CS 7641- Machine Learning
Project 2 – Randomized Optimization
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Abstract

This report analyzes performance of 4 randomized optimization algorithms: Randomized Hill Climbing, Simulated Annealing, Genetic Algorithm and MIMIC. First, we analyze these algorithms' performance in determining weights in Artificial Neural Networks. Next, we look at the performance of these algorithms on 3 optimization problems: Travelling Salesman, Continuous Peaks and Flip Flop.

Part 1: Apply Random Optimization in finding ANN weights

The dataset that I used for this was the Adult dataset that was used in project 1.
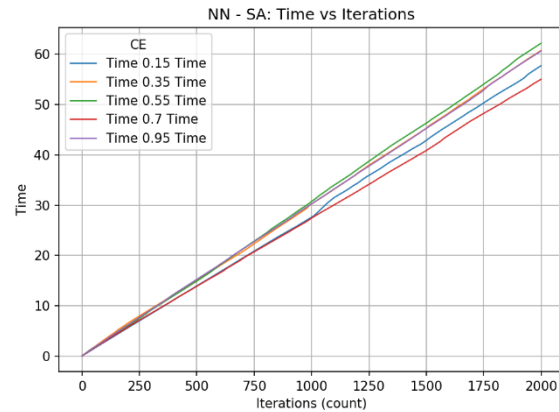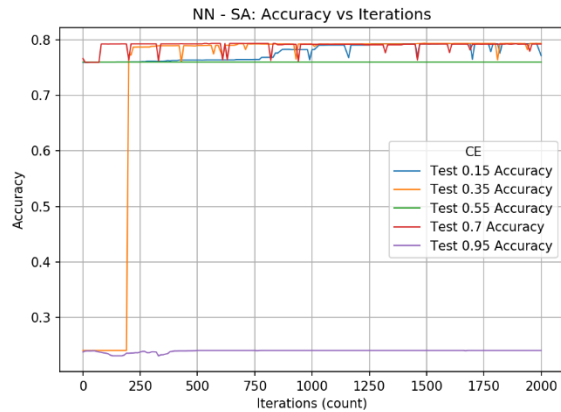
Randomized Hill Climbing:

Following are the accuracy and time obtained with the algorithm.

RHC produced about 79% accuracy with reasonable time taken. This was achieved around 300 iterations, taking about 7 seconds to train. RHC appears to be performing reasonably well for the problem as this was expected.
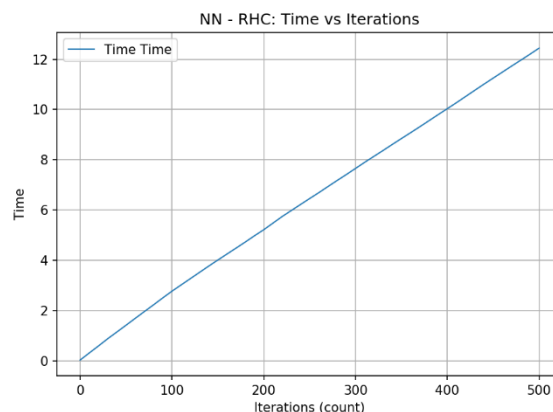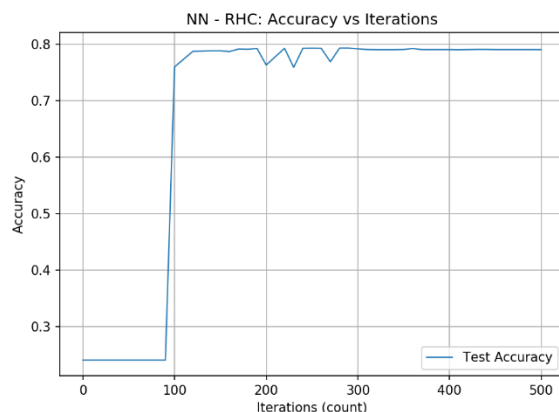
Simulated Annealing:

Following are the accuracy and time obtained with the algorithm.

Simulated annealing produced similar results to Randomized Hill Climbing. The maximum accuracy hovered around 79%, within about 200 iterations taking about 6 seconds to train.

Genetic Algorithm:

Following are the accuracy and time obtained with the algorithm.

