# **Final Year Project: Multiplayer Online Game with AI - Progress Report**

## **Progress Chart**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Agenda\Week** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** |
| Determine project direction |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Find out feasibility of Mahjong AI |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Explore Unity |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Study Machine Learning |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Research on TensorFlow & Pytorch |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Research and understand Machine Learning agents (ML-agents) in Unity |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Try out demo game using ML-agent in Unity |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identify methods to train the AI (Tic Tac Toe) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Understanding the of various data types seen in examples |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Implementing the logic required by the AI |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Write and troubleshoot the script for the AI gameObject |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Training and troubleshooting the AI script with existing .yaml trainer file. |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Edit the Tic Tac Toe script for faster training and troubleshoot errors |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Create documentation for Unity ML agents |  |  |  |  |  |  |  |  |  |  |  |  |  |

## **Tasks Completed**

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| **Date** | **Number of hours** | **Task Completed** |
| 11-OCT-20 | Completed | Training and troubleshooting the AI script with existing .yaml trainer file.  AI was able to train, however the results are not up to standard. |
| 11-OCT-20 | Ongoing | Edit the Tic Tac Toe script for faster training and troubleshoot errors  The game bugs out if the script runs without time delay (Wins mislabelled as draw) |
| 11-OCT-20 | Ongoing | Create documentation for Unity ML agents |

## **Problems Faced**

1. Ml-agents is not using custom trainer script (TicTacToe.yaml) to learn, but uses a default script. (Continuation)
   1. Renamed behavior name of agents as ‘TicTacToe’ so as to match the trainer script. Trained for 30mins but tensorboard cumulative graph shows that reward did not increase. Reward function was not called.
   2. Training progresses well
      1. 2020-10-07 16:50:24 INFO [stats.py:118] TicTacToe. Step: 1000. Time Elapsed: 2349.184 s. Mean Reward: 0.449. Std of Reward: 0.430. Training.. ELO: 1224.863
      2. 2020-10-07 17:29:38 INFO [stats.py:118] TicTacToe. Step: 2000. Time Elapsed: 4703.498 s. Mean Reward: 0.451. Std of Reward: 0.425. Training.. ELO: 1253.112
      3. 2020-10-07 18:08:37 INFO [stats.py:118] TicTacToe. Step: 3000. Time Elapsed: 7042.676 s. Mean Reward: 0.498. Std of Reward: 0.405. Training.. ELO: 1270.621
      4. 2020-10-07 19:03:17 INFO [stats.py:118] TicTacToe. Step: 4000. Time Elapsed: 10322.749 s. Mean Reward: 0.501. Std of Reward: 0.407. Training.. ELO: 1288.142
      5. 2020-10-07 19:42:22 INFO [stats.py:118] TicTacToe. Step: 5000. Time Elapsed: 12667.198 s. Mean Reward: 0.596. Std of Reward: 0.342. Training.. ELO: 1290.337

A steep decrease was observed around step 9k-10k. Code require optimisation for fast training, and changes are required for parallel training (eg. More boards playing concurrently)