

# CE 4984 & 5984: (Advanced) Robot Motion Planning Fall 2018

## Proposal

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### Project Title

Auto Drive Robot with Reinforcement Learning

### Team Members

Jianyuan (Jet) Yu

### Team Name

AutoDriveRobot

### Overview

*Brief motivation for your problem and the related work.*

Most auto drive robot apply stop-sense-act way, which slow down the actions for robot in same time-critical task, as well as full sensing is not available in some cases. While reinforcement learning could avoid excessive sensing by partial observation. MDP is a classic way while constraint for the number of states and corresponding computation, the more recent Deep Q Network tends to be promising at this point. Our proposal aims at apply MDP, DQN and some other variation to guide robot drive automatically even with partial observation.

A real time evaluation will be carried on robot after abundant offline training in simulation.

### Problem Formulation

*Concise definition of the problem you intend to solve.*

*List of assumptions*

A robot car is running in a fix-lane highway, with endless blockage (like show cargos) ahead. These blockages show up in various patterns like constant, hopping, intermittent etc. Our auto car may take hard brake when choose wrong lane, or smartly choose the right lane. We expect our car can learn the patterns of blockages in a reinforcement way to avoid them with the least trials.

The scenarios are simulations by ROS & Gazebo, programming is implemented by python and tensorflow library.

### Proposed Approach

*Overview of how you plan on solving the problem. Include references to existing work if you plan on implementing their algorithms. It is okay if this changes over time.*

1. Markov Decision Process
2. Deep Q Network
3. POMCP for partial observation
4. Deep Recurrent Q Network for partial observation

### Proposed Timeline

Dec, 2 <sup>nd</sup>	Submit report
Nov, 25 <sup>th</sup>	Field work
Nov, 11 <sup>th</sup>	POMDP, simulation setup
Oct, 28 <sup>th</sup>	DQN
Oct, 14 <sup>th</sup>	MDP

### Individual Responsibilities

Clearly mark the responsibilities of each individual in the group. It is okay if these change over time.