Genetic algorithm was the best performing algorithm of the 3. I was able to get an accuracy of 81% with Genetic Algorithm. One of the downsides of the algorithm was the long time taken to train.
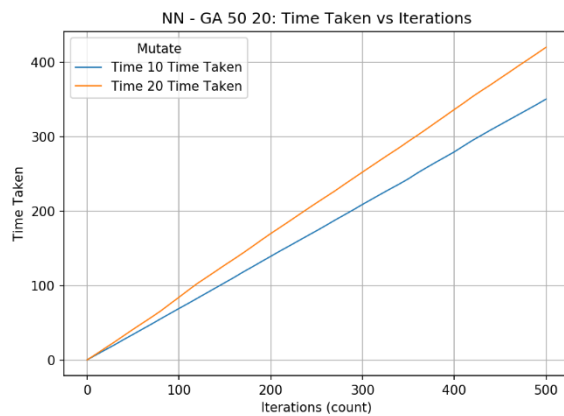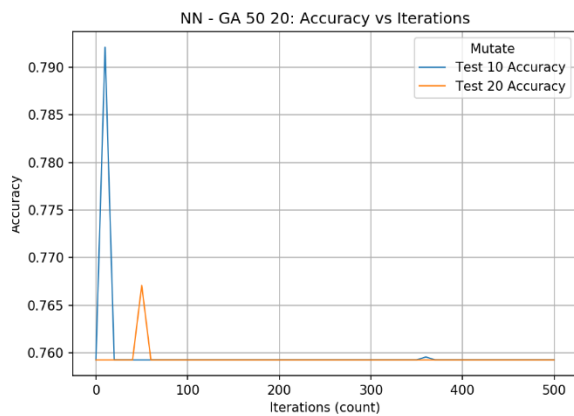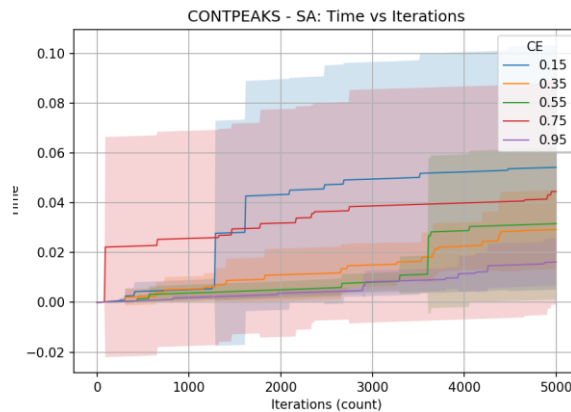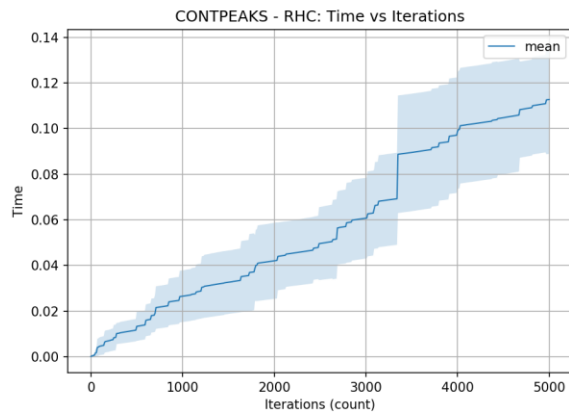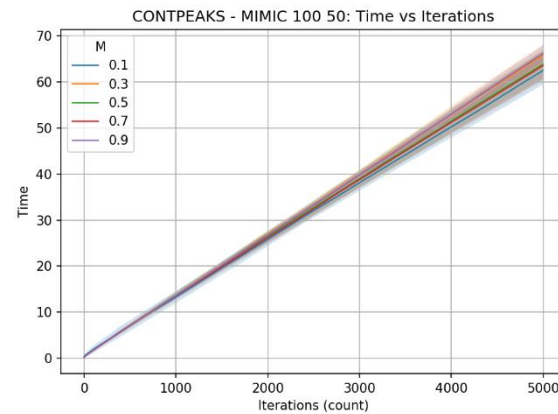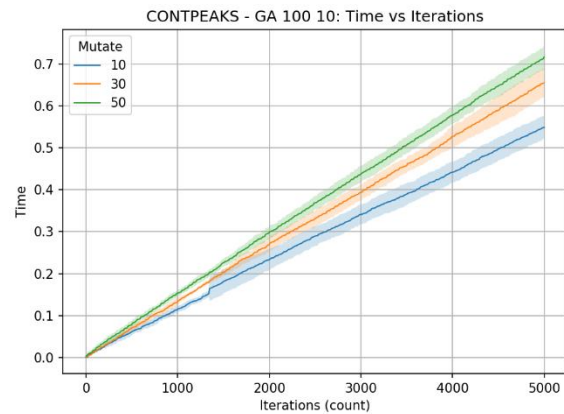

