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## DEEP REINFORCEMENT LEARNING

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Deep reinforcement learning (DRL) is a subfield of machine learning that utilizes deep learning models (i. e. neural networks) in reinforcement learning (RL) tasks. The agent takes actions in an evolving environment that produces rewards to reinforce the actions of the agent. Therefore, «computer» is rewarded if it does something productive and gets «punished» in case of undesired results. Best actions are selected and bad moves don't make it in. This method is known as Markov decision process.

I created the environment where reinforcement learning approach is used for training physics based car which learns to avoid obstacles. The project was made in Unity, using MLAgents, reinforcement learning and C# scripts. The car receives positive reward for driving into the goal and negative reward for driving into the walls, obstacles or for circling around. This is the first project of its kind that takes on using reinforcement learning for physics based car. Car controller is based on wheel collider physics; therefore, it was tricky to train such car. The main goal is for the car to reach a certain point on the map while avoiding objects, obstacles and other cars.

The model was set to train on static obstacles for 5 million steps. After successful training, it was time to move on to the randomly generated positions of the obstacles which took over 60 million steps to train perfectly. The final goal was to train model with dynamic obstacles. This process took over 200 million steps.

The next project was training a drone environment which was setup in similar manner, except neural network was programmed to take over 21 actions and collect the observations in 3D space. Training such environment proved to be challenging as it took nearly 3 months of complex computations of trial and error. Nevertheless, it turned out to be a successful project. Drone became fully operational and could maneuver easily and smoothly within complex environment, filled with obstacles.

Deep learning algorithms have become ubiquitous in our daily lives, and their sophistication and complexity continue to grow rapidly. As someone who works as a backend developer in IT, I am fascinated by the potential of machine learning and the development of neural networks. In the future, these skills will be invaluable, and I am excited to contribute to this field and help make the world a better place through my work as a machine learning developer.