RESULTS:

This is for first question

The two probabilities for AI1 vs. AI0 game for (3,3,3) board are p1=P(AI1)=0.90501 and p2=P(AI0)=0.08244

The two probabilities for AI2 vs. AI0 game for (3,3,3) board are p1=P(AI2)=0.96753 and p2=P(AI0)=0.0091

The two probabilities for AI2 vs. AI1 game for (3,3,3) board are p1=P(AI2)=0.77102 and p2=P(AI1)=0.08389

The two probabilities for AI1 vs. AI0 game for (4,4,4) board are p1=P(AI1)=0.92468 and p2=P(AI0)=0.04663

The two probabilities for AI2 vs. AI0 game for (4,4,4) board are p1=P(AI2)=0.95791 and p2=P(AI0)=0.001

The two probabilities for AI2 vs. AI1 game for (4,4,4) board are p1=P(AI2)=0.5649 and p2=P(AI1)=0.01504

The two probabilities for AI1 vs. AI0 game and (4,3,3) board are p1=P(AI1)=0.91575 and p2=P(AI0)=0.0832

The two probabilities for AI2 vs. AI0 game and (4,3,3) board are p1=P(AI2)=0.97982 and p2=P(AI0)=0.01697

The two probabilities for AI2 vs. AI1 game and (4,3,3) board are p1=P(AI2)=0.84567 and p2=P(AI0)=0.13892

This is for second question

The two probabilities for AI0 vs. AI0 game for (3,3,3) board and p1 first are p1=P(AI1)=0.51697 and p2=P(AI0)=0.4801

The two probabilities for AI0 vs. AI0 game for (3,3,3) board and p2 first are p1=P(AI1)=0.48311 and p2=P(AI0)=0.51395

The two probabilities for AI2 vs. AI2 game for (3,3,3) board and p1 first are p1=P(AI1)=0.31024 and p2=P(AI0)=0.17306

The two probabilities for AI2 vs. AI2 game for (3,3,3) board and p2 first are p1=P(AI1)=0.17336 and p2=P(AI0)=0.3105

The two probabilities for AI0 vs. AI0 game for (4,4,4) board and p1 first are p1=P(AI1)=0.50421 and p2=P(AI0)=0.49263

The two probabilities for AI0 vs. AI0 game for (4,4,4) board and p2 first are p1=P(AI1)=0.49191 and p2=P(AI0)=0.50491

The two probabilities for AI2 vs. AI2 game for (4,4,4) board and p1 first are p1=P(AI1)=0.03833 and p2=P(AI0)=0.02049

The two probabilities for AI2 vs. AI2 game for (4,4,4) board and p2 first are p1=P(AI1)=0.02112 and p2=P(AI0)=0.03971

The two probabilities for AI0 vs. AI0 game for (4,3,3) board and p1 first are p1=P(AI1)=0.52332 and p2=P(AI0)=0.47634

The two probabilities for AI0 vs. AI0 game for (4,3,3) board and p2 first are p1=P(AI1)=0.47384 and p2=P(AI0)=0.52582

The two probabilities for AI2 vs. AI2 game for (4,3,3) board and p1 first are p1=P(AI1)=0.54231 and p2=P(AI0)=0.24372
The two probabilities for AI2 vs. AI2 game for (4,3,3) board and p2 first are p1=P(AI1)=0.24561 and p2=P(AI0)=0.5413

DISCUSSIONS:

From the above results for the first question:

Since, AI2 is most clever among all, AI2 was winning all the games with good probability in all the games it participated. And, in games between AI1 and AI0, AI1 is a better(clever) player, so it is winning the most as per the estimated probabilities and as well as per the intuition. However, to comment on games between AI2 and AI0, AI2 should have fairly high probability of winning which is what our results also gives (winning probability of AI2 is > 0.95 for all games vs. AI0) and between AI1 vs. AI0 the winning probability of AI1 is a little less than that of AI2 when they play against AI0 which is around 0.9 and it is an expected result. Now, to comment on the games between AI2 and AI1, AI2 have more than 0.5 probability of winning and AI1 has less than 2% chance of winning in general across all the board types.

