

Evaluation function

The function calculates utility in two ways and combines them-

1. The first method is a Gaussian normal distribution centered around the mean position of board. The one with more centered positions gets higher score from this evaluation function. The numbers in the table indicate the number of four connected positions which include that space for example:

The 3 in the upper left corner is for one each of horizontal, vertical, and diagonal lines of four which can be made with it.

The 4 beside it is for two horizontal (one including starting in the corner, one starting on it, one vertical, and one diagonal)

```
eval table =  
[[3, 4, 5, 7, 5, 4, 3],  
 [4, 6, 8, 10, 8, 6, 4],  
 [5, 8, 11, 13, 11, 8, 5],  
 [5, 8, 11, 13, 11, 8, 5],  
 [4, 6, 8, 10, 8, 6, 4],  
 [3, 4, 5, 7, 5, 4, 3]]
```

This gives a measurement of how useful each square is for winning the game, so it helps decide the strategy.

Utility is instantiated to 138(since the sum of all the values in the table is $276 = 2 \times 138$) this return 3 values based on

< 0 if the player whose marker is '1' is likely to win (has the most strategic places based on the utility function)

= 0 if the players are equally likely to win

> 0 if the player whose marker is '2' is likely to win.

2. The second method calculates a multiple of current player score and subtracts from the opposite player scores. A multiplier(2) was used because it was approximate to the sum of the current player score and number of moves to get a score.

Then both the utilities together are returned.