Algorithm: Greedy – Nearest Neighbor

Description of Algorithm:

This greedy algorithm starts at a random city on the graph and then visits the nearest city until all cities have been visited. Some of the resources used while researching TSP and the nearest neighbor algorithm: https://web.tuke.sk/fei-cit/butka/hop/htsp.pdf, https://en.wikipedia.org/wiki/Travelling_salesman_problem, https://en.wikipedia.org/wiki/Nearest_neighbour_algorithm

Algorithm Discussion:

Seeing as there were three of us in the group, we attempted to each research and implement a different type of algorithm. I opted for the greedy route because I find them easier to implement while still being quick and relatively efficient while generally returning a near optimal result. This algorithm has a $O(n^2)$ runtime, and was able to find routes that were within ~21% of the optimal distance for example 1, and ~15% of the optimal length for example 2. Due to example 3's extremely large size, it took an exceptional amount of time to run and was terminated after around an hour of waiting for it to complete.

Algorithm Pseudocode:

1) Start/pick an arbitrary city to start from and set it to current (U)
2) Determine the shortest route available to an unvisited city (V)
    a. Take that route (U to V)
3) Update the current city to V
4) Mark U as visited
5) If all cities have been visited
    a. End the tour
6) Otherwise
    a. Go to step 2

Example Tour Times – No Limit:

Example File	Runtime	"Best" Distance
tsp_example_1.txt	0.097 seconds	130921
tsp_example_2.txt	3.6269 seconds	2975
tsp_example_3.txt	n/a	n/a

Competition Tour Times – 3-min:

Input File	Runtime	"Best" Distance
Test-input-1	~0.07759	5911
Test-input-2	~0.2111	8011
Test-input-3	~2.76935	14826
Test-input-4	~20.6689	19711
Test-input-5	~176.325	27128
Test-input-6	~29.58	39834

Test-input-7	~153.72	62110

Competition Tour Times – Unlimited:

Input File	Runtime	"Best" Distance
Test-input-1	~0.07759	5911
Test-input-2	~0.2111	8011
Test-input-3	~2.76935	14826
Test-input-4	~20.6689	19711
Test-input-5	~176.325	27128
Test-input-6	>30m	39469
Test-input-7	>30m	61947