Analysis of Greedy, Genetic and A* algorithms on various datasets

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1 Introduction

For this assignment, we have tried solving the Travelling Salesperson Problem (TSP) using three approaches: Greedy Algorithm, Genetic Algorithm and A* algorithm. We have benchmarked these algorithms on various DIMAC datasets and recorded results for further analysis

2 Methods

The algorithms were implemented on a MacBook with 2.8 Ghz Intel Core i7 Processor with 16GB RAM having 2133 MHz speed

3 Results

Eye balling the benchmarks in Table 1,we see that for smaller sized datasets, there is not much difference between Genetic and Greedy algorithm's results. But as the size of the dataset increases, the value of the tour length for Genetic Algorithm becomes almost twice of that of Greedy. From Graph 1, we see the distribution comparison of Genetic algorithm with Greedy for our datasets and our claim is thus somewhat proven. Initially for smaller datasets, both lines are closer, but as the size increases, Genetic's values increase substantially

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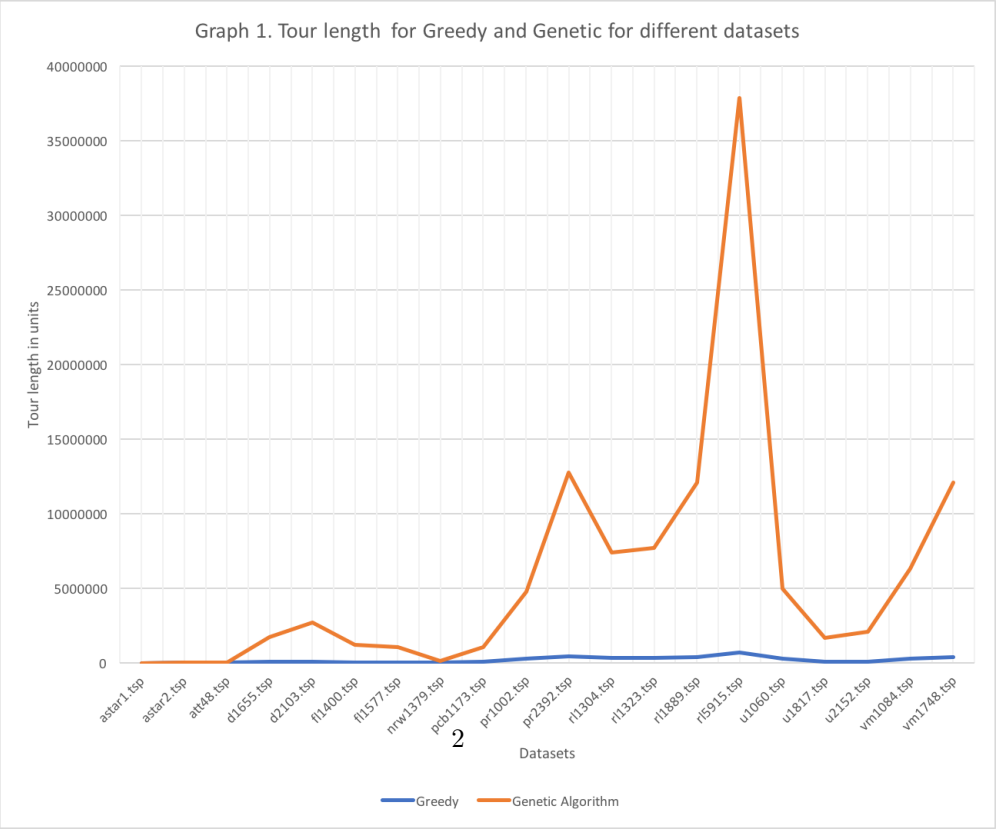
Table 1: Benchmarks

Dataset	Greedy Algorithm		Genetic Algorithm		A* algorithm		Size
	Tour length	Time	Tour length	Time	Tour length	Time	
astar1.tsp	11023.3878	0.0008	10769.2327	4.8909	12481.2188	0.0540	15
astar2.tsp	44030.5000	0.0015	42764.2316	6.1506	46350.4984	07980	18
att48.tsp	40526.4211	0.0056	44613.6406	10.4344	50255.6302	3.9317	48
d1655.tsp	77026.4152	8.5971	1756139.9410	477.7593			1655
d2103.tsp	87468.5691	13.5324	2697923.2563	796.3314			2103
fl1400.tsp	26971.8850	6.4546	1222340.1095	360.6363			1400
fl1577.tsp	27950.8142	7.1984	1090187.6693	430.0102			1577
nrw1379.tsp	21694.1301	0.4163	140159.4300	77.1025			1379
pcb1173.tsp	70277.9415	4.0345	1076216.9674	266.9118			1173
pr1002.tsp	315596.5874	2.8371	4763977.0099	232.4504			1002
pr2392.tsp	466471.5897	18.9792	12794934.2973	1059.2264			2392
rl1304.tsp	339797.4720	4.9526	7385948.2023	310.9583			1304
rl1323.tsp	332094.9697	5.2913	7739096.7749	320.2369			1323
rl1889.tsp	400684.6384	12.1027	12099360.1481	677.6620			1889
rl5915	702964.2229	160.8261	37876086.2885	8298.5155			5915
u1060.tsp	281908.0272	3.4270	5006812.7151	251.9483			1060
u1817.tsp	69365.2014	11.0712	1710207.0024	2245.0629			1817
u2152.tsp	80320.7095	12.6455	2085510.7729	634.4657			2152
vm1084.tsp	301469.2276	3.6471	6344315.9323	259.9232			1084
vm1748.tsp	408089.1942	8.6667	6344315.9323	259.9232			1748



On performing Pearson's correlation between Tour lengths of both Greedy and Genetic with respect to the size of the dataset and Time taken to compute the tour, we found the following:

For Greedy algorithm:
r(Tour length, Size) = 0.657
r(Tour length, Time) = 0.637

For Genetic Algorithm:
r(Tour length, Size) = 0.859
r(Tour length, Time) = 0.864

For A* algorithm:
r(Tour length, Size) = 0.593
r(Tour length, Time) = 0.475

Hence we can say that for Genetic algorithm, the tour length has a more positive correlation with the size of the dataset as well as the time taken to compute as compared to Greedy Algorithm A* is the least correlated when compared to the other two algorithms

4 Conclusion

Therefore from our above analysis, we can conclude that Greedy Algorithm has the best result for the Travelling Salesperson Problem, followed by Genetic Algorithm and then A*. Time taken by Greedy is also the least compared to the other two algorithms