COMP 6660 Fall 2022 Assignment 2a

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1 Random Search Results

The experiment was run 30 times for 2000 evaluations per run. The config file used for the experiment can be found at `configs/green2a_config.txt`. Run metrics are given in table 1 on page 3. The best solution found was given a fitness score of **96**. This fitness was hit in the **9th run**. The stair step plot for best fitness run is shown in figure 1 on page 4. The plot of the standard deviation of the best fitness per run is shown in figure 2 on page 5. The plot of the average fitness per run is shown in figure 3 on page 6.

Run Number	Best Solution Fitness Score	Average Fitness Score	Best Fitness Standard Deviation
1	76	74.18	7.63
2	90	87.98	9.58
3	73	71.92	5.98
4	90	84.29	11.43
5	80	78.46	7.55
6	83	73.07	7.11
7	83	79.62	9.5
8	73	72.02	4.26
9	96	91.71	10.32
10	83	82.66	4.04
11	76	73.94	6.3
12	80	77.23	6.19
13	80	74.18	9.25
14	83	77.19	8.77
15	70	65.58	3.78
16	76	73.57	6.8
17	90	84.79	9.2
18	70	66.4	6.03
19	76	70.55	5.87
20	83	74.8	9.82
21	83	79.46	5.8
22	93	92.72	4.32
23	93	86.93	12.02
24	76	72.66	6.06
25	86	84.61	6.32
26	86	81.88	7.19
27	96	85.22	9.18
28	73	68.98	5.99
29	70	68.13	4.43
30	93	84.92	12.44

