The Traveling Salesman Problem
Assignment – 3
Special Topics in AI

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Problem Definition:

Given a complete graph, find a path from a source to all nodes and back such that the sum of distances over the path(cost of the path) is minimum.

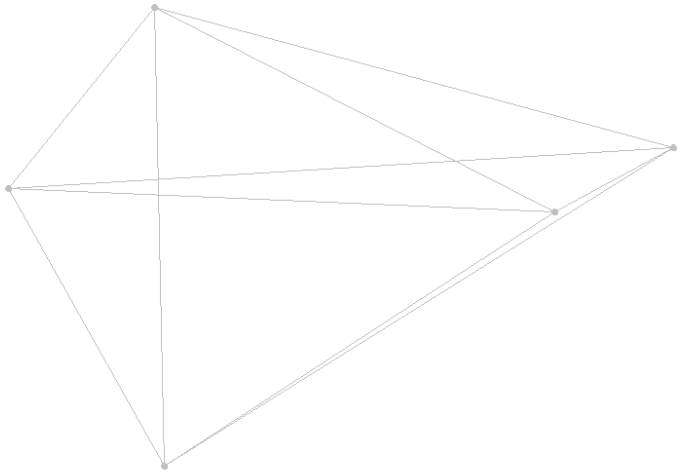
Solution:

The problem is NP-complete and an optimal solution cannot be found for each case, every time, by using any algorithm. We used genetic algorithm that uses a crossover algorithm to devise a path that is better than previous ones.

This works because the Genetic algorithm allows best solutions (the fittest ones) to propagate. Thus, only the best solutions get to be a part of the solution. This algorithm is very effective when the solution is not solvable straight away, but the solution needs to be refined in several iterations.

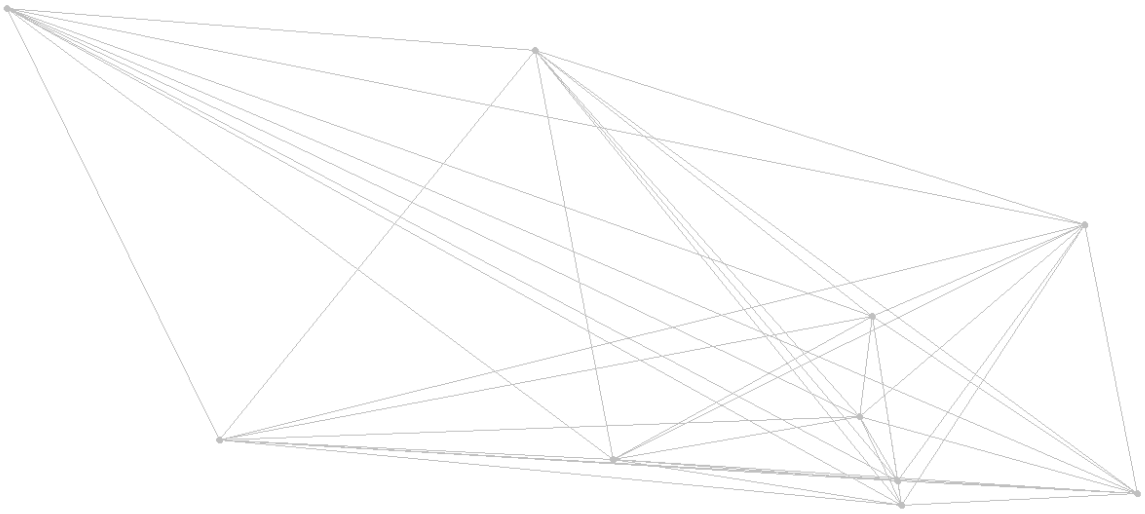
Sample run:
1. Go to File → New
2. Select Algorithm → Genetic
3. Enter number of nodes and choose graph type “Graph Dense”. This is because the graph will be completely connected this way.
4. Select start and end nodes, click on Run.

For now, the solution is printed on the command line.



For the above completely connected graph of 5 Nodes:
The solution comes out to be:

Initial distance: 1732
Finished
Final distance: 1732
Solution:
|605, 379|765, 664|1166, 403|1288, 337|755, 193|



For the above completely connected graph with 10 Nodes, the solution comes out to be:

Initial distance: 3870
Finished
Final distance: 3106
Solution:
|172, 150|714, 193|1047, 569|1086, 635|1090, 660|1332, 648|1278, 372|1060, 466|794, 613|390, 593|