AI Lab-3 Report

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Introduction:

In this lab, we were supposed to find the shortest path of the TSP problem on the dataset we were presented. We used Ant-Colony-Optimization(ACO) and Particle-Swarm-Optimization(PSO) to do this.

Motivation:

At first, we were using the Genetic Algorithm to find the shortest path, but the problems we faced were the following:
- The algorithm took a lot of time on a larger population to find the optimal solution for the problem.
- The algorithm was also relatively slow regarding its efficiency and computational speed. We had to reduce the number of new children that we returned or had to being with a smaller population.
- There were problems finding optimal Mutation functions to make the mutations helpful rather than random swaps.

After that, we switched to ACO and PSO(for larger datasets). These were better than GA in the following parameters:
- There was no need to find the optimal Mutation function, and there was a higher amount of exploration than exploitation.
- The algorithms were faster than those used in G.A.(s).

Iterative Improvements:

Genetic Algorithms:

Number Of Iter.	Mutation Freq	DataSet	Optimal Path
1000	Per 25 moves	euc_100	5790.3132
1000	Per 12 moves	euc_100	4577.5605
5000	Per 25 moves	euc_100	3852.1640

Ant Colony Optimization:

In this we varied the parameters and tried to find the optimal solution of the TSP problem. We used many combinations of all the three parameters and at last settled on the following:

alpha(α)	2(eucledian) 5(non-eucledian)
beta(β)	5
rho(ρ)	0.1(eucledian) 0.05(non-eucledian)