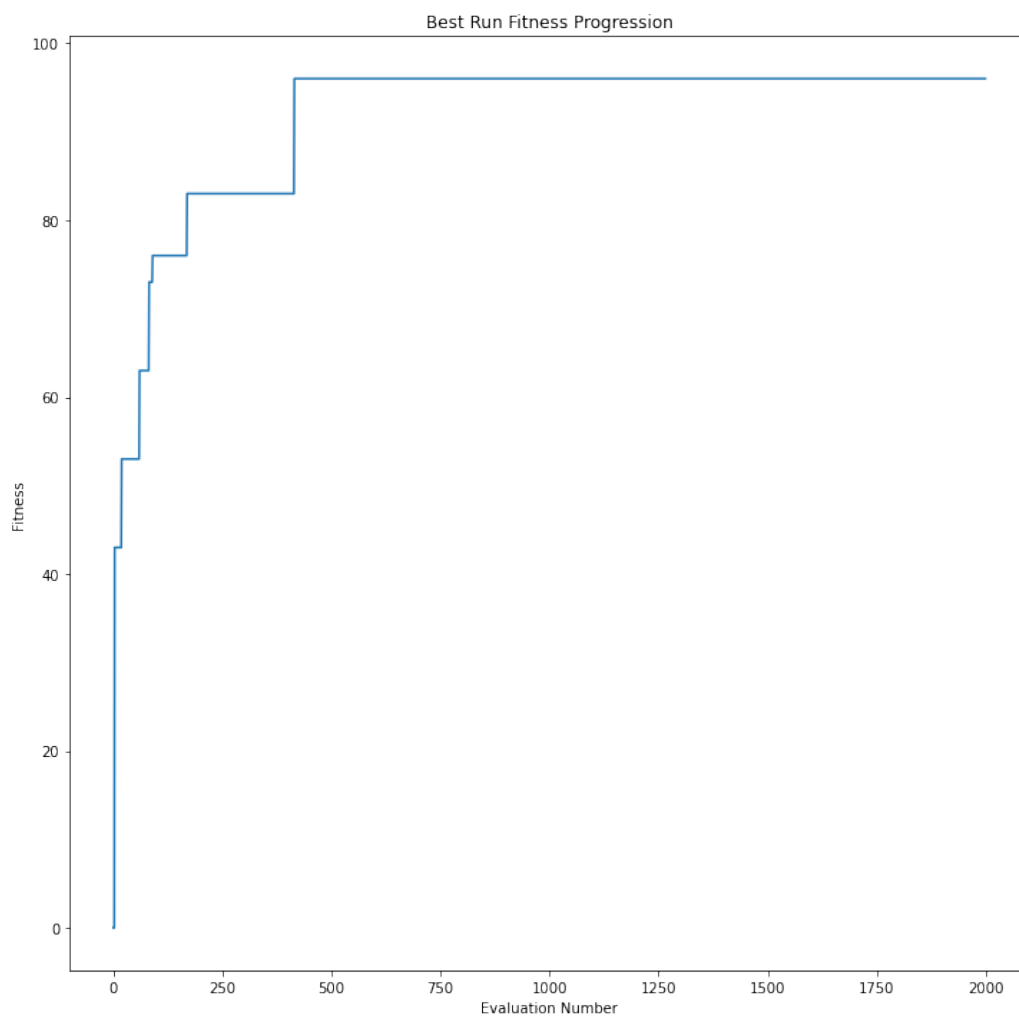Table 1: Random Search Metrics Per Run

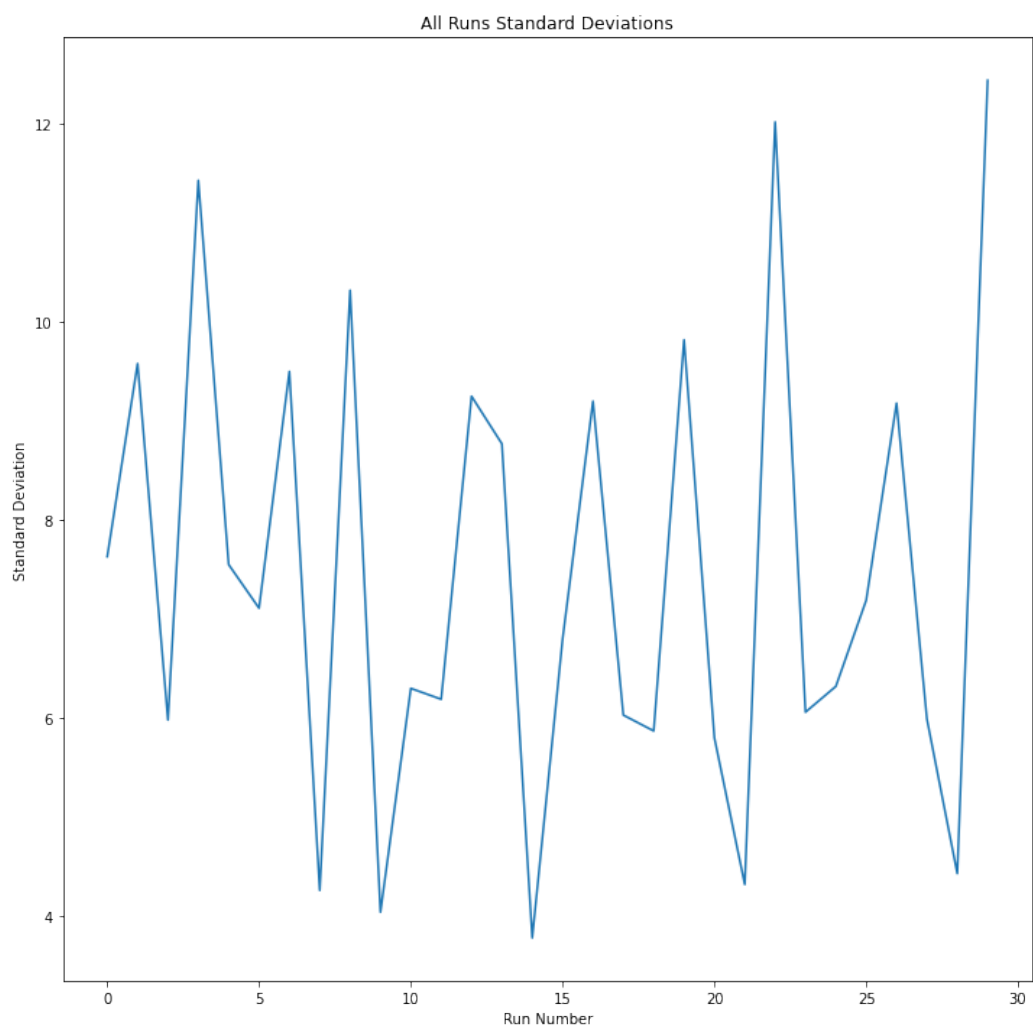Figure 1: Random Search Best Fitness Run Stair Plot

