Project Plan

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0. Motivation

Conceptually, a 'self-driving car' is an intelligent agent which perceives its environment and acts rationally upon it. A car might obtain signals from its environment through an in-car camera, a cheap camera device which provides low-resolution images. We will focus on a narrow subtask of object classification and detection. Specifically, can we detect speed-related signages on Singapore roads? We envision that such a model could inform the car's CPU of the speed limit, and the driver may be notified if he exceeds the speed limit.

1. Problem Statement

Develop and deploy a deep learning **multi-label, multi-class classifier** which, given images from a consumer-grade in-car camera, is able to detect **speed-related signages** in the driving environment with reasonable accuracy. We have shortlisted the following classification tasks:

- Speed limit signs (including distinguishing between different speed limits, e.g. 60 km/h vs 90 km/h)
- School Zone entry and exit signages
- Expressway entry and exit signages

2. Methodology

1. Obtain 500 Street View images of Singapore roads from the Google Maps Street View Static API. We will manually select and annotate these images ourselves.
2. Train deep learning models (MLP, CNN) to perform the classification tasks on the Street View images.
3. In the meantime, Kenneth will install a front-facing in-car camera and collect real-world images from his commutes.
4. Generalize our model to make predictions on the collected images. Make the appropriate enhancements to our models through experimentation & inspiration from known object detection models.

3. Project Milestones & Tasks

All tasks are equally shared between us with the exception of street video recording. Coding will be done live on Google Colaboratory. Additional tasks may be explored if time permits.

No.	Milestone	Subtasks (work allocation)	Target date
0	Collect Google Maps Data	Meet with TA, discuss project. Image selection & acquisition. Image processing & annotation.	27/09/21
1	Train Baseline Models	MLP & CNN from scratch. Further opportunistic image acquisition.	20/10/21
2	Collect Data From Car Camera	Record street video. Image processing & annotation.	In parallel with task 1
3	Further Enhancements To Models	Experiment with model architecture. Regularization.	End of October 2021