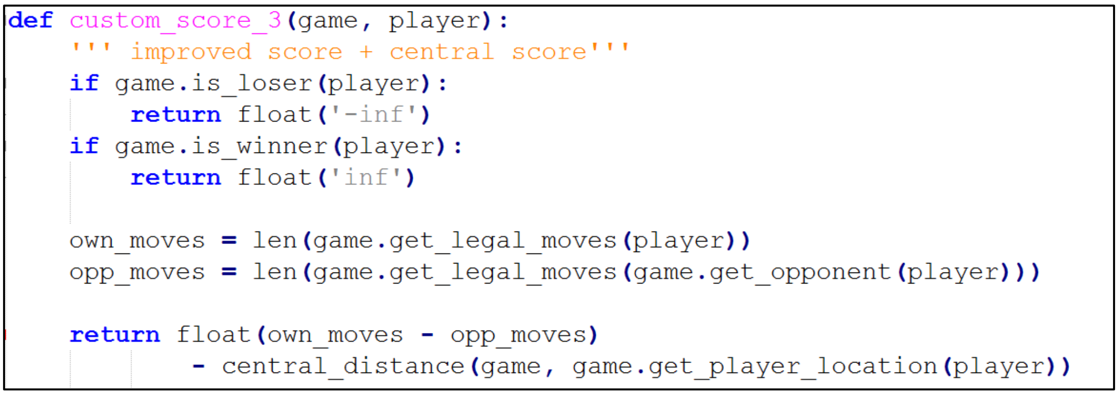
Build a Game-Playing Agent

Heuristic Analysis

custom_score_3

Based on **improved_score()**, I add **center_score()** because it is important to stay close to center. This method will increase the win rate.



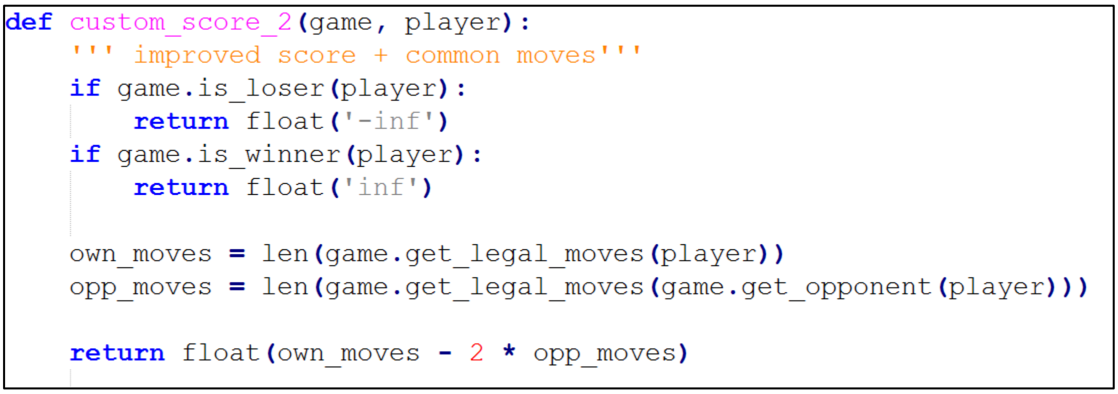
```python
def custom_score_3(game, player):
    ''' improved score + central score'''
    if game.is_loser(player):
        return float('-inf')
    if game.is_winner(player):
        return float('inf')

    own_moves = len(game.get_legal_moves(player))
    opp_moves = len(game.get_legal_moves(game.get_opponent(player)))

    return float(own_moves - opp_moves)
            - central_distance(game, game.get_player_location(player))
```

custom_score_2

The **custom_score2()** modifies **AB_Improved()**. Doubling the opponent’s move means we focus more on the count of opponent’s moves.



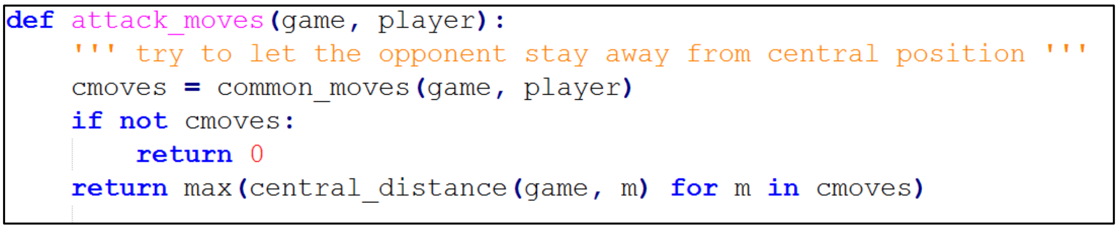
```python
def custom_score_2(game, player):
    ''' improved score + common moves'''
    if game.is_loser(player):
        return float('-inf')
    if game.is_winner(player):
        return float('inf')

    own_moves = len(game.get_legal_moves(player))
    opp_moves = len(game.get_legal_moves(game.get_opponent(player)))

    return float(own_moves - 2 * opp_moves)
```

