Assignment 12

Reinforcement Learning

Reinforcement learning is more suitable for simulated environments, and environments in which making mistakes has very low to zero cost. For the applications listed below, list whether reinforcement learning is suitable or not, explaining why. Feel free to include details that better define the environment or the conditions under which reinforcement learning would or would not be suitable.

1. Medical diagnosis of cancer patients
   1. Not suitable. Mistakes will have devastating, possibly fatal consequences for patient outcomes if they are misdiagnosed. Patients with cancer would not receive vital treatment, and patients without cancer would unnecessarily undergo toxic chemo and radiation therapy. However, this could be a suitable approach if only historical data is used and the results are not used to guide patient treatment.
2. Recommending the next action to an auto-pilot
   1. Not suitable. This will endanger lives and property given that the vehicle will often collide with objects until it learns to avoid them and properly navigate. However, this would be perfectly suitable in a video game or within a simulation.
3. Exploring a area with limited space to explore
   1. Suitable. RL is a good option for determining space limitations and obstacles within the space.
4. Identifying plants based on their physical features
   1. Not suitable. This application is a classification task, so a neural network would be more suitable for this.
5. Recommending buying/selling decisions for stocks
   1. Not suitable. Every decision incurs real costs, and using RL for this is about as useful as a coin toss.
6. Controlling a robot arm that assembles toys
   1. Suitable. The risk is low in this application, so RL is fine. However, I believe there are likely better alternatives than a trial and error approach to this.
7. Training a self-driving car in a simulated environment
   1. Suitable. Simulations are risk free and so this is a great application for RL in learning how to handle obstacles and stay within proper roadways.
8. Training a self-driving car in a real environment (driving in real streets)
   1. Not suitable. This is not a good application of RL for the same reasons as #2 above. It would be better to train the model using recorded or simulated examples prior to using it in a real-life scenario.