Part 2: Optimization Problems

Continuous Peaks – Simulated Annealing

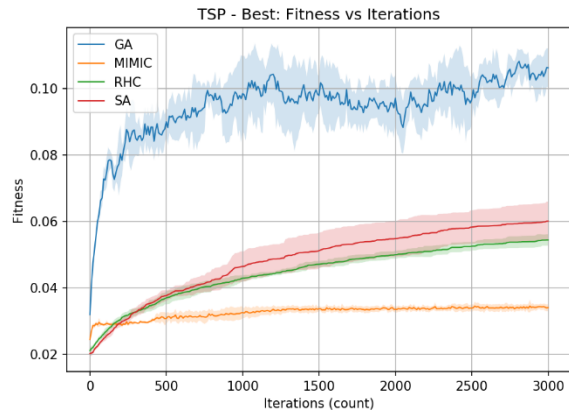Following chart shows the performance of the 4 algorithms for the problem.
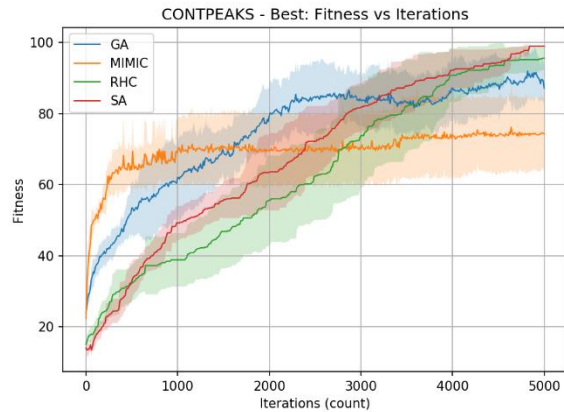
Following charts show the time taken by each of these algorithms.
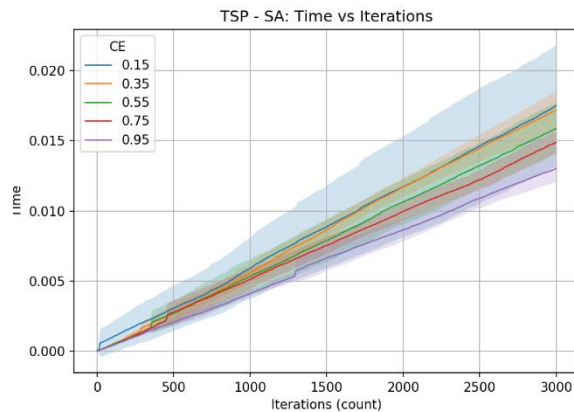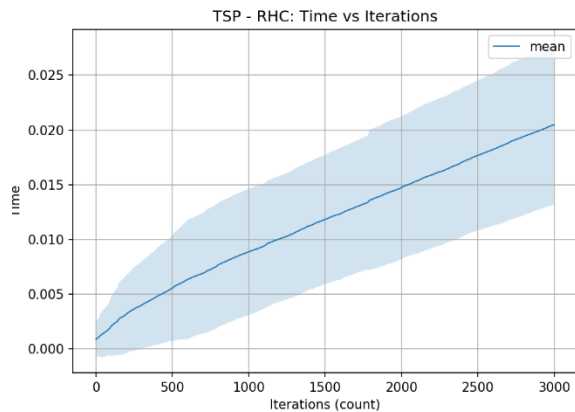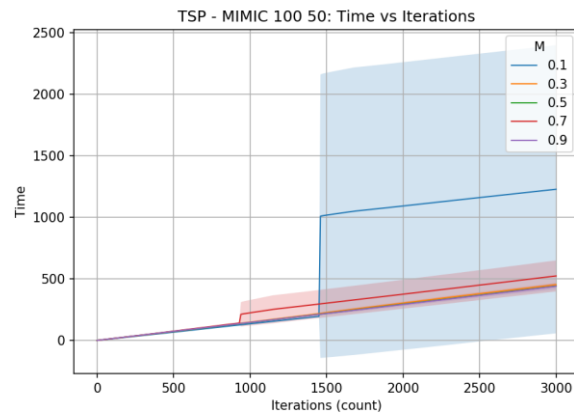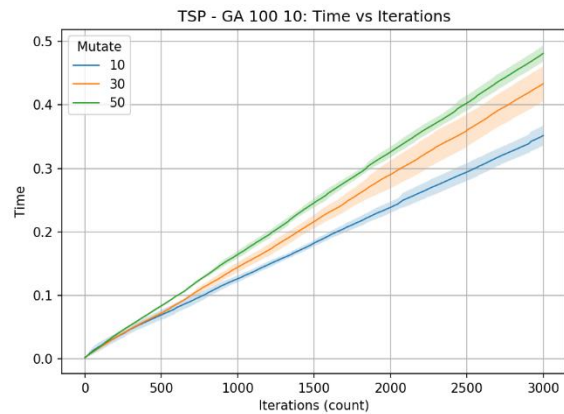

For Continuous Peaks problem, the best algorithm was Simulated Annealing. RHC and GA were close but did not achieve the same fitness as Simulated Annealing.

