Project Title:  
Exploring RL as a means for solving the self-driving car problem

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# Introduction and Motivation

Millions of automotive deaths a year globally make self-driving problems incredibly important. Mitigating these deaths by creating effective models for autonomous vehicle. Cars R cool. Passing the course. We want to show up Uber ATG, and get payyyyyed.

# Methods

## Environment Selection and Setup

* What gyms we are using OPENAI
* What environments
  + CarRacing-V0
    - descriptions
  + Highway-V0
    - descriptions

## Algorithm Selection

* Q-Learning
  + Talk a little bit about each
* DDPG

## Algorithm Integration and Development

### Tier 1: Completing a 2d race track

### Tier 2: meeting some type of speed requirement

### (POSSIBLE) Tier 3: navigating obstacles/traffic

## Evaluation Metrics

* The following are not weighted equally in descending order of importance:
  + Vehicle collisions
  + Time off track
  + Time to complete
* Other metrics we will consider include:
  + Dispersion across Time (DT)
  + Short-term Risk across Time (SRT)
  + Long-term Risk across Time (LRT)

# Intended Experiments

A number of experiments will be carried out in order to evaluate our implementations of each tier and for each algorithm:

* Tier 1 experiments:
  + Changing the track after learning
* Tier 2 experiments:
  + Reward adjustment to optimize for speed.
  + Episodic limits
* Tier 3 experiments:
  + Adding obstacles to the track upon instantiation
  + Adding obstacles at stochastic intervals
  + Adding additional actors to track
  + Randomized variable assignment

# Planning and Milestones

## Milestone 1

* February 14
* Environments, workflow, repository, GCP, configured and installed.

## Milestone 2

* February 28
* Q learning implemented and working for Tier 1

## Milestone 3

* March 7th
* DDPG implemented and working for Tier 1

## Milestone 4

* March 14
* Q learning and DDPG for Tier 2
* Start project report

## Milestone 5

* March 21
* Tier 2 completed and finalized (including all information required to get a B)

## Milestone 6

* April 4
* Complete any extra materials/experiments/implementations related to Tier 3

## Milestone 6

* April 11
* Project wrap up and polish
* ReadME updating, documentation, images, Project asset creation, data visualization

##### References