Results

The performance of various agents for ***20 matches*** are as follow:

Agent	Performance	Rank
ID_Improved	60.54	8
Student1	61.07	7
Student2	63.39	3
Student3	58.93	10
Student4	59.64	9
Student5	62.68	6
Student6	63.21	5
Student7	63.39	3
Defensive2Offensive	63.75	1
Offensive2Defensive	63.75	1

Table 1

The performance of various agents for ***20 matches*** are as follow:

Agent	Performance	Rank
Defensive2Offensive	64.29	2
Offensive2Defensive	65	1

Table 2

In *Table 1*, both the custom heuristics agents that have created (**Defensive2Offensive** and **Offensive2Defensive**) perform better than the agents such as, ID_Improved and Student(s) by a reasonable margin.

Offensive2Defensive performs better than Defensive2offensive as stated in *Table 2*.

The raw evaluation result stated in *Table 1* is stated below:

```
This script evaluates the performance of the custom heuristic function by
comparing the strength of an agent using iterative deepening (ID) search with
alpha-beta pruning against the strength rating of agents using other heuristic
functions.  The `ID_Improved` agent provides a baseline by measuring the
performance of a basic agent using Iterative Deepening and the "improved"
heuristic (from lecture) on your hardware.  The `Student` agent then measures
the performance of Iterative Deepening and the custom heuristic against the
same opponents.


************************
 Evaluating: ID_Improved
************************

Playing Matches:
----------
  Match 1: ID_Improved vs   Random      Result: 74 to 6
  Match 2: ID_Improved vs   MM_Null     Result: 55 to 25
  Match 3: ID_Improved vs   MM_Open     Result: 37 to 43
tournament.py:100: UserWarning: One or more agents lost a match this round due to timeout. The get_move(
) function must return before time_left() reaches 0 ms. You will need to leave some time for the functio
n to return, and may need to increase this margin to avoid timeouts during  tournament play.
  warnings.warn(TIMEOUT_WARNING)
  Match 4: ID_Improved vs MM_Improved   Result: 40 to 40
  Match 5: ID_Improved vs   AB_Null     Result: 47 to 33
  Match 6: ID_Improved vs   AB_Open     Result: 40 to 40
  Match 7: ID_Improved vs AB_Improved   Result: 46 to 34


Results:
----------
ID_Improved         60.54%
```

```
*************************
  Evaluating: Student1
*************************

Playing Matches:
----------
  Match 1:  Student1   vs   Random      Result: 73 to 7
  Match 2:  Student1   vs   MM_Null     Result: 50 to 30
  Match 3:  Student1   vs   MM_Open     Result: 41 to 39
  Match 4:  Student1   vs MM_Improved   Result: 36 to 44
  Match 5:  Student1   vs   AB_Null     Result: 50 to 30
  Match 6:  Student1   vs   AB_Open     Result: 44 to 36
  Match 7:  Student1   vs AB_Improved   Result: 48 to 32


Results:
----------
Student1            61.07%

*************************
  Evaluating: Student2
*************************

Playing Matches:
----------
  Match 1:  Student2   vs   Random      Result: 69 to 11
  Match 2:  Student2   vs   MM_Null     Result: 57 to 23
  Match 3:  Student2   vs   MM_Open     Result: 40 to 40
  Match 4:  Student2   vs MM_Improved   Result: 37 to 43
  Match 5:  Student2   vs   AB_Null     Result: 55 to 25
  Match 6:  Student2   vs   AB_Open     Result: 51 to 29
  Match 7:  Student2   vs AB_Improved   Result: 46 to 34


Results:
----------
Student2            63.39%
```

```
**************************
  Evaluating: Student3
**************************

Playing Matches:
----------
  Match 1:  Student3   vs   Random      Result: 67 to 13
  Match 2:  Student3   vs   MM_Null     Result: 56 to 24
  Match 3:  Student3   vs   MM_Open     Result: 35 to 45
  Match 4:  Student3   vs MM_Improved   Result: 30 to 50
  Match 5:  Student3   vs   AB_Null     Result: 53 to 27
  Match 6:  Student3   vs   AB_Open     Result: 43 to 37
  Match 7:  Student3   vs AB_Improved   Result: 46 to 34


Results:
----------
Student3            58.93%

**************************
  Evaluating: Student4
**************************

Playing Matches:
----------
  Match 1:  Student4   vs   Random      Result: 65 to 15
  Match 2:  Student4   vs   MM_Null     Result: 45 to 35
  Match 3:  Student4   vs   MM_Open     Result: 40 to 40
  Match 4:  Student4   vs MM_Improved   Result: 40 to 40
  Match 5:  Student4   vs   AB_Null     Result: 52 to 28
  Match 6:  Student4   vs   AB_Open     Result: 45 to 35
  Match 7:  Student4   vs AB_Improved   Result: 47 to 33


Results:
----------
Student4            59.64%
```

```
************************
  Evaluating: Student5
************************

Playing Matches:
----------
  Match 1:  Student5   vs   Random      Result: 71 to 9
  Match 2:  Student5   vs   MM_Null     Result: 56 to 24
  Match 3:  Student5   vs   MM_Open     Result: 38 to 42
  Match 4:  Student5   vs MM_Improved   Result: 38 to 42
  Match 5:  Student5   vs   AB_Null     Result: 58 to 22
  Match 6:  Student5   vs   AB_Open     Result: 42 to 38
  Match 7:  Student5   vs AB_Improved   Result: 48 to 32


Results:
----------
Student5            62.68%

************************
  Evaluating: Student6
************************

Playing Matches:
----------
  Match 1:  Student6   vs   Random      Result: 67 to 13
  Match 2:  Student6   vs   MM_Null     Result: 59 to 21
  Match 3:  Student6   vs   MM_Open     Result: 47 to 33
  Match 4:  Student6   vs MM_Improved   Result: 50 to 30
  Match 5:  Student6   vs   AB_Null     Result: 40 to 40
  Match 6:  Student6   vs   AB_Open     Result: 45 to 35
  Match 7:  Student6   vs AB_Improved   Result: 46 to 34


Results:
----------
Student6            63.21%
```

```
************************
  Evaluating: Student7
************************

Playing Matches:
----------
  Match 1:  Student7   vs   Random      Result: 70 to 10
  Match 2:  Student7   vs   MM_Null     Result: 61 to 19
  Match 3:  Student7   vs   MM_Open     Result: 37 to 43
  Match 4:  Student7   vs MM_Improved   Result: 41 to 39
  Match 5:  Student7   vs   AB_Null     Result: 58 to 22
  Match 6:  Student7   vs   AB_Open     Result: 45 to 35
  Match 7:  Student7   vs AB_Improved   Result: 43 to 37


Results:
----------
Student7            63.39%
```

```
************************
Evaluating: Defensive2offensive
************************

Playing Matches:
----------
  Match 1: Defensive2offensive vs   Random      Result: 62 to 18
  Match 2: Defensive2offensive vs   MM_Null     Result: 57 to 23
  Match 3: Defensive2offensive vs   MM_Open     Result: 39 to 41
  Match 4: Defensive2offensive vs MM_Improved   Result: 45 to 35
  Match 5: Defensive2offensive vs   AB_Null     Result: 52 to 28
  Match 6: Defensive2offensive vs   AB_Open     Result: 47 to 33
  Match 7: Defensive2offensive vs AB_Improved   Result: 55 to 25


Results:
----------
Defensive2offensive     63.75%

************************
Evaluating: Offensive2defensive
************************

Playing Matches:
----------
  Match 1: Offensive2defensive vs   Random      Result: 69 to 11
  Match 2: Offensive2defensive vs   MM_Null     Result: 57 to 23
  Match 3: Offensive2defensive vs   MM_Open     Result: 38 to 42
  Match 4: Offensive2defensive vs MM_Improved   Result: 43 to 37
  Match 5: Offensive2defensive vs   AB_Null     Result: 58 to 22
  Match 6: Offensive2defensive vs   AB_Open     Result: 43 to 37
  Match 7: Offensive2defensive vs AB_Improved   Result: 49 to 31


Results:
----------
Offensive2defensive     63.75%
```

