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COMP SCI 5401 FS2017 Assignment 1b

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Average vs Best Fitness

As can be seen from Figure 1, the designed EA gradually improves as the number of evaulations goes up. This is what is expected from evolutionary algorithms. This trend does not continue in Figure 2 and Figure 3. The solution improves rapidly at first, but quickly levels off.

1A vs 1B

F and t tests are employed to test the null hypotheses that both random search and evolutionary algorithms (EA) produce equally good results. This is because the distribution is not known, but 30 runs are completed for each test case.

First Input

As can be seen from Figure 4, a t-test with equal variance is used because the mean of random search is less than the mean of EA and F $>$ F Critical one-tail. In Figure 5 shows that T-stat is less than t Critical two-tail, so the null hypothesis is not rejected and there is NO SIGNIFICANT DIFFERENCE between the two algorithms.

Second Input

As can be seen from Figure 6, a t-test with unequal variance is used because the mean of random search is less than the mean of EA and F $<$ F Critical one-tail. In Figure 7 shows that T-stat is less than t Critical two-tail, so the null hypothesis is not rejected and there is NO SIGNIFICANT DIFFERENCE between the two algorithms.

Third Input

As can be seen from Figure 8, a t-test with equal variance is used because the mean of random search is less than the mean of EA and F $<$ F Critical one-tail. In Figure 9 shows that T-stat is less than t Critical two-tail, so the null hypothesis is not rejected and there is NO SIGNIFICANT DIFFERENCE between the two algorithms.