Travelling Salesman – Genetic Algorithm

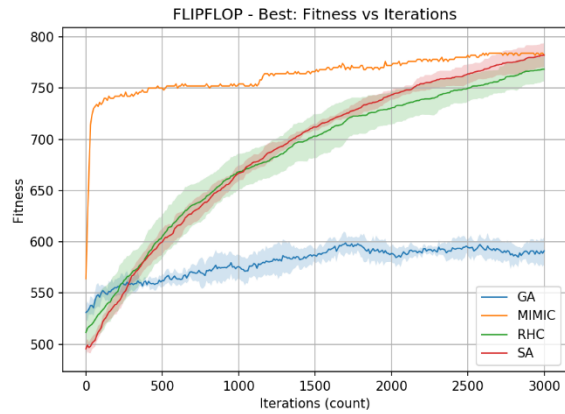Following chart shows the performance of the 4 algorithms for the problem.

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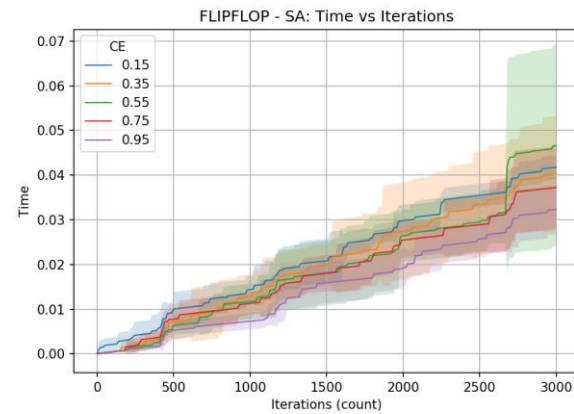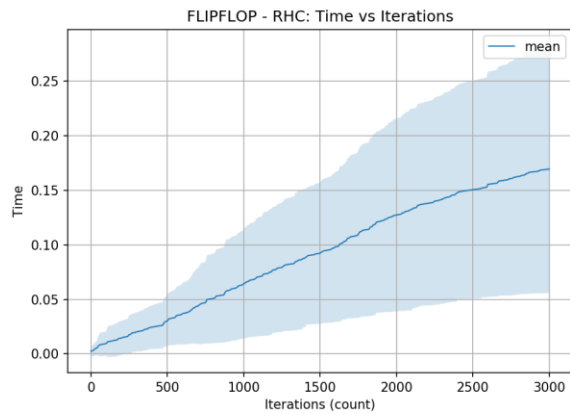

The best algorithm for the Travelling Salesman problem was Genetic Algorithm.

FlipFlop Problem
Following chart shows the performance of the 4 algorithms for the problem.

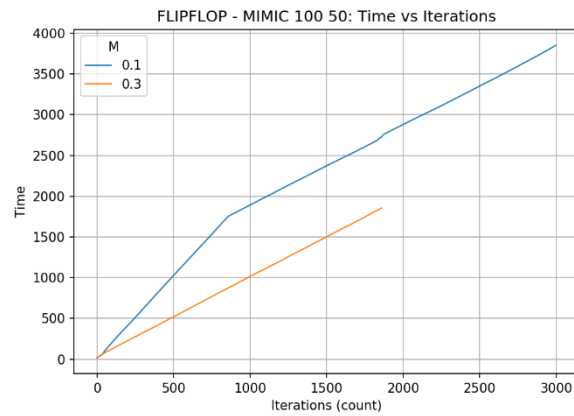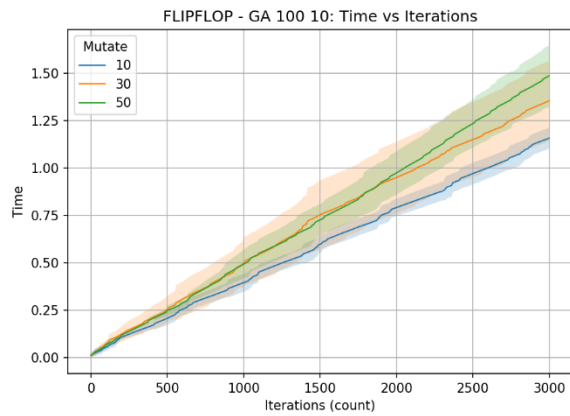Following charts show the time taken by each of these algorithms.

Best algorithm for Flip Flop problem was MIMIC.