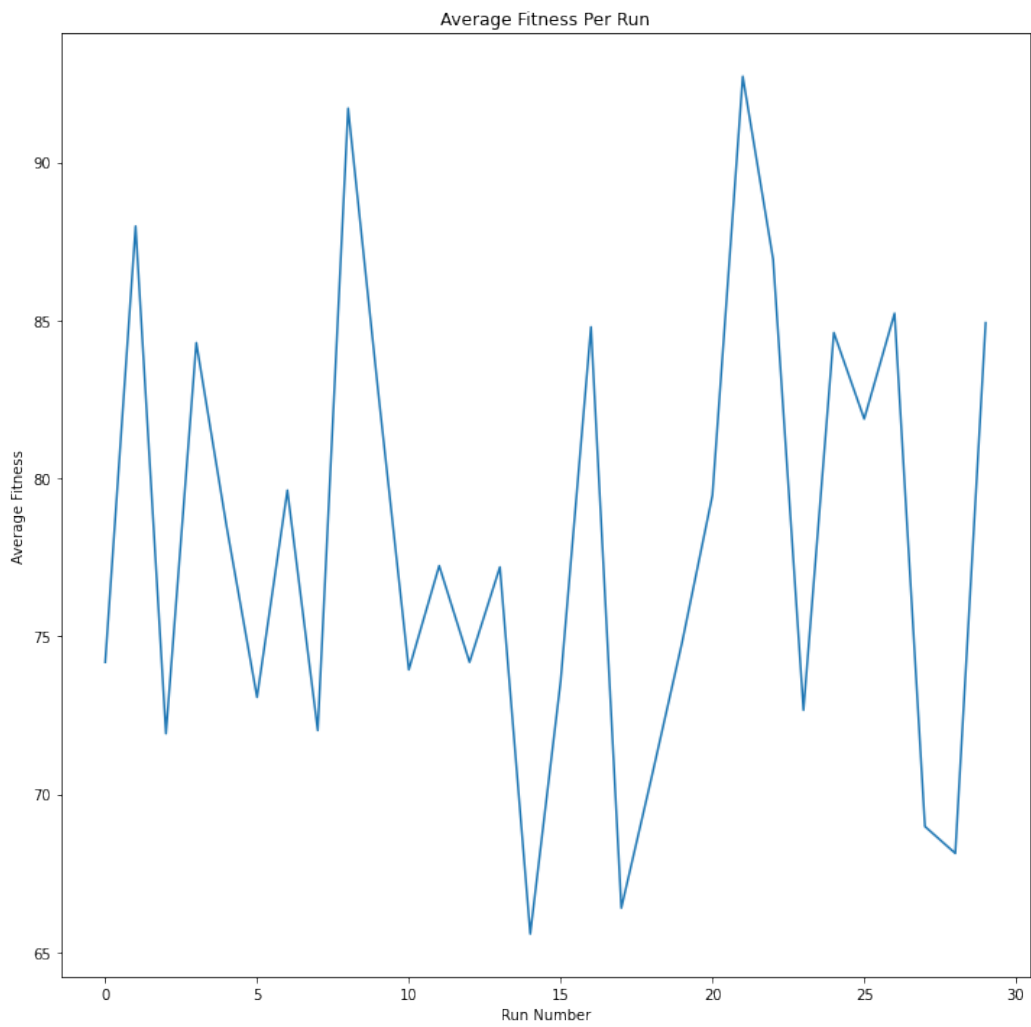Figure 2: Random Search Best Fitness Standard Deviation Plot

Figure 3: Random Search Average Fitness Per Run Plot

1.1 Random Search Informal Analysis

One thing that I noticed when watching the visualization was that the agent kept moving back and forth in the same location. To me this is a clear sign of just random decision and not calculated at all. Additionally, the agent did not seem to take into consideration the location of the ghost to try to avoid them. This is clear since the agent did not make it through a whole game before getting hit by a ghost. I do not think that this agent did very well and could be improved.

