

CS 325
Summary of TSP Results

Test Case	Minimum Tour length	Time
1	5911	0.00s
2	8039	0.00s
3	14826	.05s
4	19756	.22s
5	27306	.89s
6	40031	3.57s
7	61923	22.36s

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Project 4: Traveling Salesman Problem

Algorithm Description:

For our algorithm, we used a greedy approach; that is, from a given starting node, we would find the closest unvisited node, and travel there. We would then repeat this process, traveling to the closest unvisited node until we had visited all nodes.

To help control for errors that can occur from the use of greedy algorithms (as per https://en.wikipedia.org/wiki/Travelling_salesman_problem) such as the greedy algorithm sometimes producing the worst possible results, or from the greedy algorithm producing an average result that is 25% longer than the optimal (which we were asked to stay under) we elected to try multiple starting locations and selecting the best one. To limit the processing time to under 3 minutes, we limit ourselves to testing just 30 cities, which statistically speaking, and because of the average correctness of the greedy algorithm, would keep us under the 1.25 ratio for almost all test cases.

Pseudo-code:

```
search_differential = 1
if (#_nodes > 30){
    search_differential = floor(#_nodes/30)
}
for (h=0;h<#_nodes;h+search_differential){
    if(#_nodes == 1){
        distance = 0
    }
    if(#_nodes == 2){
        distance = distance_between_two_cities
    }
```

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```
for (i=0;i<#_nodes;i++){
    shortestEdge = +infinity
    for(j=0;j<#_nodes;j++){
        curDistance = getDistance(current_vertex,
vertex_j)//getDistance=function that
//returns distance between two points
        if(curDistance<shortestEdge){
            shortestEdge = curDistance
            closestNode = j
        }
    }
    curVertex = closestNode
    add closestNode to list of visited
    totalDistance = totalDistance+shortestEdge
}
totalDistance = getDistance(last_node_visited,starting_node)
}
```

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Case:	Tour Length:	Time
tsp_example_1:	130921	.01s
tsp_example_2:	2989	.07s
tsp_example_3:	1921401	203.58s
test-input-1:	5911	0.00s
test-input-2:	8039	0.00s
test-input-3:	14826	.05s
test-input-4:	19756	.22s
test-input-5:	27306	.89s
test-input-6:	40031	3.57s
test-input-7:	61923	22.36s