INF3490

Mandatory Assignment 1:

Travelling Salesman Problem

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Instructions on how to run my programs:

All my programs are written for python3.31 and above.

- Exhaustive search:

python exhaustive\_search.py [number\_of\_cities]

Provide the number of cities you would want the program to compute as the command line argument, starting from the beginning of the european\_cities.csv.

Hill climbing:

python hill\_climber.py [number\_of\_cities] [number\_of\_attempts]

Provide the number of cities you would want the program to compute as the first command line argument, then the number of hill climbing attempts that you would like the program to compute.

Genetic algorithm:

python genetic\_algorithm.py [number\_of\_cities] [number\_of\_generations] [population\_size]

Provide the number of cities you would want the program to compute as the first command line argument, then the number of generations you would want the population to evolve, and the at last the population size.

PS:

The results of the programs are not showing the last part of travel, e.g. the route from A to B to C and back to A is: [A, B, C]. The last part is not shown but the distance is calculated with the last part.

Questions and implementation explanation

Exhaustive search:

I used the itertools in the python library to generate all the possible combinations of cities in the form of list and used another function to calculate the distance of each route.

1. What is the shortest tour among the first 10 cities?

The shortest tour among the first 10 cities was:

Copenhagen -> Hamburg -> Brussels -> Dublin -> Barcelona -> Belgrade -> Istanbul -> Burcharest -> Budapest -> Berlin -> Copenhagen

The tour distance id 7486.31 km.

1. How long would you expect it to take with all 24 cities?

It took about 209 seconds for the program to compute for the first 10 cities.

There are 362880 possible routes with 10 cities and 6.204484 \* 10 ^23 routes with 24 cities. I estimate the running time for 24 cities would be about 1.2 \* 10 ^13 years.