Eric Wolff

Fred Annexstein

Senior Design

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Individual Capstone Assessment

My team’s senior design project will be a roguelike dungeon crawler game. In this game, the enemies will adapt to beat the player(s) specific playstyles. It will be done using an evolutionary algorithm where the “generations” last a single floor in the dungeon. The enemies will be rated on their fitness based on some metrics, like how much damage they did to the player or how long they lived. Every generation will be created randomly from the last with the higher the enemy’s fitness giving it a higher probability of being chosen to parent the next generation. In my studies I have always loved machine learning, and I got started in the field with genetic algorithms so I am very happy to have the opportunity to use them here. I also am excited to try out some of the cool techniques that I have only ever used in dummy projects, like neuroevolution of augmenting topologies.

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 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 genetic algorithms, and I have always loved the ideas behind how they work. I also think it is going to be easier to stay motivated working on because it is a game, and games are (hopefully) more fun to test. I am also extremely excited to work on some new things outside of machine learning too, like creating these combat systems and mechanics. 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 game design, etc.) we will refine the ideas to what actually is 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 playable game where the enemies are noticeably better at playing against your specific playstyle by the later levels. I expect that we will have the genetic algorithm implemented using NEAT (or just neuro evolution), as it is the choice that would allow the enemies to change their behavior instead of just changing their stats. Like all machine learning projects, evaluating the results can be a bit tricky since it will be hard to tell if the enemies are actually learning. I think we will accomplish this by having multiple play testers record their gameplay to ensure that the enemies actually learn the specific player style. We will also have to make sure the game is fun, and that is another thing we can ask the people who are testing the game for us as we finish it. Finally, I think we will know we are done by the amount and quality of feedback from the people testing the game out, when the negative feedback slows down significantly it should be good to go.