

Machine Learning XO

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Project description

The aim of our project is to create an Artificial Intelligence which plays Tic-Tac-Toe and Gomoku board game against either a computer or player opponent. We also intended to create a fully interactive website - whereby users can play Tic-Tac-Toe or Gomoku on the same site.

The Artificial Intelligence architecture of the game will be a variation of the Minimax algorithm which predicts the next move and chooses the best possible option on the board. This will work for Tac-Tac-Toe but due to the fact that Gomoku has many potentials moves we are also implementing the Monte-Carlo algorithm, as this will cut down the number of potential moves substantially. The Monte-Carlo algorithm does this by using randomness to calculate the best next move and does not impact memory as much as minimax would when dealing with a bigger board.

Result

At this moment in time, our Minimax Artificial Intelligence is able to play a match of Tic-Tac-Toe with a fair amount of skill as it mostly wins and draws against a human opponent (our Artificial Intelligence implementation works best for this game mode as the tree search does not have to expand too much due to the small size of the game). We also applied the same Artificial Intelligence to the Gomoku game, but the results were not promising –this is because there were too many computations to run and as a result, it took too long to complete a move using Minimax Gomoku.

The reason we did not opt for the Monte-Carlo algorithm is that, after researching, it proved to be too complex for us to implement –so we decided to use alpha-beta pruning algorithm with minimax instead, as this makes it more efficient by cutting down the number of branches that it searches through.