COMP SCI 5401 FS2017 Assignment 1b

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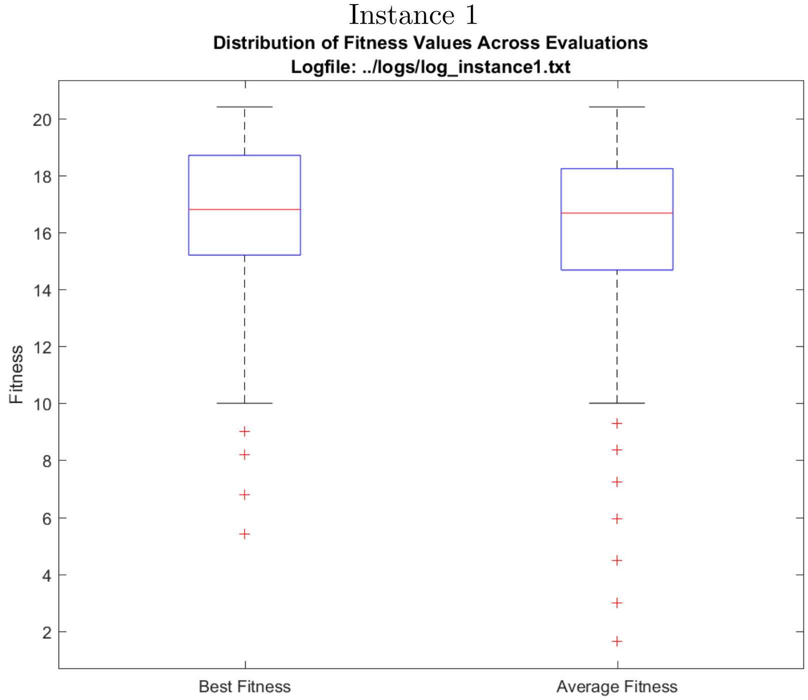
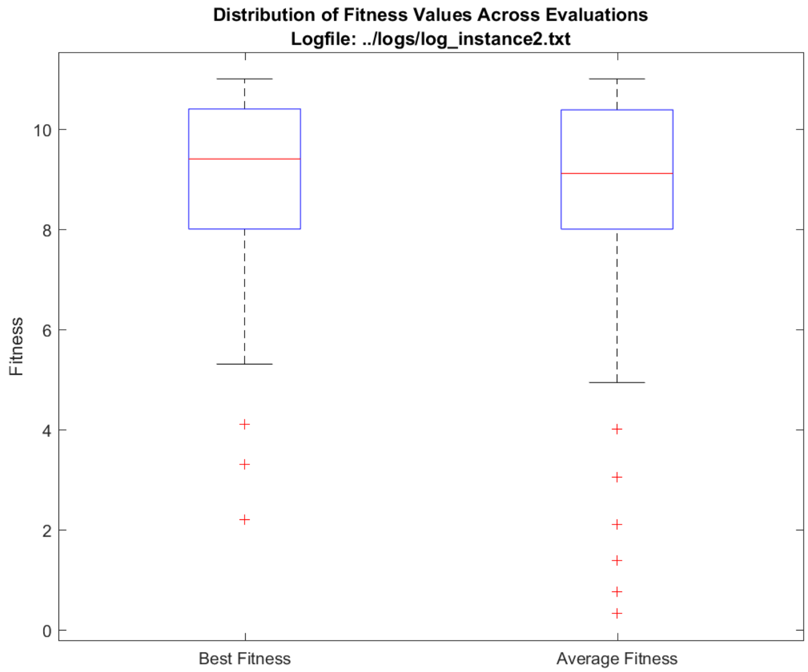
1 Fitness Plots

