# Udacity Machine Learning Engineer Nanodegree

Project 4: Smartcab

## **Student: Boaz Av-Ron**

## Implement a Basic Driving Agent

***Question:*** *Observe what you see with the agent's behavior as it takes random actions. Does the smartcab eventually make it to the destination? Are there any other interesting observations to note?*

**Answer:**

The smartcab seems to have only a small probability or reaching the destination. As long as the deadline is not enforced, the smartcab continues to move around the greed and the simulation does not end. The distance to the destination is irrelevant – the smartcab may be one intersection away from the destination and move away.

## Inform the Driving Agent

***Question:*** *What states have you identified that are appropriate for modeling the smartcab and* *environment? Why do you believe each of these states to be appropriate for this problem?*

**Answer:**

Given that we have a planner telling us where to go, I’m assuming that learning how to find the shortest route it not in scope. In fact, the rewards the learner gets relate to two thing:

* Did the learner follow directions from the planner
* Did the learner follow the rules of the road

At first I thought I could encode my domain knowledge of what the rules of the road are into the state. For example: {next\_waypoint: ‘left’, good\_to\_go: True} or {next\_waypoint: ‘right’, good\_to\_go: False}. This would be a complete enough state to teach the learner to follow the next waypoint suggestion when the rules of the road allow it and do nothing when the state is good\_to\_go == False. However, this seems like too simple an exercise, so I’m guessing the intent is to have the learner actually learn the rules of the road. For this, the learner needs to know the status of the intersection. The rules of the road depend on the traffic light and the presence and direction of other cars. The presence and direction of a car can be represented in one variable per direction (as it is in the inputs the learner gets). Therefore, the state needs 5 variables in total:

* The next waypoint – required so that the learner can learn to follow the directions
* The traffic light state (red/green) – could be a factor in the rules of road being learned (we know it is for all turns, but the learner needs to learn that)
* The state of the intersection to the left of the learner (None/left/forward/right) – could be a factor in the rules of road being learned (we know it is for right turns on a green light, but the learner needs to learn that)
* The state of the intersection for oncoming traffic (None/left/forward/right) – could be a factor in the rules of road being learned (we know it is for left turns on a green light, but the learner needs to learn that)
* The state of the intersection to the right of the learner (None/left/forward/right) – could be a factor in the rules of road being learned (we know it isn’t, but the learner needs to learn that)