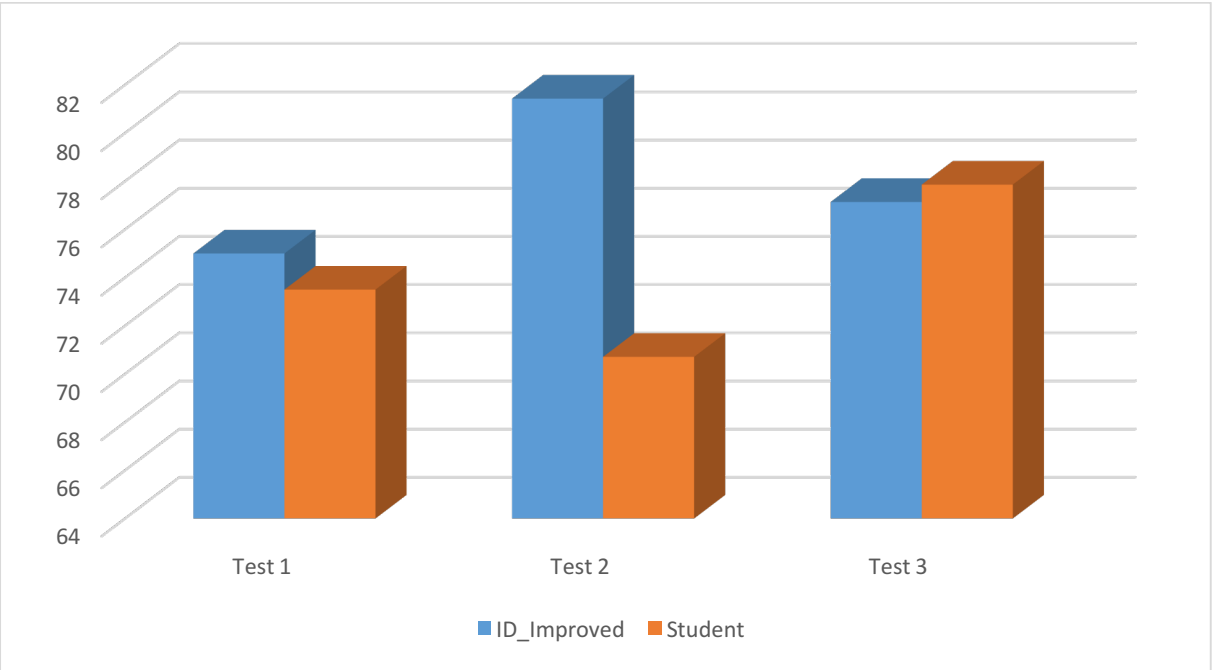
Heuristic Analysis

- The concept used for coming up with the heuristics was ratio analysis.
- I compared the score values by scaling the legal_moves with different ratios.And the function used for the scaling was f=(own_moves-opp_moves)
- If the <own_moves> are always greater than the opponent moves it will always result in a positive score thus making the student score more vs ID
- However sometimes scaling only of <own_moves> will result to wrongful results as the moves might be less than <opp_moves> by a small factor.
- I tested three different ratios to come up with the final one which consistently defeated the ID.

1 : 2

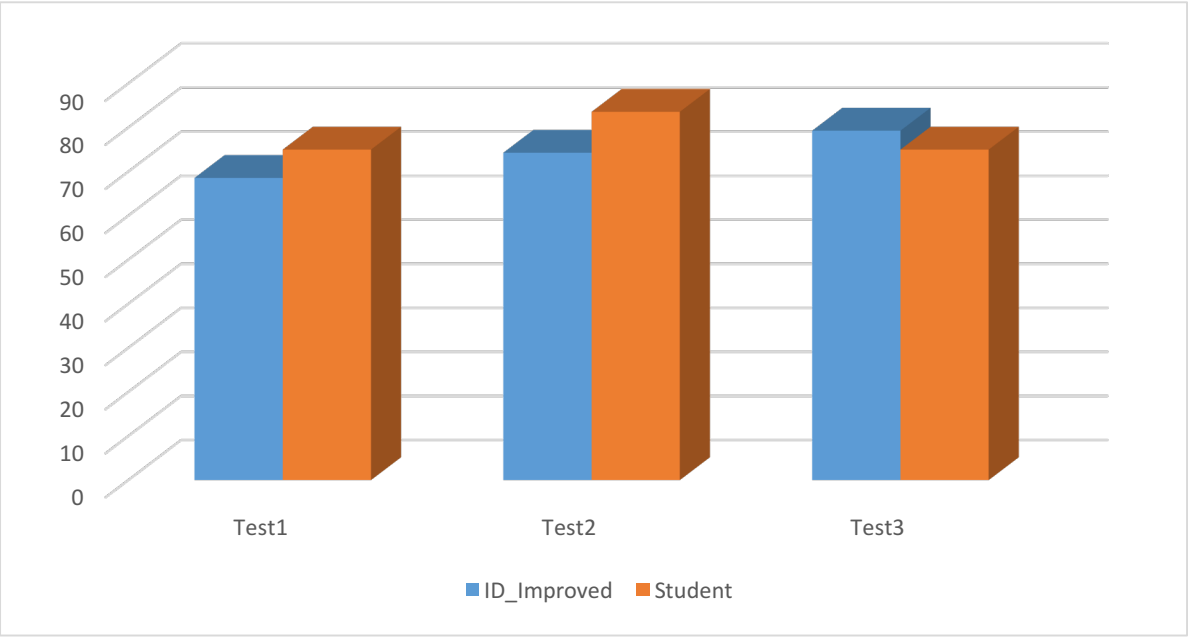
- By scaling the <opp_moves> by 2 the results were inconsistent Student rarely defeated ID_Improved.
- Hence this weightage ratio is not taken