The raw evaluation result stated in *Table 2* is stated below:

```
*************************
Evaluating: Defensive2offensive
*************************
Number of rounds:  20

Playing Matches:
----------
  Match 1: Defensive2offensive vs   Random      Result: 70 to 10
  Match 2: Defensive2offensive vs   MM_Null     Result: 59 to 21
  Match 3: Defensive2offensive vs   MM_Open     Result: 44 to 36
  Match 4: Defensive2offensive vs MM_Improved   Result: 41 to 39
  Match 5: Defensive2offensive vs   AB_Null     Result: 50 to 30
  Match 6: Defensive2offensive vs   AB_Open     Result: 46 to 34
  Match 7: Defensive2offensive vs AB_Improved   Result: 50 to 30


Results:
----------
Defensive2offensive     64.29%
```

```
************************
Evaluating: Offensive2defensive
************************
Number of rounds:  20

Playing Matches:
----------
  Match 1: Offensive2defensive vs   Random      Result: 67 to 13
  Match 2: Offensive2defensive vs   MM_Null     Result: 67 to 13
  Match 3: Offensive2defensive vs   MM_Open     Result: 48 to 32
  Match 4: Offensive2defensive vs MM_Improved   Result: 34 to 46
  Match 5: Offensive2defensive vs   AB_Null     Result: 51 to 29
  Match 6: Offensive2defensive vs   AB_Open     Result: 44 to 36
  Match 7: Offensive2defensive vs AB_Improved   Result: 53 to 27


Results:
----------
Offensive2defensive     65.00%
```

Conclusion: The custom_score function will implement **Offensive2defensive** as it outperforms all other heuristics with win-rate **65%** which is the highest among all.