2   Hill Climbing Results

The experiment was run 30 times for 2000 evaluations per run. The config file used for the experiment can be found at `configs/hill_climbing_config.txt`. Run metrics are given in table 2 on page 9. The best solution found was given a fitness score of **100**. This fitness was hit in the **14th run**. The stair step plot for best fitness run is shown in figure 4 on page 10. The plot of the standard deviation of the best fitness per run is shown in figure 5 on page 11. The plot of the average fitness per run is shown in figure 6 on page 12.

2.1   Hill Climbing Informal Analysis

As far as the visualization, it seemed to me that the agent made a bit more calculated moves when it came to going to the nearest pill as well as avoiding the ghost player. However, the model could still be improved. Surprisingly to me, the hill climbing achieved a higher best fitness than the random search. I believe that this is just a fluke of the randomness of both algorithms since both best fitness values were pretty close to one another. However, the hill climbing did produce a much shorter solution tree than the random search EA did. In support of the EA though, it did hit a higher fitness faster than the hill climbing algorithm did.

| Run Number	Best Solution Fitness Score	Average Fitness Score	Best Fitness Standard Deviation
1	93	75.14	10.68
2	80	75.48	6.82
3	86	76.87	10.15
4	93	87.14	7.69
5	86	83.46	8.95
6	96	82.19	9.33
7	86	76.66	9.38
8	76	71.69	10.40
9	83	80.81	4.39
10	86	78.97	4.32
11	86	83.21	7.4
12	80	77.73	8.88
13	76	73.44	7.0
14	100	85.36	12.51
15	90	83.72	9.55
16	93	83.32	13.95
17	83	78.01	10.55
18	93	90.56	8.7
19	76	75.08	3.77
20	80	78.15	5.84
21	83	80.8	9.08
22	86	82.24	7.38
23	90	85.10	10.15
24	93	74.69	9.4
25	80	79.21	3.82
26	83	79.04	10.96
27	80	72.70	11.32
28	83	75.09	6.2
29	90	87.46	7.08
30	86	78.06	9.33

