project

Connect 4 game

Team Members :

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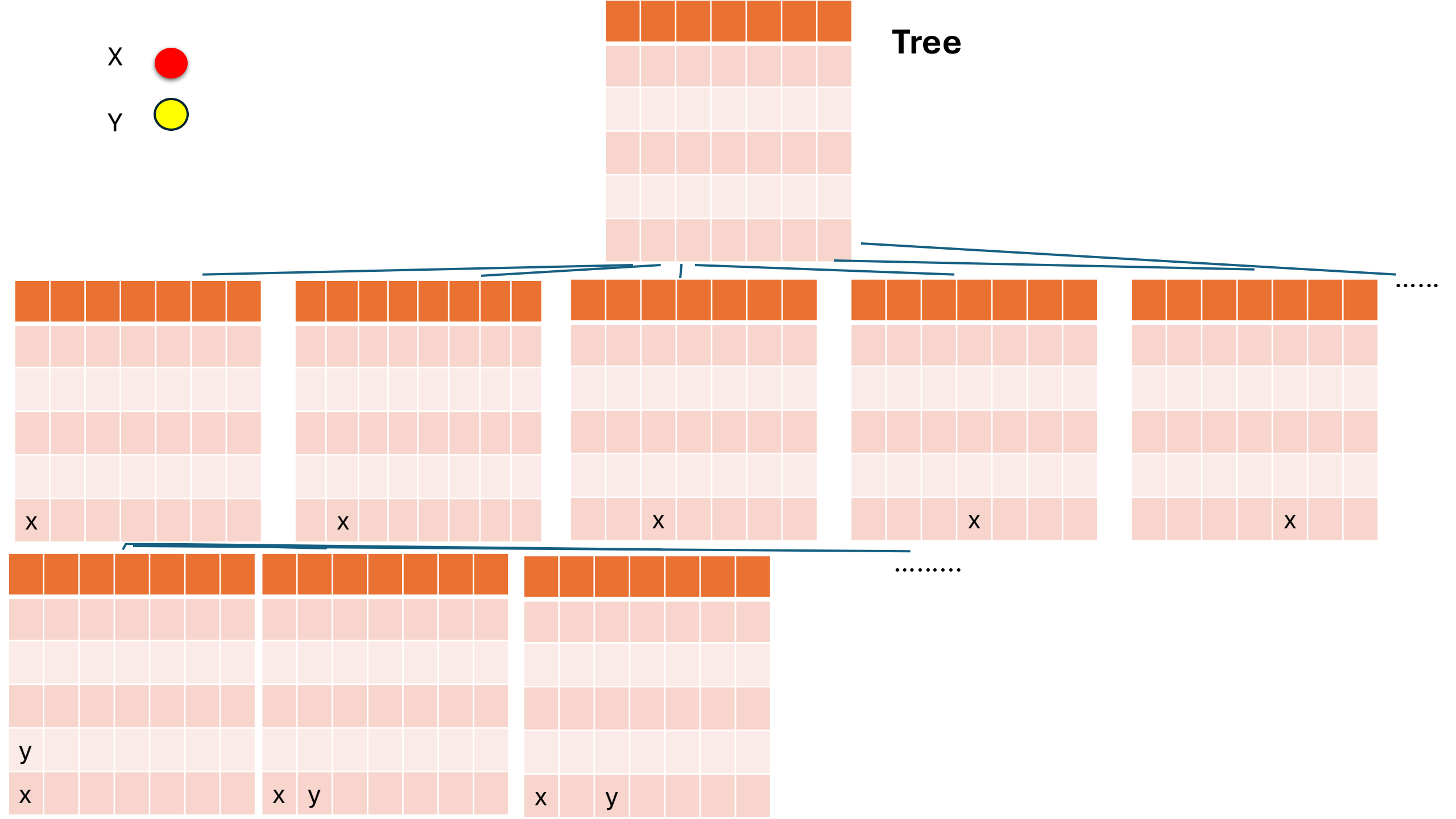
