

Methods	Length and Time Taken for Western Sahara (29 cities)	Length and Time Taken for Rwanda (1,621 cities)	Length and Time Taken for Argentina (9,152 cities)	Length and Time Taken for Panama (8,079 Cities (Includes duplications; 4,951 distinct cities)
Nearest Neighbor	36388.1 and 0 ms	32276.7 and 75 ms	1.03496e+06 and 2508 ms	146661 and 1956 ms
Greedy TSP	N/A	N/A	N/A	N/A
Optimal Tour	27603 and 90 ms	26051 and 14699670 ms	837,479 and 24301000 milliseconds	Best Tour was 114,855 and Best Lower Bound was 114,831 and took 399316000 ms

I learned that the nearest neighbor algorithm has a faster time than the optimal tour on the website. I can clearly see this with the tours with less than 50 cities. The optimal tour took 90 milliseconds for the Western Sahara tour with 29 cities and 0 ms using the nearest neighbor algorithm. The better speed can also be seen during the tours with higher amounts of cities. For the Rwanda tour with 1621 cities, it took the nearest neighbor algorithm 75 ms, but the optimal tour took 14699670 ms. The optimal tour took way longer than the nearest neighbor algorithm did. This shows that it is faster for smaller and bigger outputs. The biggest tour in the table was the Argentina tour. That tour had 9,152 cities. It took the nearest neighbor algorithm 2508 ms to complete it and the optimal tour took 24301000 to complete. The two times are greatly different and show that the nearest neighbor algorithm is faster.

Even though the nearest neighbor algorithm is faster, it has a worse solution. The optimal tour has the distance that it is supposed to take for a tour. The nearest neighbor algorithm never gives the same exact number, making it a worse solution. This is clearly seen with the tours in the table above. For small tours like the Sahara one, the optimal tour was supposed to be 27603, but the nearest neighbor algorithm got 36388.1. This shows that the nearest neighbor is close, but not exact to the optimal tour. To make sure this is correct I analyzed tours of greater sizes. The Rwanda Tour with 1,621 cities had an optimal tour of 26051, but the nearest neighbor algorithm got a distance of 32276.7.

This helps prove the fact that even though the algorithm is close, it will never be exact. The two main things I learned are that the nearest neighbor algorithm is faster, but gives a less accurate distance than the distance of the optimal solution of a tour.