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Senior Design

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Individual Capstone Assessment

My team’s senior design project will be an AI Pokémon Battler. It will be done using a Double DQN reinforcement learning algorithm. The algorithm will learn by playing against itself and, possibly including some professional players to help the model’s initial learning. In my studies I have always loved machine learning, and I got started in the field using machine learning to play games, so I am excited to go back to doing that as it is very fun while still being an incredibly useful learning tool. I also am excited to learn out some new techniques since I have very little experience in the field of reinforcement learning.

Throughout the years at UC, I have kept my interest for machine learning, and one of my recent classes, Deep Learning (CS 6073), helped me understand the more fundamental aspects of how it works. I also worked a bit on game development/interaction in my Software Engineering class (EECE3093C). In software engineering, my team and I made a mobile app tower defense game, which was super fun to work on so that definitely influenced my idea for the capstone project. I also have to mention that my Intro to Data Science class (STAT3041) helped keep me on the right track for learning about how these algorithms work. Another class I took, Python Programming (CS2021), gave me a lot of the tools I ended up using to actually learn and develop my own skills with machine learning and data science as a whole. Overall I have known I wanted to do machine learning since I got here at UC, and all of these classes have given me the tools to explore the field on my own and actually make my own machine learning projects.

I only worked for Kinetic Vision for all five of my co-ops, I worked as a “Machine Learning Intern.” I have loved machine learning since my interview, and they have a fun team of people who I enjoyed working with, so I stuck with them the whole time. I obviously learned a lot about specific machine learning frameworks like TensorFlow and PyTorch, but I also learned so much about image processing and graphics. I ended up doing a lot of computer vision projects, allowing me to learn about things like 3D modeling in Blender and how to use opencv and numpy for image processing. I think these more technical skills might be useful in this project for creating some of the art. I also learned some other things, like how to manage a long-term project while working as a part of a team using JIRA or something similar. I will probably try to get my team to use a JIRA board as a way to organize our effort throughout the capstone project.

This project has me excited because it has to do with reinforcement learning agents, and I have always loved the ideas behind how they work since they can seemingly learn on their own to play a large variety of games. I also think it is going to be easier to stay motivated working on because it is related to a fun game, and games are (hopefully) more fun to test. I have started designing the game with my team in the same way I approach a lot of my school projects, with a brain dump document for all of our ideas. As we work on the project and finalize some of the more basic things (what frameworks to use, overall agent architecture design, etc.) we will refine the ideas to what is actually feasible in the remaining project scope. I think it will also be extremely useful to have a JIRA board like I mentioned before, since they can be very helpful in organizing thoughts and ideas.

Hopefully, by the end of the project we will have a decent Pokémon AI where the player can notice that it is at least on-par with the average player. I expect that we will have the agent architecture be a Double DQN, as there are tutorials online for how to use those to learn games like Mario. Like all machine learning projects, evaluating the results can be a bit tricky since it will be hard to tell if the agent is learning how to play better, since “better” is hard to define in a game as complex as this. I think we will accomplish this by having multiple play testers record their gameplay to ensure that the agent is able to beat real humans sometimes. Finally, I think we will know we are done by the amount and quality of feedback from the people battling against the agent, when the negative feedback slows down significantly it should be good to go.