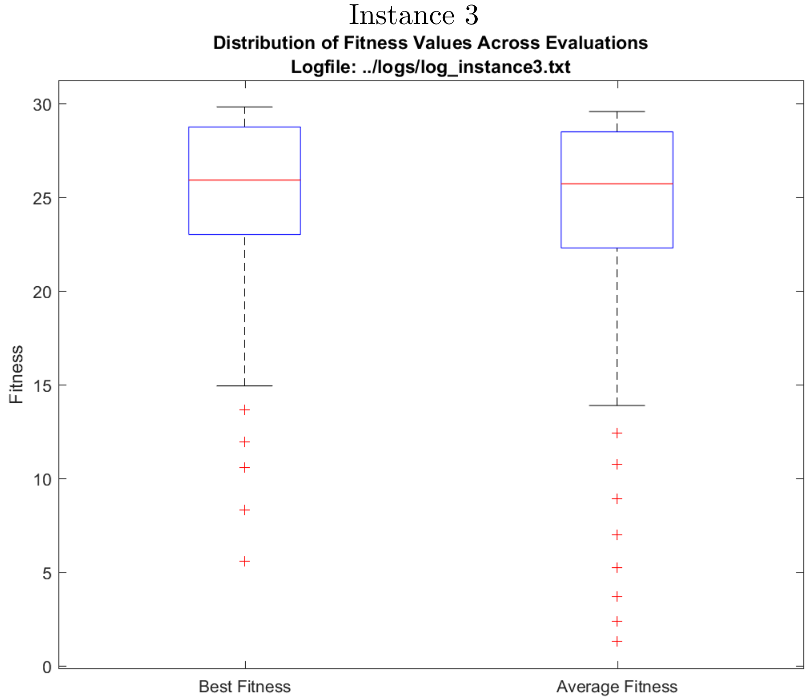
Instance 1



Instance 2



Instance 3



2 Statistical Analysis

Instance 1

F-Test Two-Sample for Variances

	Variable 1	Variable 2
Mean	3.428571429	18.8289899
Variance	6.952380952	26.47215938
Observations	7	198
df	6	197
F	0.262629914	
P(F<=f) one-tail	0.046377354	
F Critical one-tail	0.270947267	

t-Test: Two-Sample Assuming Unequal Variances

	Variable 1	Variable 2
Mean	3.428571429	18.8289899
Variance	6.952380952	26.47215938
Observations	7	198
Hypothesized Mean Difference	0	
df	8	
t Stat	-14.5074401	
P(T<=t) one-tail	2.49526E-07	
t Critical one-tail	1.859548038	
P(T<=t) two-tail	4.99053E-07	
t Critical two-tail	2.306004135	

Instance 2

F-Test Two-Sample for Variances

	Variable 1	Variable 2
Mean	1	8.997777778
Variance	1	5.01318793
Observations	3	198
df	2	197
F	0.199473871	
P(F<=f) one-tail	0.180673128	
F Critical one-tail	0.051306652	

t-Test: Two-Sample Assuming Equal Variances

	Variable 1	Variable 2
Mean	1	8.997777778
Variance	1	5.01318793
Observations	3	198
Pooled Variance	4.972854383	
Hypothesized Mean Difference	0	
df	199	
t Stat	-6.16540564	
P(T<=t) one-tail	1.92261E-09	
t Critical one-tail	1.652546746	
P(T<=t) two-tail	3.84522E-09	
t Critical two-tail	1.971956544	

Instance 3

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	2.75	24.00818182
Variance	7.583333333	40.83395505
Observations	4	198
df	3	197
F	0.185711458	
P(F<=f) one-tail	0.09396887	
F Critical one-tail	0.117090126	

