# **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. |  |  |  |  |  |  |  |  |  |  |  |  |  |

## **Tasks Completed**

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| **Date** | **Number of hours** | **Task Completed** |
| 04-OCT-20 | Ongoing | Training and troubleshooting the AI script with existing .yaml trainer file.  Rewards does not seems to translate to the AI, as seen in tensorboard. |

## **Problems Faced**

1. Heuristic methods called but not implemented, this is especially true for X agent (Think there is a need to implement random heuristic function), thus resulting in “O” putting the first value despite starting with “X”.
   1. Added a random heuristic and the function ChangeSides into the decision request function.
2. Game does not end even when all board are filled up, and winning is only possible on player’s turn.
   1. Tried to log PlayerChanged input but didn’t show on console, thus the function was not even accessed. Added EndTime into decision request.
3. Masking is not working as intended, all actions are masked in new game, which only happens in a draw. Refer to point 5.
4. Game is not restarting by itself, and AI is not giving inputs after restart.
   1. Added Coroutine to delay restart and is able to restart automatically, but AI requires first button to be clicked by human to start.
   2. Set playerChanged = true in RestartGame() to access agent.RequestDecision. Game doesn’t restart on draw.
   3. Added agent.EndEpisode() and DelayedReplay() in draw function.
5. Game bugging out after a few runs, where circle and crosses are seemingly planted in the same “turn”.
   1. Added extra time after decision is requested before processing EndTime(). Training bugged out after masking failed. Error occurs when: Draw. Noticed that moveCount jumped way more than 9 after a draw.
   2. Implemented the count++ to be before requestDecision(). Able to train on slow pace, raise some exceptions when training fast, especially when count = 9 and one side wins. (still shows as draw)
6. Ml-agents is not using custom trainer script (TicTacToe.yaml) to learn, but uses a default script.
   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.