Group : **14**

CS 312: Artificial Intelligence Laboratory

Task 4: TSP Competition

Team Members

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1. Problem Description

The objective of this task is to solve the Travelling Salesman Problem. We are given a set of cities (coordinates) and distances between them, find the best (shortest) tour (visiting all cities exactly once and returning to the origin city) in a given amount of time which is 300s in our case .

2. Methodology

We are using Genetic Algorithm to solve this problem .
Here is a outline of all the steps involved :

1. Start with some random chromosomes initially
2. Mutate and Crossover the chromosomes
3. Select best N chromosomes from all of them
4. Add some random chromosomes to maintain diversity
5. Keep track of best chromosome and repeat from Step 1

Each chromosome contains the order in which we visit the cities. In crossover, 2 chromosomes are crossed with each other.

Each chromosome consists of order in which we visit the cities.

So each chromosome contains a permutation from range [0, Ncities-1]

3. Method of Crossover with 2 chromosomes:

- We select a range [L, R] randomly.
- We take segment of cities from the range [L, R] of the second chromosome and insert it at the end of the first chromosome. (we first remove the cities which are present in range [L, R] in second chromosome from first one)
- We do the same thing with the second chromosome using the first chromosome.
- Ex. let Ncities = 4 and [L, R] = [0, 2]
- Chromosome1 = {0, 1, 2, 3}
- Chromosome2 = {3, 1, 0, 2}
- So, crossover1 = {2, 3, 1, 0}
- And crossover2 = {3, 0, 1, 2}

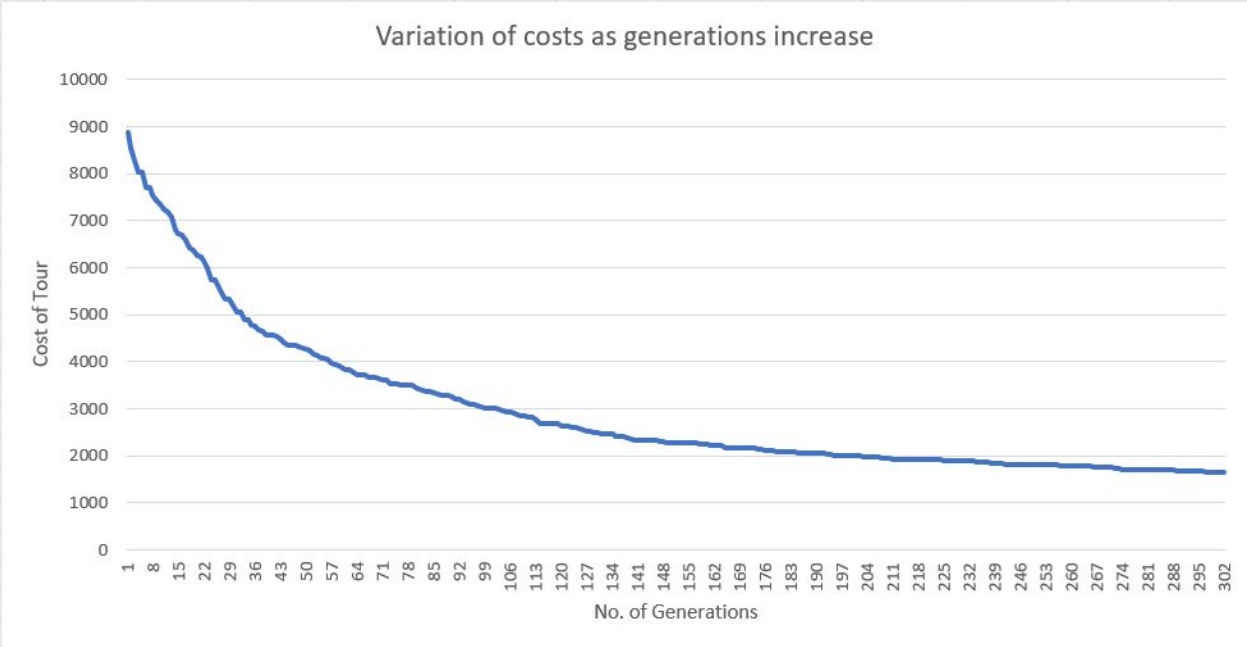
4. Mutation inside a chromosome:

- For doing mutation, we select a random range [L, R] and reverse the order of cities visited in that range [L, R].
- Ex. chromosome = {0, 1, 2, 3} and [L, R] = [2, 3]
- After mutations, mutatedChromosome = {0, 1, 3, 2}

There is always some possibility that genetic algorithms may get stuck in the local optimum. Hence we have introduced some random chromosomes at every generation to get outside the local optima.

5. Iterative Improvements

As the generations increase , we keep the best N chromosomes and move ahead.



* tour_cost vs generations graph for euc_100