

```
1 import math
2
3 def print_board(board):
4     for row in board:
5         print(" | ".join(row))
6         print("-" * 9)
7
8 def check_winner(board):
9
10    for i in range(3):
11        if board[i][0] != " " and all(board[i][j] == board[i][0] for j in range(3)):
12            return board[i][0]
13        if board[0][i] != " " and all(board[j][i] == board[0][i] for j in range(3)):
14            return board[0][i]
15
16    if board[0][0] != " " and all(board[i][i] == board[0][0] for i in range(3)):
17        return board[0][0]
18    if board[0][2] != " " and all(board[i][2-i] == board[0][2] for i in range(3)):
19        return board[0][2]
20
21    if all(board[i][j] != " " for i in range(3) for j in range(3)):
22        return "Tie"
23    return None
24
25 def minimax(board, depth, is_maximizing):
26     winner = check_winner(board)
27     if winner == "O":
28         return 1
29     elif winner == "X":
30         return -1
31     elif winner == "Tie":
32         return 0
33
```

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34 if is_maximizing:
35     best_score = -math.inf
36     for i in range(3):
37         for j in range(3):
38             if board[i][j] == " ":
39                 board[i][j] = "O"
40                 score = minimax(board, depth + 1, False)
41                 board[i][j] = " "
42                 best_score = max(score, best_score)
43     return best_score
44 else:
45     best_score = math.inf
46     for i in range(3):
47         for j in range(3):
48             if board[i][j] == " ":
49                 board[i][j] = "X"
50                 score = minimax(board, depth + 1, True)
51                 board[i][j] = " "
52                 best_score = min(score, best_score)
53     return best_score
54
55 def best_move(board):
56     move = None
57     best_score = -math.inf
58     for i in range(3):
59         for j in range(3):
60             if board[i][j] == " ":
61                 board[i][j] = "O"
62                 score = minimax(board, 0, False)
63                 board[i][j] = " "
64                 if score > best_score:
65                     best_score = score
66                     move = (i, j)
67     return move

```

```

69 def tic_tac_toe_ai():
70     board = [[" "]*3 for _ in range(3)]
71     print("Tic-Tac-Toe Game: You = X, Computer = O\n")
72     print_board(board)
73
74     while True:
75
76         try:
77             row = int(input("Enter row (0-2): "))
78             col = int(input("Enter column (0-2): "))
79         except ValueError:
80             print("Invalid input! Enter numbers 0-2.")
81             continue
82
83         if 0 <= row <= 2 and 0 <= col <= 2:
84             if board[row][col] == " ":
85                 board[row][col] = "X"
86             else:
87                 print("Cell occupied! Try again.")
88                 continue
89         else:
90             print("Invalid position! Enter 0-2.")
91             continue
92
93     print_board(board)
94     result = check_winner(board)
95     if result:
96         if result == "Tie":
97             print("It's a tie!")
98         else:
99             print(f"{result} wins!")
100         break
101     move = best_move(board)
102

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```
103     if move:
104         board[move[0]][move[1]] = "O"
105         print("Computer played:")
106         print_board(board)
107         result = check_winner(board)
108         if result:
109             if result == "Tie":
110                 print("It's a tie!")
111             else:
112                 print(f"{result} wins!")
113             break
114 tic_tac_toe_ai()
115
```

```
>>> %Run -c $EDITOR_CONTENT
```

Tic-Tac-Toe Game: You = X, Computer = O

```
| | |
-----
| | |
-----
| | |
-----
```

Enter row (0-2): 1
Enter column (0-2): 1

```
| | |
-----
| x |
-----
| | |
-----
```

Computer played:

```
O | | |
-----
| x |
-----
| | |
-----
```

Enter row (0-2): 2
Enter column (0-2): 2

```
O | | |
-----
| x |
-----
| | | x
-----
```

Computer played:

```
O | | O
-----
| x |
-----
| | | x
-----
```

Enter row (0-2): 0

Enter column (0-2): 1

O | X | O

| X |

| | X

Computer played:

O | X | O

| X |

| O | X

Enter row (0-2): 2

Enter column (0-2): 0

O | X | O

| X |

X | O | X

Computer played:

O | X | O

O | X |

X | O | X

Enter row (0-2): 1

Enter column (0-2): 2

O | X | O

O | X | X

X | O | X

It's a tie!