Figure 1: Average and Best Fitness for Input 1

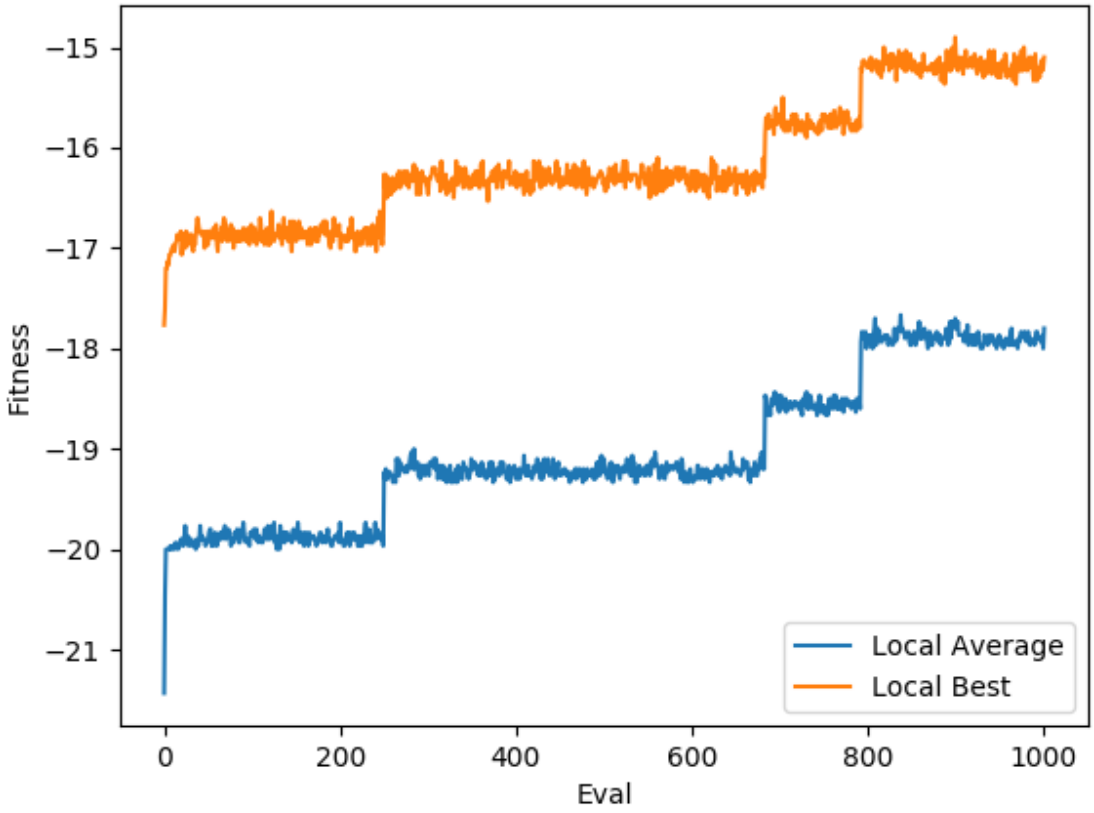

Figure 2: Average and Best Fitness for Input 2

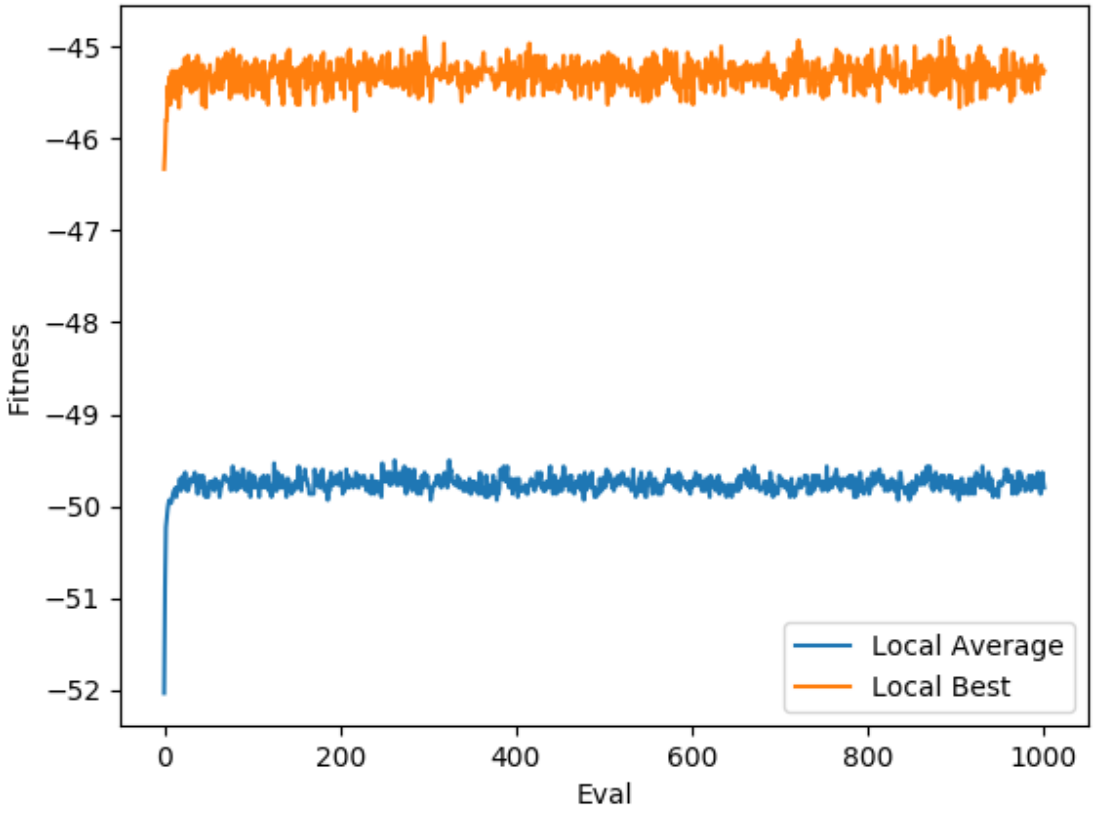

Figure 3: Average and Best Fitness for Input 3

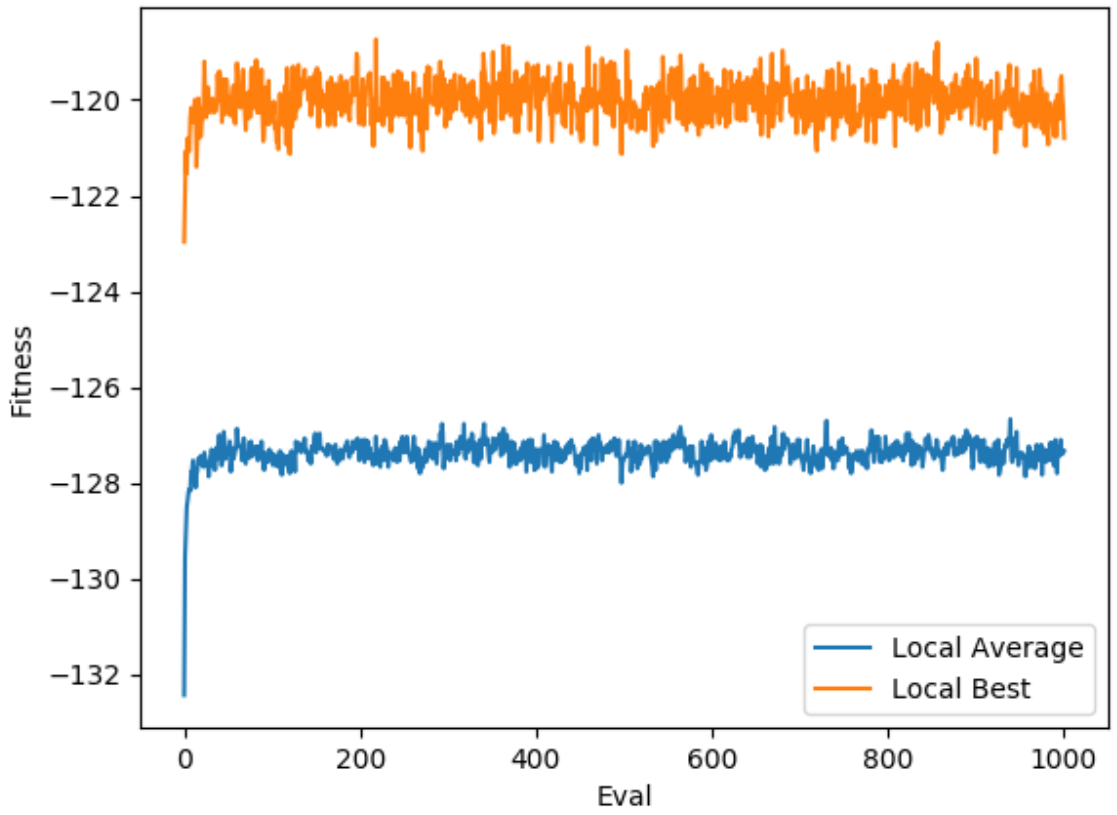

Figure 4: F Test for Input 1 Assignment 1B vs 1A

F-Test Two-Sample for Variances

	Variable 1	*Variable 2*
Mean	-16.9333	-16.8333
Variance	0.616092	0.143678
Observations	30	30
df	29	29
F	4.288	
P(F<=f) one-tail	9.43E-05	
F Critical one-tail	1.860811	

Figure 5: T Test for Input 1 Assignment 1B vs 1A

t-Test: Two-Sample Assuming Equal Variances

	Variable 1	*Variable 2*
Mean	-16.9333	-16.8333
Variance	0.616092	0.143678
Observations	30	30
Pooled Variance	0.379885	
Hypothesized Mean Difference	0	
df	58	
t Stat	-0.62838	
P(T<=t) one-tail	0.266112	
t Critical one-tail	1.671553	
P(T<=t) two-tail	0.532224	
t Critical two-tail	2.001717	

Figure 6: F Test for Input 2 Assignment 1B vs 1A

F-Test Two-Sample for Variances

	Variable 1	*Variable 2*
Mean	-45.2667	-45.2333
Variance	0.478161	0.322989
Observations	30	30
