TSP using Genetic Algorithm (GA)
Baiaman Bazarbaev 20190763

Flow of my GA algorithm

Mutation

First, I have used the following operator. I iterated over all cities i = 0 .. n - 1 and, with probability p, I swapped this city with another random city. This approach turned out to have a very unstable improvement rate with 10-20 generations in row not being able to improve the solution. For example, this approach could only improve 85,890,556 path length down to 81,563,738 - a 5.03% improvement.

The mutation operator I eventually chose was swap operator. I simply pick two random city in the route and swap them.

Mutation rate was experimentally set to 0.015. Values such as 0.010, 0.1, 0.2, and 0.3 were tested as well.

Crossover

At first, I tried the following: I picked a prefix of random length from the first parent and added remaining cities, which were not present, from the second parent in the consecutive order. However, this custom operator turned out to have a worse improvement rate.

I decided to settle down with the operator that picks a random length segment from the first parent and complements the remaining path using the second parent's route.

Population

I use a population of size 50. Populations of sizes 10, 20, 25 were tested out as well.

Selection

For selection, I use tournament selection with tournament_size = 5. I select 5 random routes and pick the one with the best fitness as a parent.

The best result I got using the aforementioned GA was:

- Starting path length: 86,315,166
- Final path length after 400 generations: 78,350,598
- Improvement: 9.22%