**GOVERNMENT COLLEGE UNIVERSITY LAHORE.**



Subject

Connect 4 AI AGENT

Artificial Intelligence Lab

Connect-4 Game Agent

**DEPARTMENT OF COMPUTER SCIENCE.**

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## Introduction:

This is a note about implementing the final project of my Artificial Intelligence course. The scope of this project is developing an AI agent for Connect 4.

Connect 4, also known as four-in-a-row, is a strategy board game which is traditionally played with Go pieces on a go board with 6 × 7 intersections. The rules for Connect 4 are similar to go, where two players place stones alternatively on the intersections of the board. The winner is the first player to get 4 of their stones in a row, either vertically, horizontally or diagonally.

## Project Scope:

This project has functionality like it calculates the score of the user as well as AI. The AI suggest the best move using Alpha-Beta Pruning algorithm, the AI then plays the move on the board using the scores. The Algorithm assists the AI to score the best and beat the human player.

## Implementation:

This project is based on the Alpha-Beta Pruning algorithm using the python language. In this project, I used python libraries like numpy (for numerical calculations), pygame (for GUI). This game is based on 6 × 7 game board, on this board I used the above mentioned algorithm to create the Connect 4. This game is a Human player Vs AI in which the AI is assisted by the Alpha-Beta Pruning algorithm to find the best score and make best move on the board.

## Results & Discussion:

The result is concluded and the winner is announced at the end when one of the two players scores the highest. It can be the AI or the human player. The Alpha-Beta algorithm works very efficiently in assisting the AI.

I used the Min-Max algorithm before but that made the program very slow in terms of computation. It requires 6401 calculations for 1 move if the depth is 2. This is the drawback of Min-Max algorithm. So, I choose the Alpha-beta pruning algorithm. It is fast and efficient than Min-Max.

## Conclusion:

Despite the Drawback of increasing computation time with increasing depth, Min-Max algorithm works very efficiently and gets the job done. The remedy of computation time can be done by using the Alpha-Beta Pruning Algorithm. The Alpha-beta is fast and efficient enough for this project with depth-3. If we further increase the depth, it becomes much complex to compute.