

CSC 4661

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Final Project Proposal

What is the problem that you will be investigating and what is your contribution to solving it?

Our team will be attempting to solve the game Flappy Bird. In Flappy Bird, the player attempts to navigate through narrow channels. Our challenge would be to teach an agent when the bird should flap or not. We aim to create a model that can better navigate the environment from existing models by adding priority to past playthroughs experiences.

What data, simulator or real-world reinforcement learning domain will you be looking at? How will you get the data you need?

We plan to use the environment provided by the pygame library. We will be starting with the implementation of the Flappy Bird game from Geeks for Geeks (<https://www.geeksforgeeks.org/how-to-make-flappy-bird-game-in-pygame/>). We have downloaded and explored the implementation, so we can access and use it.

What algorithm do you propose to address this problem/domain and why? Are there existing implementations for your chosen problem? If so, how do you plan to improve or modify them?

We plan to use DeepQ algorithm to address this. Since Flappy Bird's environment is continuous, the DeepQ algorithm will be able to efficiently manage the state space. Existing implementations also take advantage of a DQN; however, some shortcomings of [the current approach](#) are overfitting and forgetting. Because the existing approach uniformly samples from replay memory, there are some important playthroughs (that provide more impact than others) that are not included, preventing the model from performing at its highest potential. Therefore, we aim to prioritize these playthrough experiences to expedite training and convergence.

What literature do you need to survey to provide context and background?

To solve the game of Flappy Bird using a DQN, we first need to learn how DQNs work. Once we have the background knowledge, we will need to explore libraries for DQN implementation. In addition, we can review existing implementations to see what software/libraries used and how they captured the Flappy Bird environment for their models. Finally, we can further explore the Geeks for Geeks implementation and the pygame library to get a better understanding of the environment we are using.

What sort of results do you expect and how will you evaluate them (e.g. plots or figures, performance metrics, statistical hypothesis tests, etc.)?

We plan to use the agent's score (the number of pipes successfully flown through), the number of frames the bird is alive in, and the number of crashes as metrics for our project. With these metrics, we can use a variety of plots to visualize our agent's progress. One example would be using a line chart to display the survival time (number of frames) of our agent throughout the episodes.