Heuristic Analysis

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Before I describe my three evaluation functions, I will describe each variables I used in the functions:

- own_moves: The number of legal moves I have
- opp_moves: The number of legal moves the opponent has
- blanks: The number of locations that are still available on the board
- w: The width of the board
- h: The height of the board

The three evaluation functions are listed below:

- Student1:
  - (own_moves-(0.1+w*h-blanks)*opp_moves)/(own_moves+(0.1+w*h-blanks)*opp_moves)
- Student2:
  - (own_moves-(0.1+w*h-1.5*blanks)*opp_moves)/(own_moves+(0.1+w*h-1.5*blanks)*opp_moves)
- Student3:
  - (own_moves-(0.1+w*h-blanks)*opp_moves) / (blanks+own_moves-opp_moves)

Table 1. shows the number of winning and losing for each evaluation functions.

Table 1.							
	Random	MM_Null	MM_Open	MM_Improved	AB_Null	AB_Open	AB_Improved
ID_Improved	339/61	343/57	339/61	336/64	339/61	324/76	337/63
Student1	336/64	343/57	335/65	342/58	328/72	335/65	349/51
Student2	332/68	336/64	345/55	339/61	339/61	337/63	351/49
Student3	351/49	329/71	355/45	339/61	340/60	344/56	351/49

Table 2. shows the winning rate for each evaluation functions.

Table 2.							
	Random	MM_Null	MM_Open	MM_Improved	AB_Null	AB_Open	AB_Improved
ID_Improved	84.75%	85.75%	84.75%	84.00%	84.75%	81.00%	84.25%
Student1	84.00%	85.75%	83.75%	85.50%	82.00%	83.75%	87.25%
Student2	83.00%	84.00%	86.25%	84.75%	84.75%	84.25%	87.75%
Student3	87.75%	82.25%	88.75%	84.75%	85.00%	86.00%	87.75%

I use winning rate from table_2 to plot following figure. We could see not single evaluation dominate the each competition. But Student_3 outperform others when facing MM_Open and Random players.

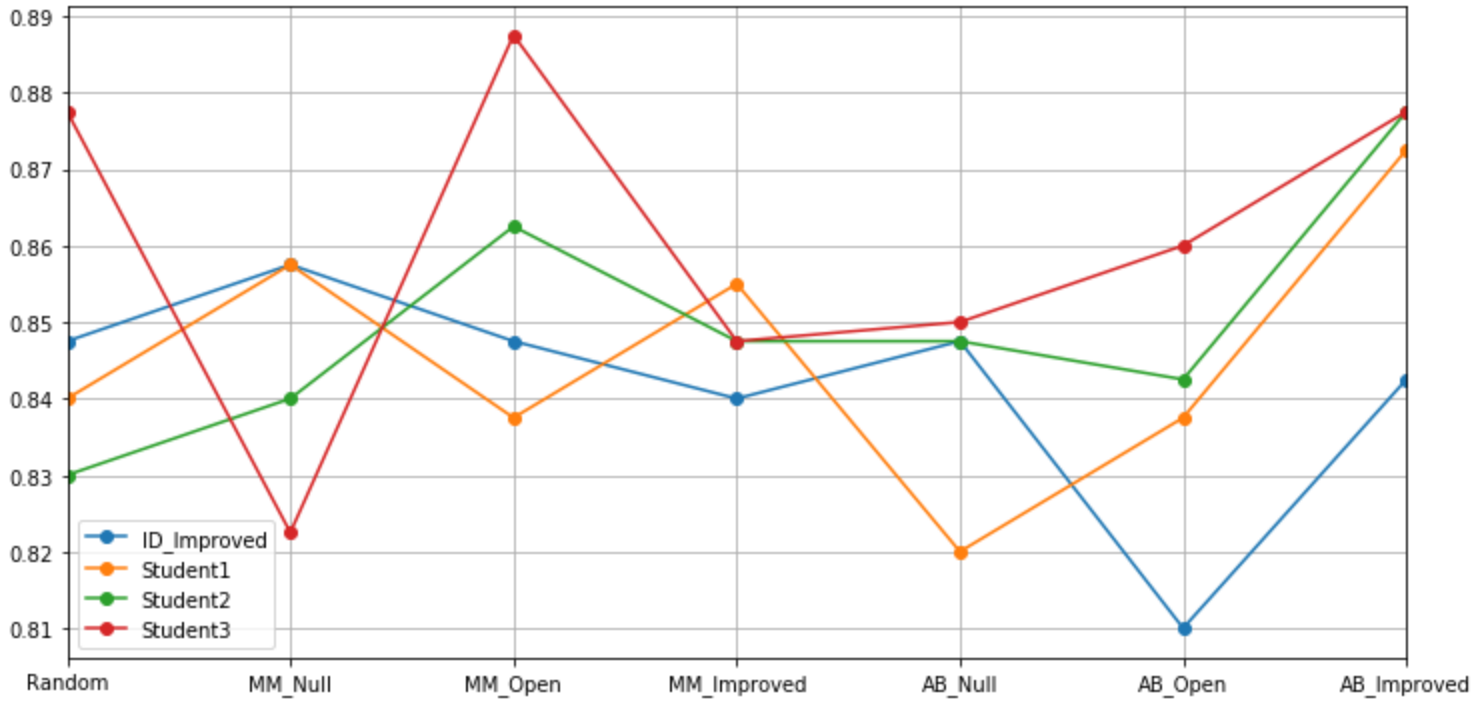

Table 3. shows the overall winning rate for each evaluation functions.

Table 3.				
	ID_Improved	Student1	Student2	Student3
Overall Winning Rate	84.18%	84.57%	84.96%	86.04%

Based on the above tables and figure, I recommend to use Student_3 as the best evaluation function. The reasons are,

1. Student_3 has the best overall winning rate. And it's almost 2% more than ID_Improved.
2. In the 7 competition, Student_3 often has the best winning rate.
3. Student_3 outperform others when facing MM_Open and Random players.