**Graded Discussion 8**

Reinforcement learning or learning by experience shows considerable promise for creating intelligent agents for difficult tasks. However, training RL models can be difficult. Difficulties can include training time, safety of actions during training, and availability of sufficient training data.

Consider an application where you would like to apply reinforcement learning. What training difficulties do you anticipate? How might you overcome some of these difficulties?

Make a post of about 100-300 words discussing your application idea. Then post a comment or question on another students post of about 100-200 words.  Posts are due by June 7. Do not post respond in Canvas.

I recently was introduced to a company called Zoox, which was recently acquired by Amazon and it is currently working on the development of self-driving cars and as they say “reimagine transportation from the ground up”. When I talked to them some of the topics mentioned as some of the main challenges they are facing are related to computer vision and the autonomous driving system, which is in turn related to Reinforcement Learning. This topic of autonomous mobility has been around for some time, but now it seems that we are closer than ever to start seeing this systems out there at a bigger scale (Examples: Zoox & Waymo). This will help to mitigate some of the problems that we see in big cities in terms of vehicle dynamics (traffic jams, over concentration, waiting times for transportation) and this will open the conversation to other topics such as allocation optimization, environment control, and even flying cars and autonomous flight (which obviously is a more complicated problem, given the new degrees of freedom). Some of the autonomous driving tasks where reinforcement learning could be applied include trajectory optimization, motion planning, dynamic pathing, controller optimization, and scenario-based learning policies for highways.

One of the main difficulties with the training of such systems is safety. Compared to other systems where learning from practice (in a real world environment) might be Ok, Reinforcement Learning for autonomous driving has to be performed in a simulated environment first where the AI Scientist will need to make sure the reward function ensures the system is not only the trajectory/energy, but also safety for the passenger and people around (which probably is more related to the policy function than the reward itself). Once this is completed to a satisfactory level, maybe at that point more testing in a control environment can be perform to ensure the autonomous system is not going to have unintended consequences in a real life scenario/environment. But I guess soon enough this is conversation that we will start having as a society, once these systems get commercialize at a bigger scale (which might be sooner than expected).

**References:**

Zoox (autonomous vehicle company): <https://zoox.com/vehicle/>

Applications of Reinforcement Learning in Real World: <https://towardsdatascience.com/applications-of-reinforcement-learning-in-real-world-1a94955bcd12>

10 Real-Life Applications of Reinforcement Learning: <https://neptune.ai/blog/reinforcement-learning-applications>

Reinforcement Learning Applications: <https://medium.com/@yuxili/rl-applications-73ef685c07eb>

Reinforcement Learning for Real Life Workshop: <https://sites.google.com/view/RL4RealLife>

Deep Reinforcement Learning for Fluid Dynamics and Control: <https://www.youtube.com/watch?v=NZNl-M040NY&list=PLMrJAkhIeNNQe1JXNvaFvURxGY4gE9k74&index=8>

“Learning to Fly like a Bird” by Tedrake et al: <https://groups.csail.mit.edu/robotics-center/public_papers/Tedrake09.pdf>

Udacity Certification on Self Driving Cars: <https://www.udacity.com/course/self-driving-car-engineer-nanodegree--nd0013>