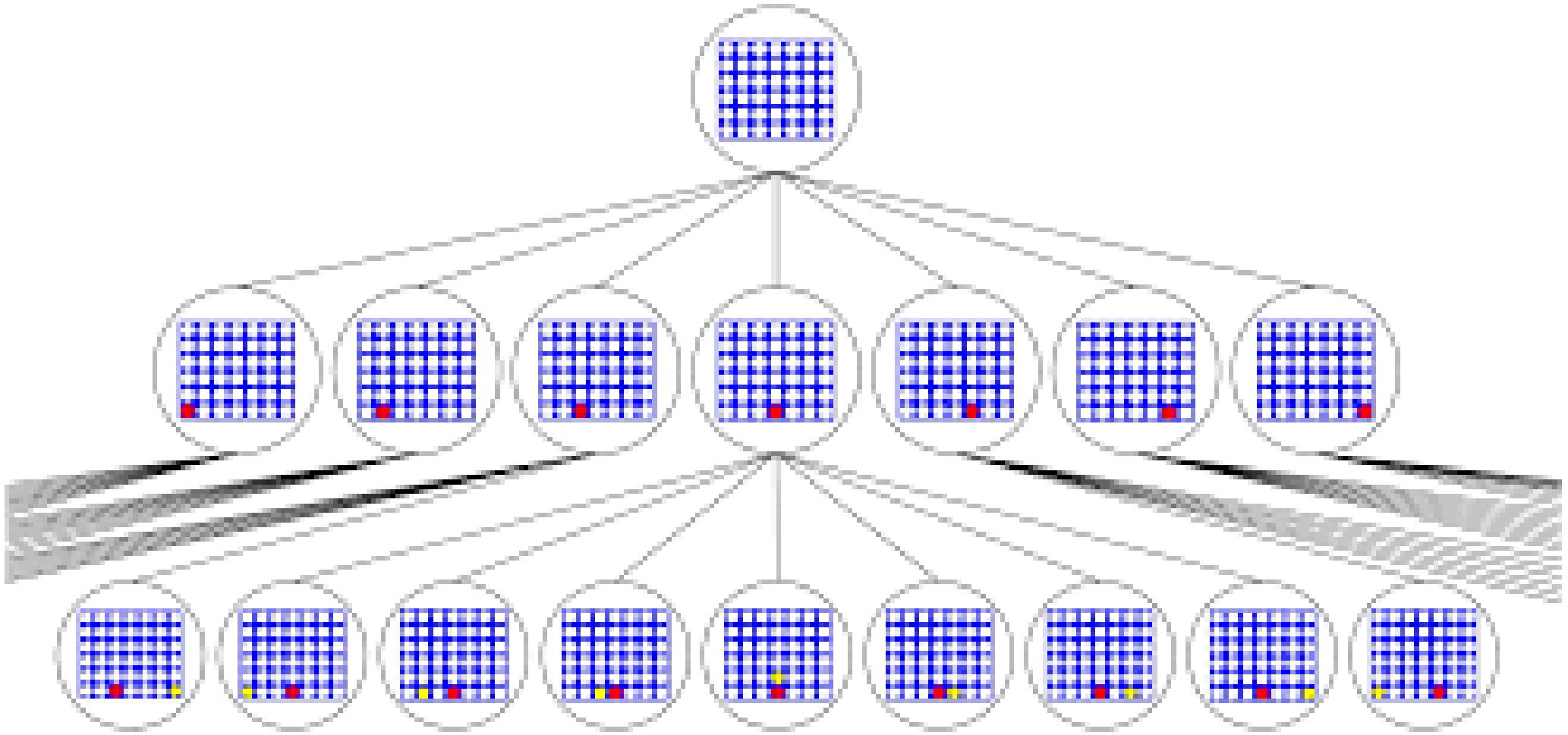
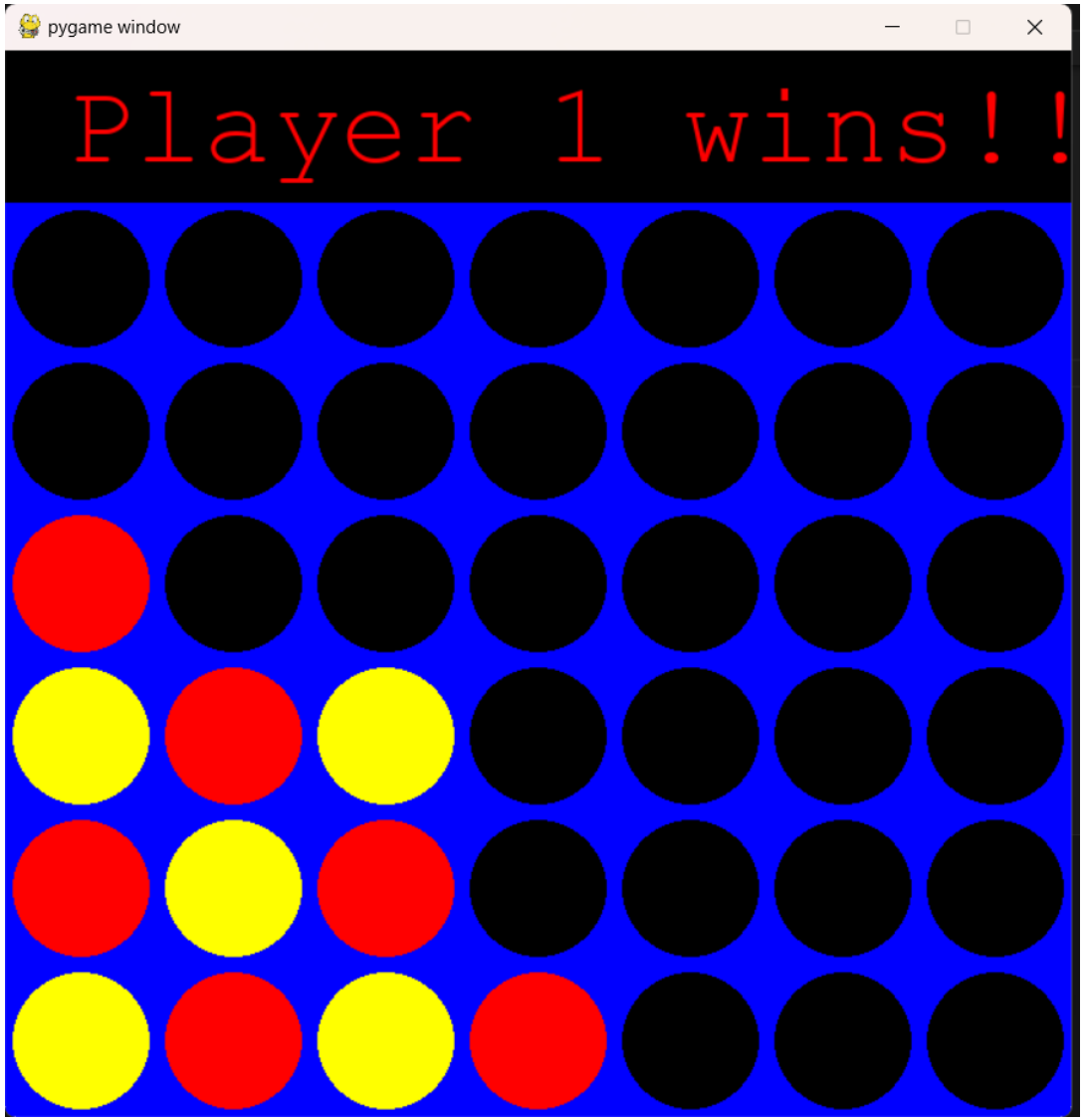

