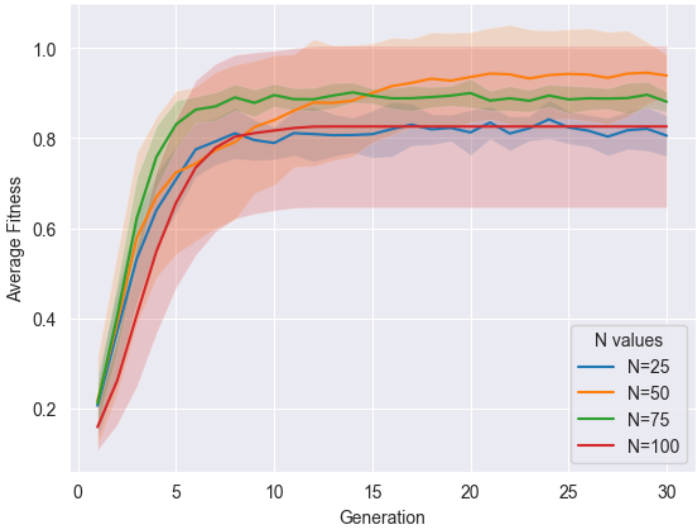
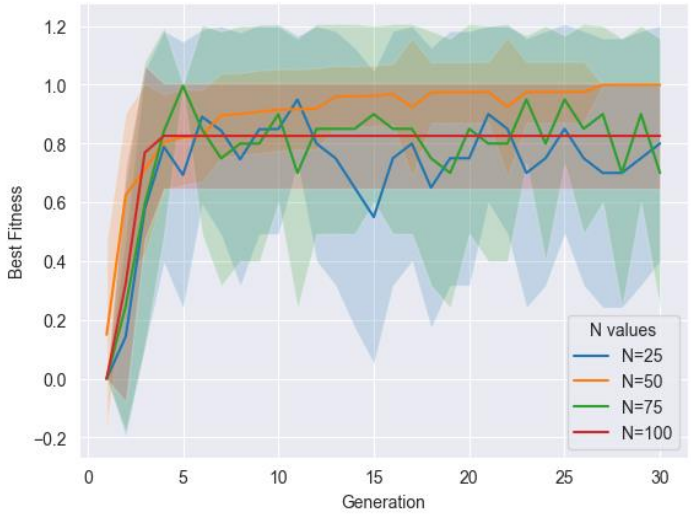
Will Hopkirk
COSC 420 Lab2 Write-up

Graphs

N Average Fitness

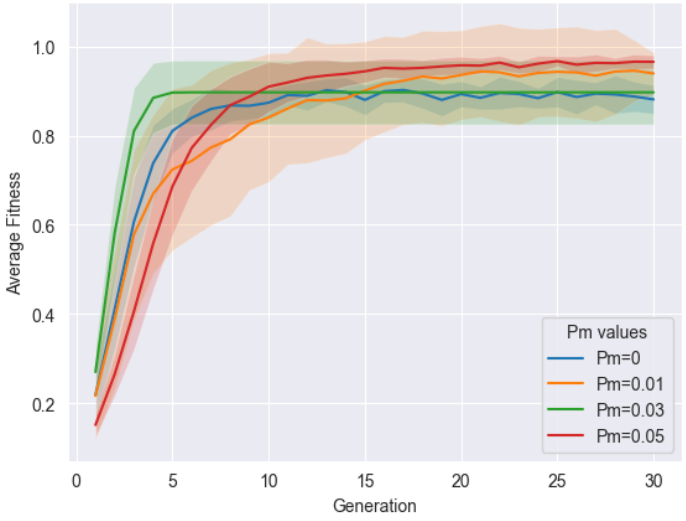


N Best Fitness



These figures above represent the fitness values of different population sizes with the other parameters at their default values. They have been split into the average and best fitness. The best performing value for population size seems to be 50 with 75 as a close second. This is likely because at a population that is too high the fitness cannot increase beyond 0.81 and at too low populations there are less chances for mutation. The size 50 population does the best overall, but it is worth noting that the population of 75 achieved a 1.0 best fitness earlier that the 50.

Pm Average Fitness



Pm Best Fitness

These figures above represent the fitness values of different probabilities of mutations with the other parameters at their default values. They have been split into the average and best fitness. The best performing value for this parameter is 0.05 as it has the highest average fitness and reaches the value 1.0 in best fitness earlier than the other values. This suggests that as the probability of mutation increases the fitness of that genome increases through generations.