Table 2: Hill Climbing Metrics Per Run
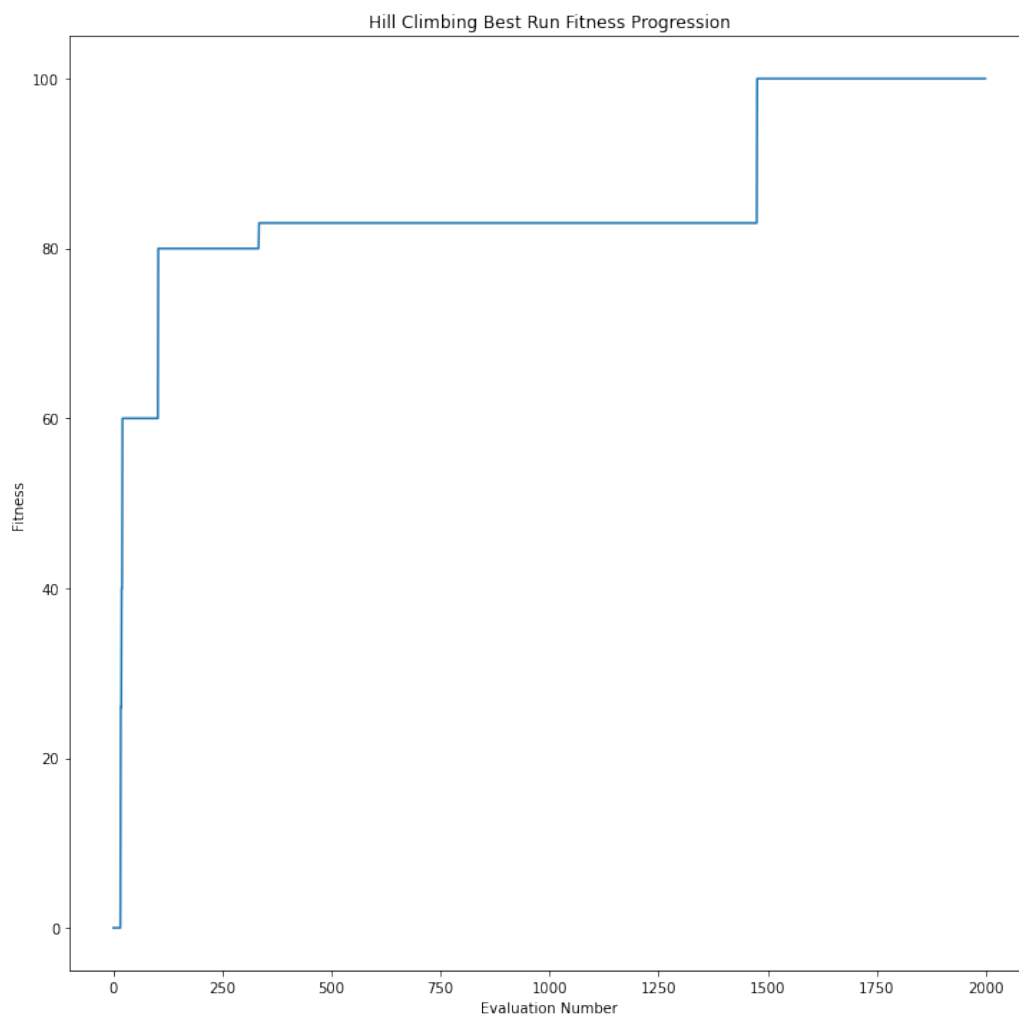
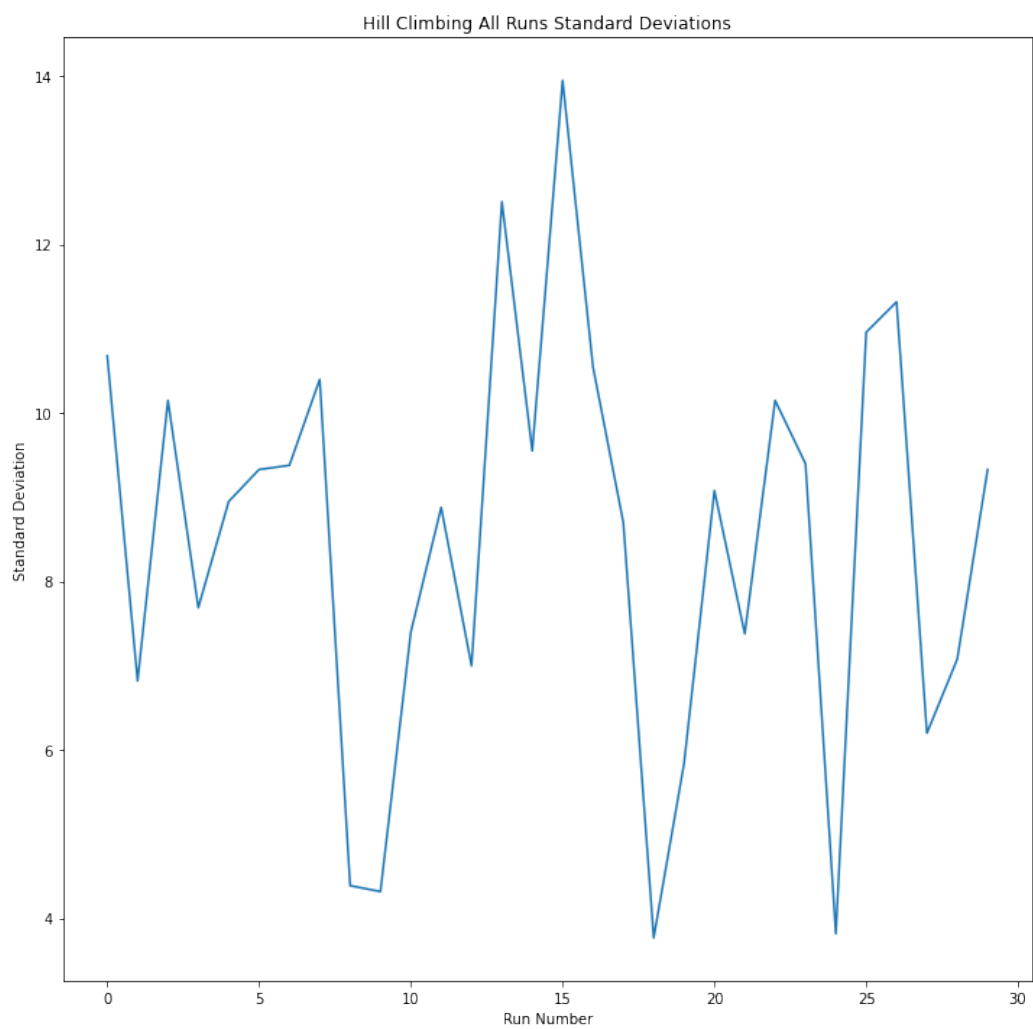Figure 4: Hill Climbing Best Fitness Run Stair Plot
