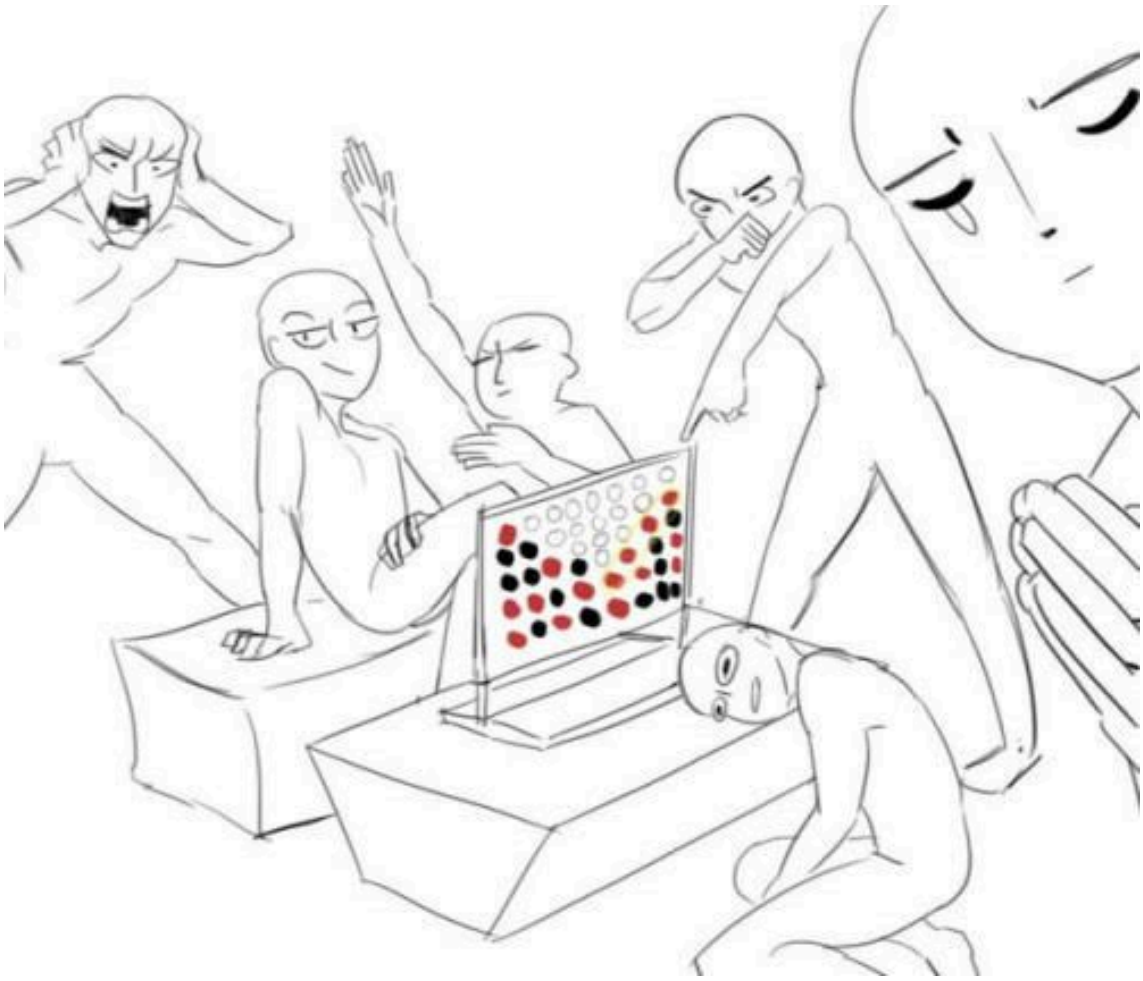

# Connect Four

14.04.2025

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# Project Proposal: Connect the Four Game with AI

## Introduction

Connect Four is a classic two-player strategy game where players take turns dropping colored discs into a vertical grid. The objective is to be the first to connect four discs in a row—horizontally, vertically, or diagonally.

This project aims to recreate the game using Python with a graphical interface, incorporating artificial intelligence to challenge the player.

## Objectives

- Develop a playable version of Connect Four with a graphical user interface (GUI).
- Integrate an AI opponent that uses decision-making algorithms.
- Enable turn-based gameplay between a human and the computer.
- Implement win condition detection, move validation, and a responsive interface.

## Features

- **Graphical Interface:** Built with Pygame
- **Human vs. AI Mode** with 3 difficulty levels:
    - **Easy:** Random or simple,  predictable moves
    - **Medium:** Intermediate strategy
    - **Hard:** Deep search with strong evaluation
- **Win Detection:** Checks for 4-in-a-row in all directions
- **Turn Randomization:** Ensures fairness

- **Visual Feedback:** Shows disc drop preview and win announcements

## Implementation Plan

- **Phase 1:** Game board setup and GUI design
- **Phase 2:** Human player logic and input handling
- **Phase 3:** AI logic with Minimax and Alpha-Beta pruning
- **Phase 4:** Integration of difficulty levels
- **Phase 5:** Testing, debugging, and polishing

## Expected Outcomes

- A fully functional Connect Four game with AI
- An adaptive AI opponent for varied challenge levels
- A clean, responsive interface that enhances user experience

## Technologies and Tools

- **Programming Language:**
  The game will be developed using **Python**, chosen for its simplicity, readability, and extensive support for libraries related to game development and AI.
- **Libraries:**
  - **Pygame** will be used to design and implement the graphical user interface and manage game rendering.
  - **NumPy** will assist in managing the game board's internal state and enable efficient array operations.
  - The built-in **math** module will support Minimax algorithm computations.
- **Development Tools:**

- **Visual Studio Code (VS Code)** will be used as the primary code editor for development.
- **GitHub** will serve as the platform for version control, collaboration, and code backup.

## Conclusion

This project will create a playable version of the Connect Four game with an AI opponent using the Minimax algorithm and Alpha-Beta pruning. It will combine basic game development with AI logic and a user-friendly interface to offer a smooth and competitive experience. The AI is expected to challenge players at multiple difficulty levels, making the game engaging for a wide range of users.