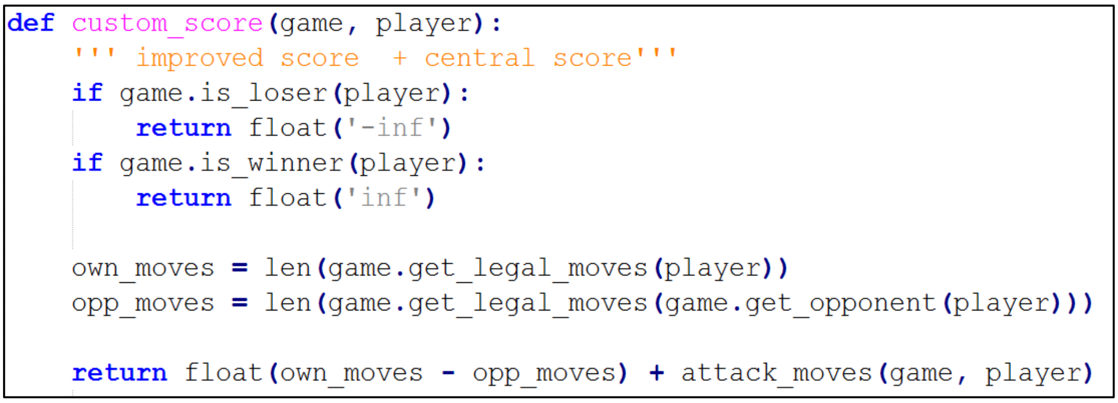
custom_score

I create a function **attack_moves()** because I want to occupy the location near the center, try to let the opponent stay away from center.



```python
def attack_moves(game, player):
    ''' try to let the opponent stay away from central position '''
    cmoves = common_moves(game, player)
    if not cmoves:
        return 0
    return max(central_distance(game, m) for m in cmoves)
```

The **custom_score()** combines with **improved_score()** and **attack_moves()** as below.

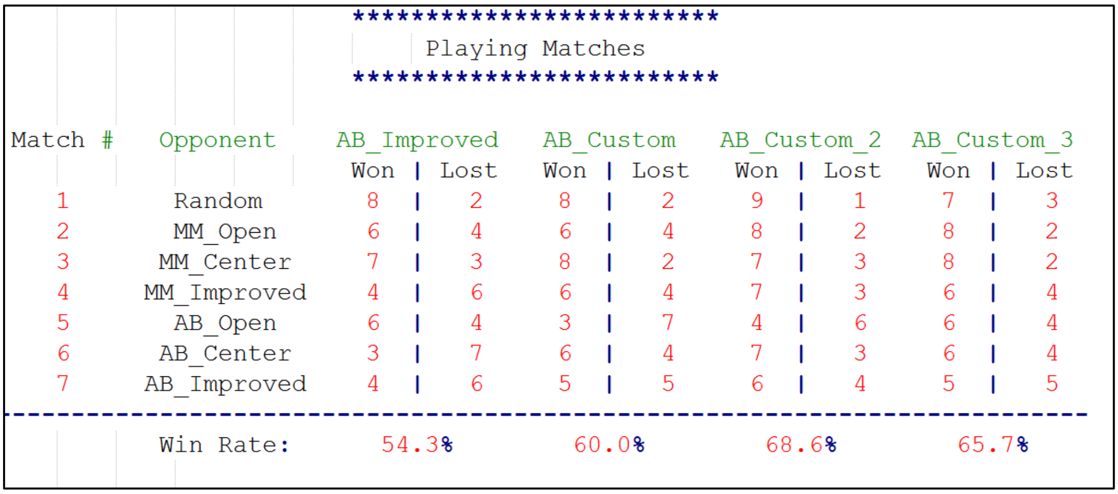


```python
def custom_score(game, player):
    ''' improved score  + central score'''
    if game.is_loser(player):
        return float('-inf')
    if game.is_winner(player):
        return float('inf')

    own_moves = len(game.get_legal_moves(player))
    opp_moves = len(game.get_legal_moves(game.get_opponent(player)))

    return float(own_moves - opp_moves) + attack_moves(game, player)
```

Performance



```
                         *************************
                              Playing Matches
                         *************************

 Match #    Opponent     AB_Improved   AB_Custom   AB_Custom_2  AB_Custom_3
                          Won | Lost   Won | Lost   Won | Lost   Won | Lost
    1        Random        8  |   2     8  |   2     9  |   1     7  |   3
    2        MM_Open       6  |   4     6  |   4     8  |   2     8  |   2
    3       MM_Center      7  |   3     8  |   2     7  |   3     8  |   2
    4      MM_Improved     4  |   6     6  |   4     7  |   3     6  |   4
    5        AB_Open       6  |   4     3  |   7     4  |   6     6  |   4
    6       AB_Center      3  |   7     6  |   4     7  |   3     6  |   4
    7      AB_Improved     4  |   6     5  |   5     6  |   4     5  |   5
--------------------------------------------------------------------------
            Win Rate:      54.3%        60.0%        68.6%        65.7%
```

AB_Custom: Improved_score() + attack_moves()

AB_Custom2: Double opponent's moves in AB_improved()

AB_Custom3: Improved_score() + center_score()

In AB_custom_2, I focus more on opponent's move. Therefore, the double weight was given. As the result, AB_custom_2 performs well in most of time. Also, AB_custom_3 performs well because it combines AB_improved() and center score calculation. Finding good position is really important to win the competition. AB_custom_3 is more stable in my result. Therefore, it is the best score function in my project.