# Assignment-2

## Adversarial Search Game Playing Agents (17 Marks)

Implement a generic game playing agent in python. The agent should make the decision of the next move using the different variants of minmax algorithm listed below:

(i)     Basic Minimax with no augmentation (5 Marks)
(ii)    Minmax with alpha beta pruning (3 Marks)
(iii)   Minmax with a depth limit (Which requires you to come up with a heuristic evaluation function for the different games below) (3 Marks)
(iv)    Minmax with both depth limit and Alpha- beta pruning (3 Marks)
(v)     Experimental Minmax variant. You can use all the improvements listed above and in addition you can try the following (3 Marks)
   a. You can improve the minmax by experimenting with better heuristic eval functions
   b. Use your creativity to see if you can do more better
   c. You should prove that your technique works better by comparing it with the remaining four, over a reasonable number of randomly generated game instances.

Except for the heuristic-eval function the remaining code should be common for all the games listed below. Hence, the term '**Generic'** game agent. We should be able to configure the variant of minmax used via a simple flag.

## The Game Playing Experience (3 Marks)

There are two ways to do the assignment.

(i)     You can do it as a simple python code in a ipython notebook. The current game state is stored in a global. You call *nextmove*() function, which makes the agent to make the next move and the result is printed with simple-text/basic visualization. (0 points)
(ii)    You can write a full fledge game using pygame (or) your favorite game library. The link: https://realpython.com/pygame-a-primer/ shows a simple tutorial for pygame. The board games listed below are even more simpler to implement. (3 points)

Students who chose to give us a full game experience (where we can choose the algorithm/strategy used by the game-agent using a dropdown) will be rewarded this 3 points.

## The Games

1. Tic Tac Toe
2. Three men's Morris game
   a. http://www.cyningstan.com/game/106/three-mens-morris
   b. https://www.youtube.com/watch?v=sCZFjiQCOww
3. Open field tic tac toe (tic tac toe played on a larger board)
   a. You can configure the board size and the number of connecting pieces required for a win
   b. https://cims.nyu.edu/drecco2016/games/OpenFieldTicTacToe/winter.html
4. Nine men's Morris
   a. https://en.wikipedia.org/wiki/Nine_men%27s_morris
   b. https://www.youtube.com/watch?v=zvbIKOHIkRE

## What to Submit

A IPython notebook with clear **markup** explaining the code. (Or) a zip file containing the following.

1. Game files and sprites, etc.
2. A readme which explains how to start (if necessary, install) the games
3. A 2 min video recording of playing the games (Its ok if this is a YouTube link to your channel)