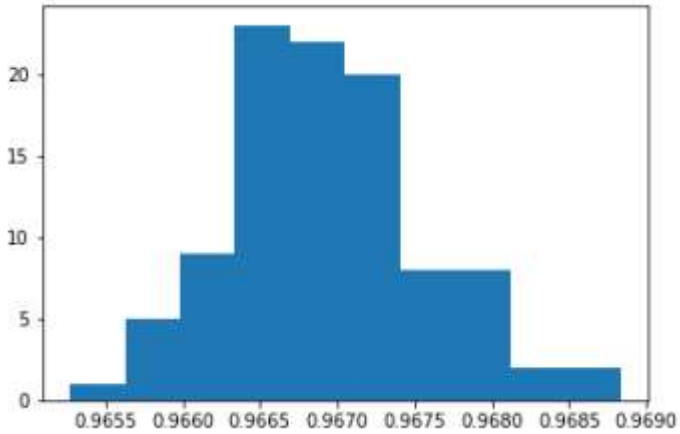
From the above results for the second question:

For second question, all the games record, the player who plays first is winning with good probability which is also expected.

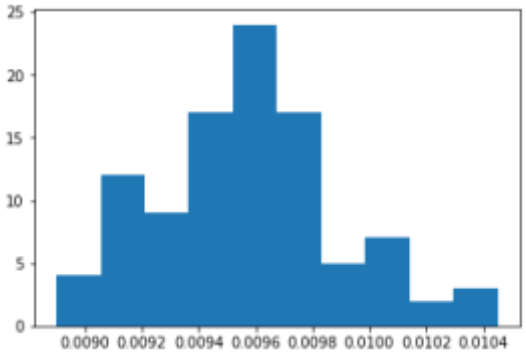
Scenario1: Since, the results of AI2 vs. AI0 says that AI2 has >0.95 probability of winning which seems to be accurate. We can simulate this game 100 times.

The below are the histograms of simulation of 100 times of 10**5 games between AI2 vs. AI0 on (3,3,3) board

1. Winning probability of AI2



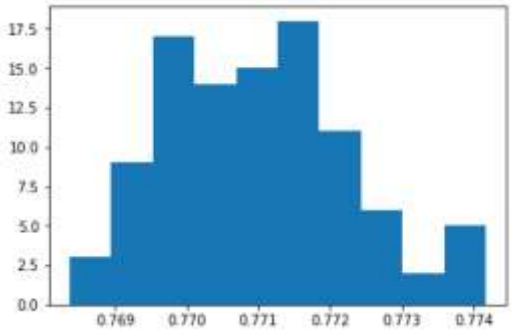
2. Winning probability of AI0



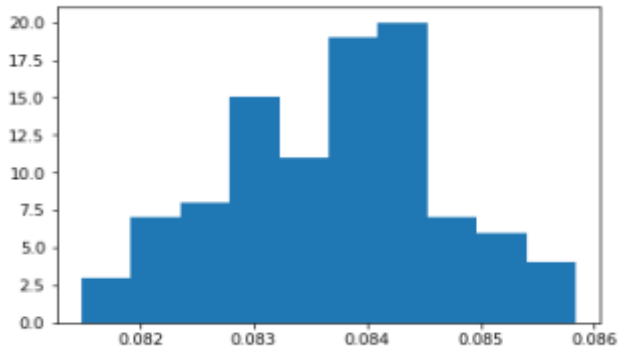
Scenario2: Since, there is a little skeptical about the game: AI2 vs. AI1 over probabilities that about many of the games result in draw, we can simulate this game 100 times.

The below are the histograms of simulation of 100 times of 10**5 games between AI2 vs. AI1 on (3,3,3) board

1. winning probability of AI2



2. winning probability of AI1



For the above two cases, we consider (3,3,3) board

From the histograms, it is pretty clear from the dispersion of the probabilities of 100 simulations that they don't have much variance and estimated probability can be considered very close to the true probability. So, everything is pretty clear now.