df	29	29
F	1.480427	
P(F<=f) one-tail	0.148239	
F Critical one-tail	1.860811	

Figure 7: T Test for Input 2 Assignment 1B vs 1A

t-Test: Two-Sample Assuming Unequal Variances

	Variable 1	*Variable 2*
Mean	-45.2667	-45.2333
Variance	0.478161	0.322989
Observations	30	30
Hypothesized Mean Difference	0	
df	56	
t Stat	-0.20398	
P(T<=t) one-tail	0.419555	
t Critical one-tail	1.672522	
P(T<=t) two-tail	0.83911	
t Critical two-tail	2.003241	

Figure 8: F Test for Input 3 Assignment 1B vs 1A

F-Test Two-Sample for Variances

	Variable 1	*Variable 2*
Mean	-120.8	-116.6
Variance	4.510345	2.041379
Observations	30	30
df	29	29
F	2.209459	
P(F<=f) one-tail	0.018323	
F Critical one-tail	1.860811	

Figure 9: T Test for Input 3 Assignment 1B vs 1A

t-Test: Two-Sample Assuming Equal Variances

	Variable 1	*Variable 2*
Mean	-120.8	-116.6
Variance	4.510345	2.041379
Observations	30	30
Pooled Variance	3.275862	
Hypothesized Mean Difference	0	
df	58	
t Stat	-8.98736	
P(T<=t) one-tail	6.96E-13	
t Critical one-tail	1.671553	
P(T<=t) two-tail	1.39E-12	
t Critical two-tail	2.001717	