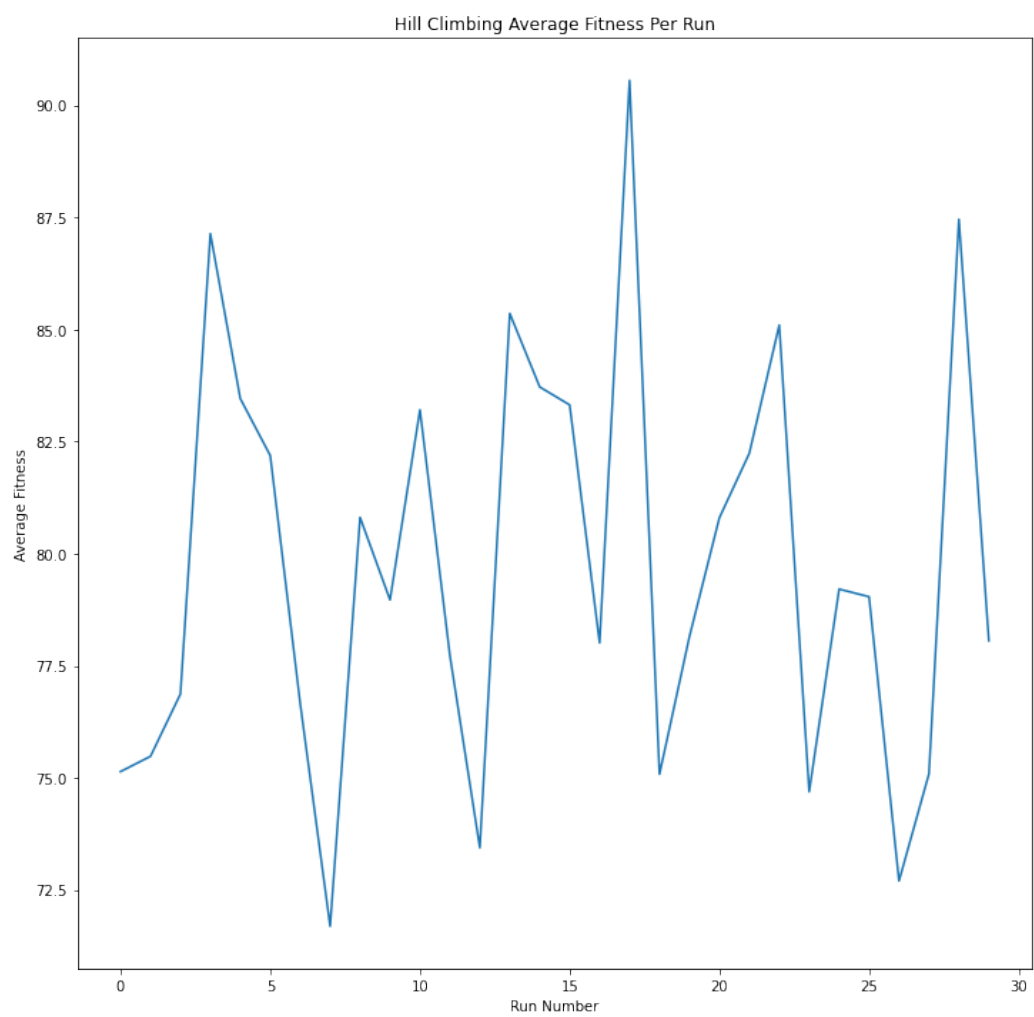
Figure 5: Hill Climbing Best Fitness Standard Deviation Plot

Figure 6: Hill Climbing Average Fitness Per Run Plot