

Report IBM-312 (Group Assignment)

A project report submitted by GROUP-16

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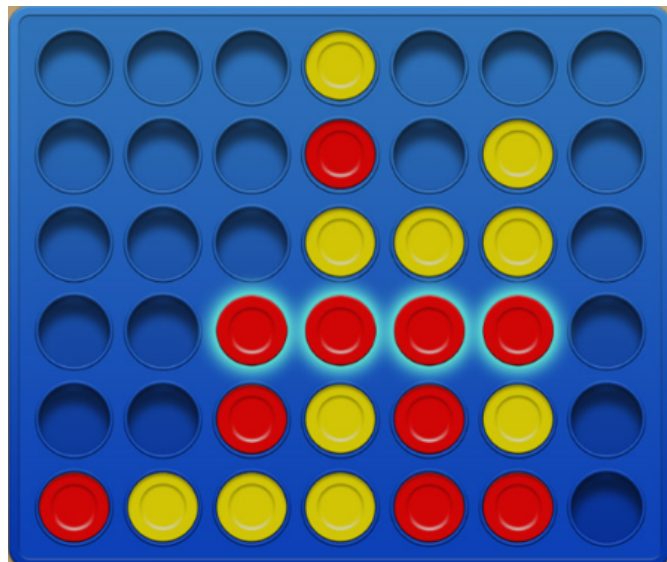
for the final group project
in the course IBM-312



Indian Institute of Technology Roorkee

MOTIVATION

The game of “**Connect 4**” has always fascinated me and my team members. From the face of it, it seems so simple as a two player game. But, we wondered what if AI plays the game randomly against human or AI plays against AI then what would be the results. This was the solo motivation of our group to build this IBM-312 final project on Connect 4 game using Artificial neural network and predict what is the success ratio if AI plays against a random strategist.



A typical 6*7 game board of Connect 4

Rules of Game:-

1. The player choose a color and then take turns dropping colored tokens into a 7-column and 6-row vertically suspended grid.
2. The pieces fall straight down, occupying the lowest available space within the column.
3. The objective of the game is to be the first to form a horizontal, vertical or diagonal line of four of one's own token.
4. If winning condition is not met for any of the two players and all the cells in grid are filled, this condition leads to draw.

Snapshot of Data

In this model, we didn't use any particular data set. We just assigned the strategies of each player to be random out of the available 7 moves after each turn.

Methodology

The methodology of this project works on Artificial Neural Networks (ANN). Firstly, we have defined a board on which game runs which is simply an array. Then, we have defined the players, their available moves after each turn and a condition whether someone won or not after each turn according to the rules of the game. Also, we assigned their strategies to be random in all game plays.

Now, we are trying to train one of the player through neural networks

in the class *ConnectFourModel* such that the player chooses the optimal next turn rather than being random. In ANN used, our input will be current position of the player and based on training, our output will be one of the most profitable move from the available 7 moves.

Analysis

After adapting the above methodology , first we tried to analyse the games where both player plays with **random strategies**.After simulating the game for 1000 iterations we got the following results:-

Red Wins: 46%

Yellow Wins: 39%

Draws: 13%

Then, we tried to training a player (yellow player in this project) with *ANN* using batch size = 50 and epochs=100 and simulated it 10 times. The following results were obtained:-

Red Wins: 30%

Yellow Wins: 70%

Draws: 0%

Now, we simulated it 100 times and the following results were obtained:-

Red Wins: 15%

Yellow Wins: 75%

Draws: 10%

Results

It is observable from the data in analysis part that after training the player in increases the chances of yellow player winning. However, it do not work perfectly due to the limitations in layer of neural network which can reject more possibility of other player's winning. That's why sometimes it gives an ambiguous results. By increasing the layers we can increase the accuracy of the yellow player winning strategies.