X
Y
Tree
x
x
x
x
x
.....
.....
y
x
x
y
x
y

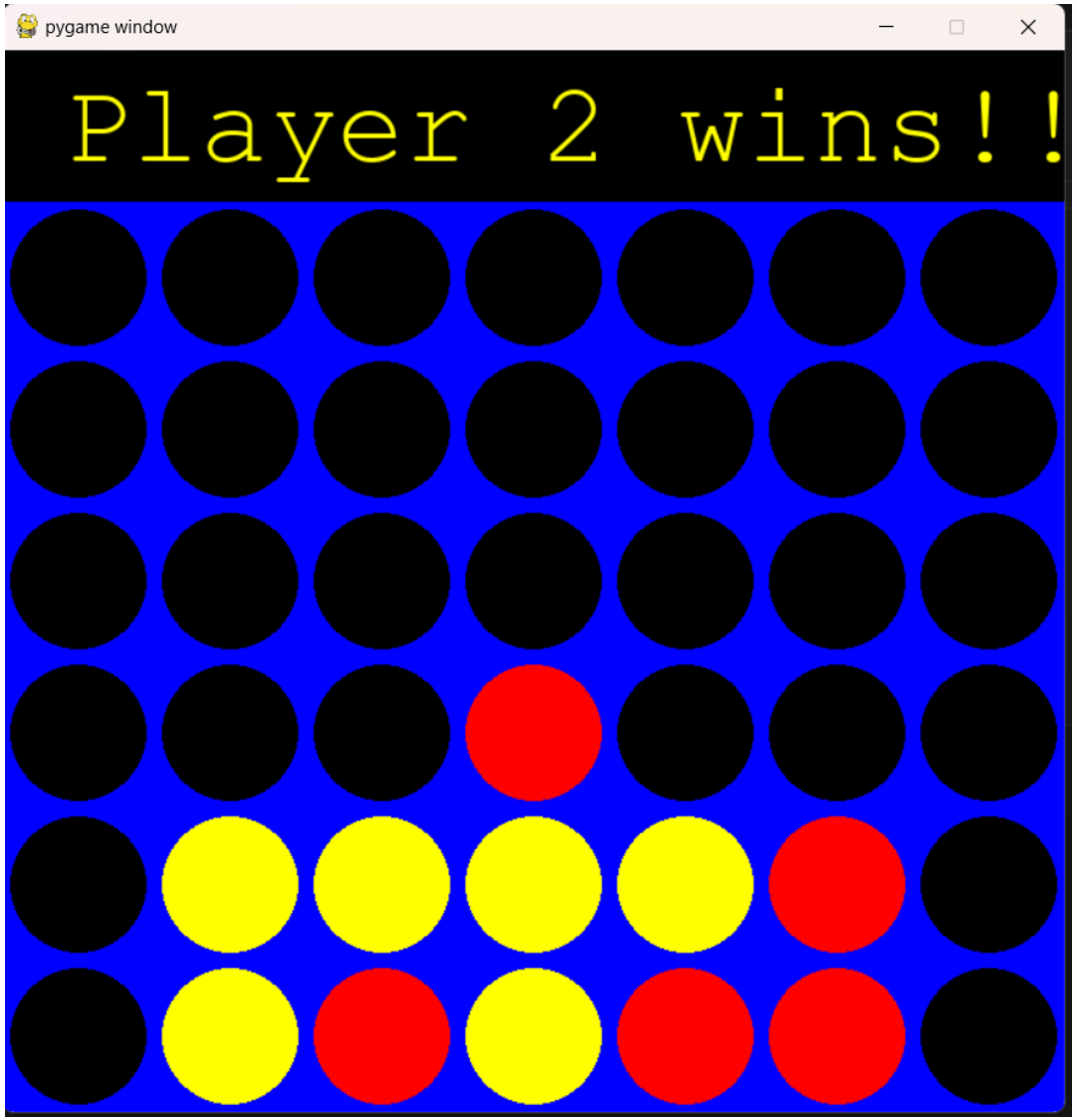


- The different between :Minimax without alpha-beta pruning And Minimax with alpha-beta pruning is :
- **Minimax Algorithm**
- **Time Complexity:** Exponential, O(b^d), where b is the branching factor (average number of children per node) and d is the depth of the search tree.
- **Nodes Expanded:** All nodes in the search tree are explored.
- **Minimax with Alpha-Beta Pruning**
- **Time Complexity:** Can vary significantly, but it's often much better than Minimax, especially for deeper search depths. In the best case, it can be O(b^(d/2)).
- **Nodes Expanded:** Many nodes are pruned, leading to a significant reduction in the number of nodes explored.

- The run of code : when player (1) win



- The run of code : when player (2) win



```
PS C:\Users\user\Desktop\Connect4-Python-master>  & 'c:\Users\user\AppData\Local\Progr
ons\ms-python.debugpy-2024.12.0-win32-x64\bundled\libs\debugpy\adapter/../..\debugpy\l
ster\connect4_with_ai.py'
pygame 2.6.1 (SDL 2.28.4, Python 3.13.1)
Hello from the pygame community. https://www.pygame.org/contribute.html
[[0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]
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 [0. 0. 1. 2. 0. 0. 0.]]
[[0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 2. 0. 0. 0. 0.]
 [0. 0. 1. 2. 0. 0. 0.]]
[[0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 2. 0. 0. 0. 0.]
 [0. 0. 1. 2. 1. 0. 0.]]
[[0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0.]
```

- **You can get source code from this drive :** https://drive.google.com/drive/folders/1ag0oqCGyZOhImANmJdSaCAgBviwP-PmK?usp=sharing

- **Or scan this QR code to get source code:**