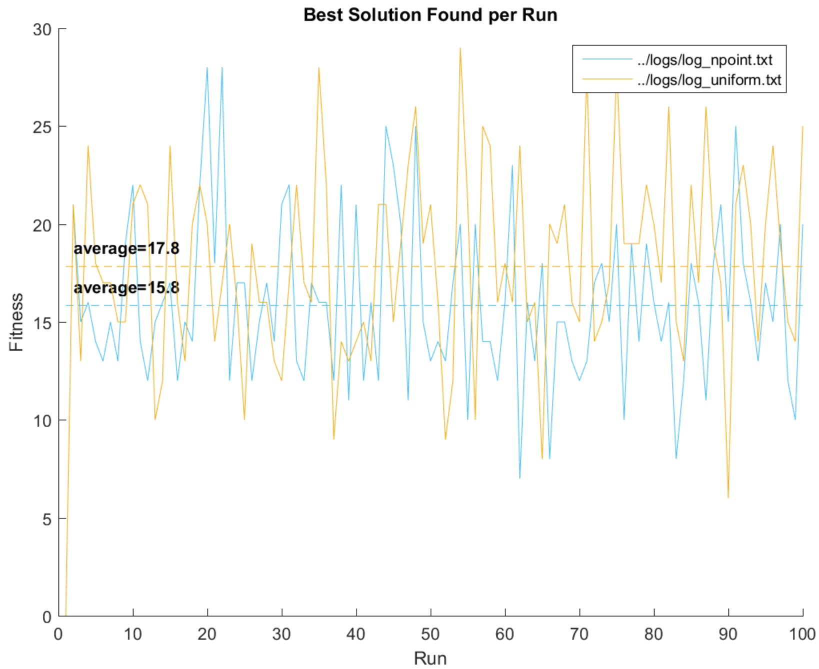
t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	2.75	24.00818182
Variance	7.583333333	40.83395505
Observations	4	198
Pooled Variance	40.33519573	
Hypothesized Mean Difference	0	
df	200	
t Stat	-6.62782357	
P(T<=t) one-tail	1.54754E-10	
t Critical one-tail	1.652508101	
P(T<=t) two-tail	3.09509E-10	
t Critical two-tail	1.971896224	

3 Bonus 1 - Operator Comparison

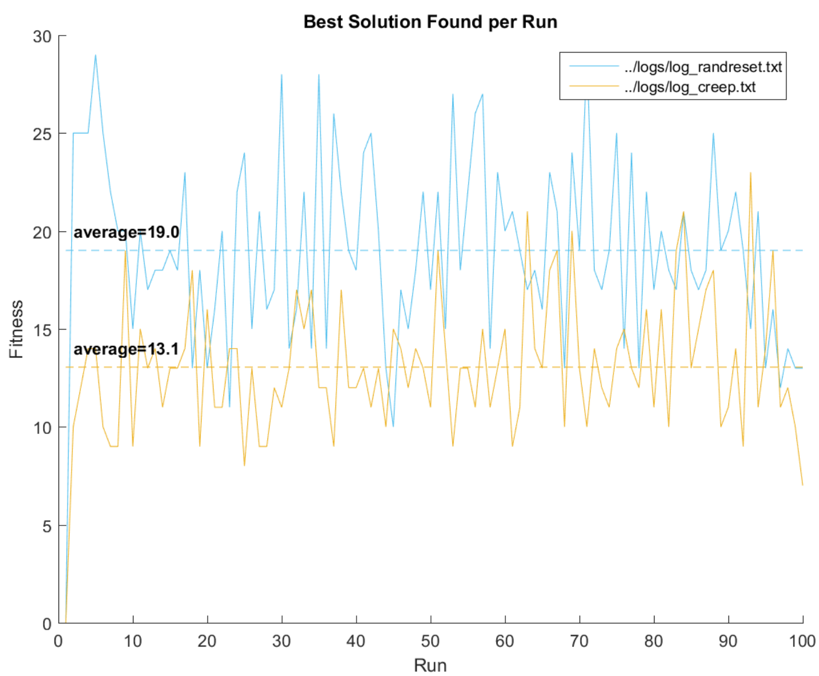
For the operator comparison, both n-point and uniform crossover methods were implemented for the recombination stage and random reset and creep methods were implemented for the mutation stage. The parameters were set to 3 crossover points (for n-point crossover), 50% distribution (for uniform crossover), creep distance of 2 (for creep mutation), and a 20% mutation chance. The limit of 10,000 fitness evaluations was kept, but increased to 100 runs for more data. The best solution from each run was kept and plotted as show below. Trendlines and labels were added to show averages for each.

As shown in the plots below, uniform crossover tends to perform slightly better, while random reset mutation consistently outperforms creep mutation.

Recombination



Mutation



4 Bonus 2 - Repair Function

For repair function analysis, the same configuration was used as Bonus 1. Recombination was set to uniform and mutation was set to random reset and these were determined to be best performing. In initial testing, the repair function always outperformed random placements, so a configuration option was not added to turn it off. For the control in this experiment, the code was manually altered to assign random placements until valid instead of attempting a repair.

As you can see, the non-repairing version performs much worse.