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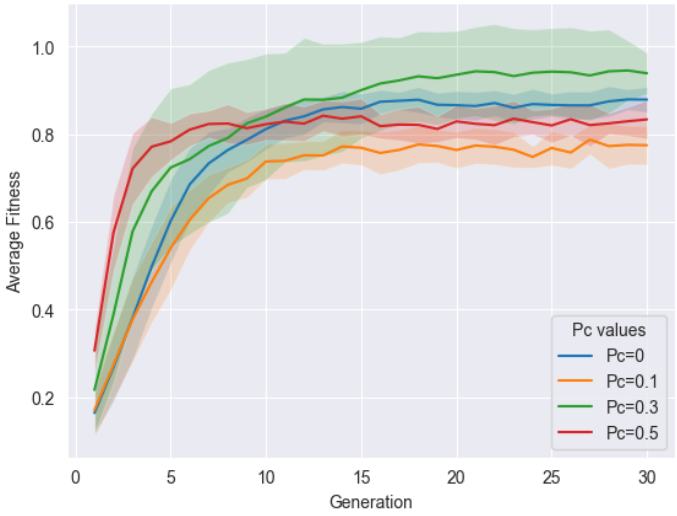
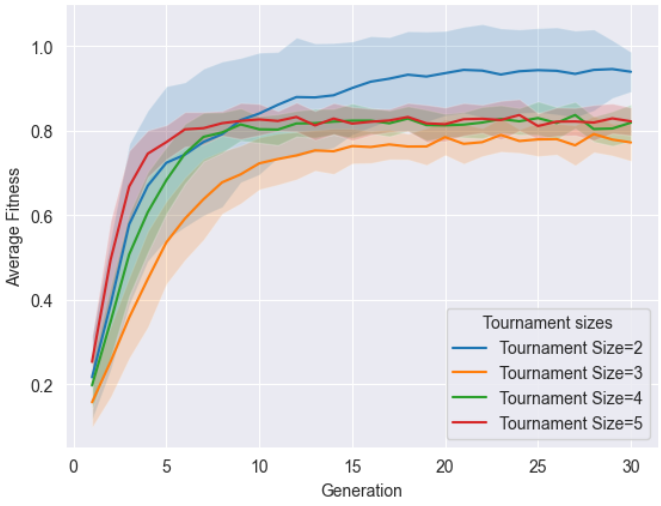
Pc Average Fitness



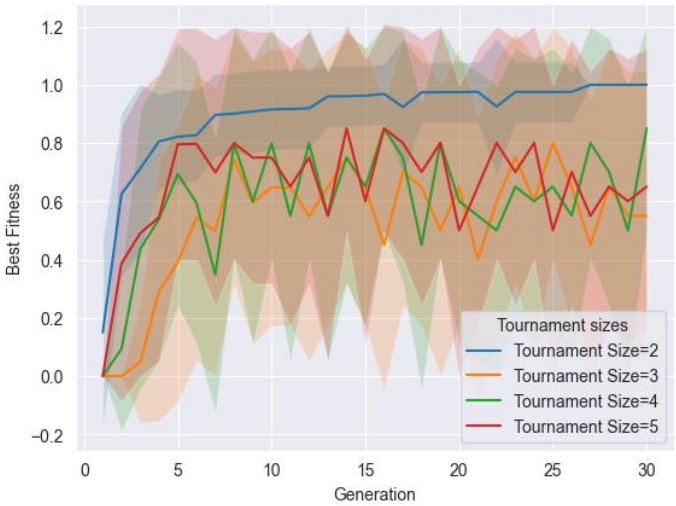
Pc Best Fitness

These figures above represent the fitness values of different probabilities of uniform crossover with the other parameters at their default values. They have been split into the average and best fitness. The highest performing value for this parameter is 0.3. This suggests that probabilities of crossover that are too high result in poorer performing genomes and low values also result in poor performing genomes since both the 0.1 and 0.5 values did poorly. It is worth noting that the 0 chance of crossover did well meaning that it is better to have no uniform crossover than a high or low probability.

Tournament Size Average Fitness



Tournament Size Best Fitness



These figures above represent the fitness values of different tournament sizes with the other parameters at their default values. They have been split into the average and best fitness. This parameter follows a pattern of higher tournament size resulting in lower fitness values. This suggests that selection pressure has a negative effect on the overall performance of the genome.

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Discussion

•Which parameters have the biggest impact on performance in terms of fitness achieved?

The different parameters seem to follow their own patterns on average and best fitness values. For the Population size N, the value 50 seems to do the best overall in terms of fitness (for crossover 0.3, for tournament size 2, and for mutation 0.05). The mutation parameter achieves the highest average fitness values the higher it goes and reaches best values the fastest, so mutation has the biggest impact on performance.

•How does selection pressure influence performance? Note that higher values of tournament size correspond to higher selection pressure.

According to the data of the tournament size graphs, the fitness values are highest when tournament size is at its lowest value 2. This is true for both average and best fitness values. Because high values of tournament size correspond to high selection pressure, selection pressure causes lower fitness values on average.

•Are both crossover and mutation necessary?

Crossover and mutation probabilities affect the genomes ability to change over the generations making them necessary for increasing fitness in populations with lower fitness genes. The probability of mutation seems to positively affect the fitness levels of the genes. It is worth noting that values of zero for crossover do better than values of 0.1 and 0.5 making that parameter less effective overall.

•Which parameters interact with each other the most?

The parameters that interact the most seem to be the tournament sizes and probability of mutation. These values increase the overall fitness of the genomes when they have a correct relationship. the most positive relationship between the values is high probability of mutation and low tournament size.

•How does the population size affect performance?

The best performing value for population size seems to be 50 with 75 as a close second. This is likely because at a population that is too high the fitness cannot increase beyond 0.81 and at too low populations there are less chances for mutation. The size 50 population does the best overall, but it is worth noting that the population of 75 achieved a 1.0 best fitness earlier that the 50 as discussed in the graph discussion.