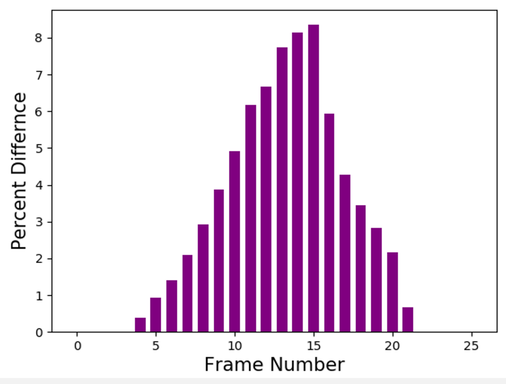
Processing Frames

Method

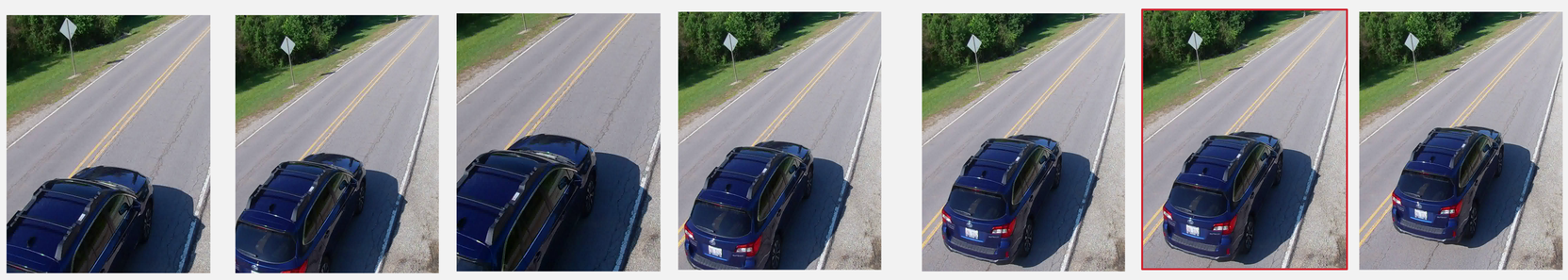
1. Spit the video frame by frame
2. Compare frames with base image and save frames with a percent difference greater than 2.5.
3. Find ”peak” frame — the frame with the biggest percent difference with base image
4. Save 5 frames before the peak, the peak frame, and one frame after the peak
5. Labeling the frame using Spectrico’s free neural network

Base Image





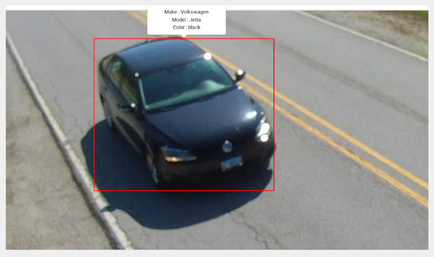
Label



Frame 1 | Frame 2 | Frame 3 | Frame 4 | Frame 5 | Peak Frame | Frame 6

Results

With the free version of Spectrico’s model, it was possible to label about 60% of the dataset. However, the model mislabeled dark colored cars and was inconsistent in the top-front perspective. We believed this was caused by the data the neural network was trained on. This prompted us to find new ways to increase the accuracy of our labeling process. We experimented with the saturation and pixel values of the images before giving the image to Spectrico’s model. However, both of these methods did not improve overall labeling accuracy. Our most effective method was requesting a post request to Spectrico’s demo version of their paid service and reading the reply for the car make and model. With this method, we are expected to label about 80% of our dataset.



Sources:
Spectrico. (2019). Retrieved July 22, 2019, from Spectrico website: http://spectrico.com/demo-car-mmr.html

Future Work

Our goals for the future are to finish labeling the dataset and to start training a neural network to label the make and model of a car. Eventually, we would like to have a model accurate enough to incorporate it into Waggle sensors. One possible use for the sensor is monitoring energy consumption of electric vehicles.

Acknowledgements

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