GAMING MEETS AI!!!

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**Keywords**

2048 , game , Reinforcement learning(RL),DQN algorithm , Prateek Neema, AI , pytorch , network, training

**Description**

The first part of the project was about learning and reading about the different concepts and methods used in machine learning especially deep and reinforcement learning.

I also had to read various research papers and previous similar topic’s project reports.

The second part was to program an agent based on the DQN algorithm (Deep q learning) and train it to play the game of 2048 and improve its score overtime to finally be able to perform at or even better than human levels.

I used python for all the coding and used pytorch to create the deep network.

**Progress**

1. **Plan**

We started the project around the start of April.

The first task was to learn and practice using python and its different modules. We were given some sources and some practice questions to get a good feel of everything. I watched a few videos on YouTube as well which greatly helped me get comfortable with python. We also had to spend some time getting familiar with git and GitHub. This would take up most of April and we also had our midsems at that time.

We would then start with the deep learning book and Stanford lectures on topics relevant to our project. This was for the last week of April and first week of May.

The next task was to read and understand a few chapters of the reinforcement learning book by Barto and Sutton. This was to be completed by the end of May.

The first two weeks of June were to be used for learning pytorch/tensorflow ad using it to create deep models on Open AI gym. We had our endsems in June end.

Post that, we had to read several research papers and project reports and then program the agent, train it and then finally perform. This would mark the end of our project around mid July.

In this whole period, we would have meets at the start of every new task and we would have meets frequently towards the ends.

1. **Execution**

I was on track with the python learning and even found time to learn several extra modules and practice programs using them. I completed this part just after the midsems were over.

I didn’t do much work in the holidays after the midsems and ended up putting the deep learning part into backlog.

I was back to work when we were about to start with the RL book. Since the deep ad RL part were independent, I focused on completing the RL part on time.

I found the RL book a bit challenging, not in terms of concepts but in terms of sitting. Although it was very interesting and things were new, I wasn’t able to sit down and do it for more than 30 mins at that time. Somehow, I did as much as I could by sitting in many sets and completed most parts of the goal. I also squeezed in the DL book at this time and completed most parts of it as well.

But both these took up a good amount of time and I found myself within two weeks of the endsems.I decided to focus on the endsems at that time.

Once they over, I knew that I would have to work more than planned to complete on time. But I was ready to do as the vacations were on and I could devote all my focus to doing the project. I took some small breaks and got to work.

I quickly revised and completed the two books. Then learnt pytorch and did some quick practice on openAI.Then I read the research papers and projects.

And now I was ready to start coding. It took me almost a day to complete the preliminary coding. Then I had to debug and make it better. That took a good three-fours days to complete. I had to have daily night meets with my mentor for almost a week.

I was done with the agent and it ran properly. However, I wasn’t left with much time to train and test it. I submitted the project at this point.

However, I wanted to complete the training and see the agent perform. So I spent the next few days completing those parts and the tested it.

I was very happy to see it perform great and much better than expected.

**Results**

Link to the submission : <https://github.com/PrateekNeema/Playing-2048-through-dqn.git>

Link to the final code(I did some edits later) : <https://drive.google.com/drive/folders/1-GdTAsU5lGDgFe7PEpmccfRaboAscxYN?usp=sharing> , https://github.com/PrateekNeema/Final-2048-dqn.git

Link to the video : <https://drive.google.com/file/d/13tVQlhTwUl2fczRpWfIcF7yZI0okkHF-/view?usp=sharing>

**References and Citations**

DL book : https://www.deeplearningbook.org/

RL book : https://web.stanford.edu/class/psych209/Readings/SuttonBartoIPRLBook2ndEd.pdf

2048 game by Sergio Lommi : https://github.com/SergioIommi/DQN-2048.git

DQN Atari research paper : <https://www.cs.toronto.edu/~vmnih/docs/dqn.pdf>

And some more that I don’t remember.