2 : 3

- By scaling the <opp_moves> by 3 and <own_moves> by 2 ,Student defeated ID_Improved but it was inconsistent.

- Similarly this ratio is also not optimal

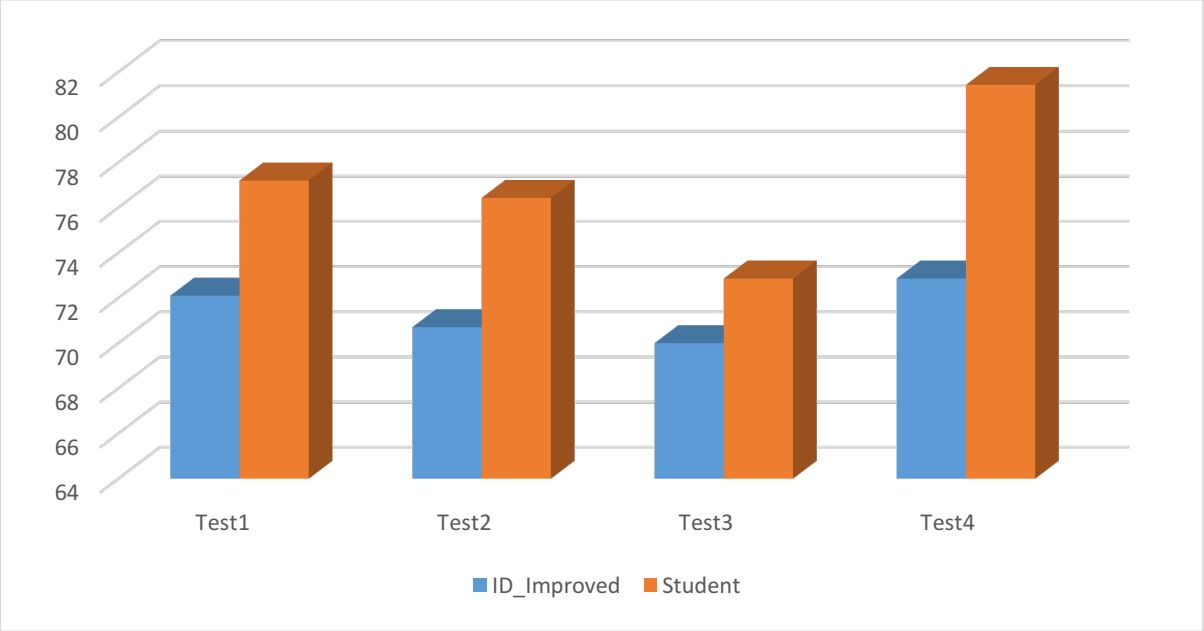


1.5 : 3

- By scaling the <opp_moves> by 3 and <own_moves> by 1.5 ,Student consistently defeated ID_Improved.

- Hence this ratio is the optimal scaling factor for the desired heuristic

Test 4	ID_Improved	Student
Random	18 to 2	19 to 1
MM_Null	17 to 3	16 to 4
MM_Open	12 to 8	15 to 5
MM_Improved	11 to9	15 to 5
AB_Null	18 to 2	18 to 2
AB_Open	15 to 5	16 to 4
AB_Improved	11 to 9	15 to 5



Reasons to consider the above heuristic ratio

- It discards the possibility of a false score when my player's moves (own_moves) are only slightly lesser than <opp_moves> as it scales both the moves by a certain factor.

- This makes our computer player chase the opponent player.But in this case it gets close to the opponent but not close enough which is what resulting in successful win ratios.

- This function does a very good job of eliminating the opponent's moves due to scaling when the opponent has many possibilities to move.