The Traveling Salesman Problem (TSP) PART I

Traveling Salesman Problem (TSP) is one of the most studied combinatorial optimization problems, which seeks an optimal tour in terms of the total distance travelled, total transportation cost, etc.

In TSP, given a set of cities that a traveling salesman must visit, the goal is to find the best route to visit every city exactly once and then return to the original city (depot), covering the shortest distance possible.

Thus, the tour corresponding to the problem's solution consists of N cities that all should be visited once and only once and it is the shortest Hamiltonian cycle of G. Despite the simplicity of its statement, the TSP is an NP-hard problem: If the TSP is symmetric then $c_{ij} = c_{ji}$, for all i, j. In this case, there are $(n - 1)!/2$ possible solutions, so the number of solutions becomes extremely large for even moderately large n so that an exhaustive search is impracticable.

TSP has many applications such as a great variety of routing and scheduling problems, computer wiring, and movement of people, X-ray crystallography, and automatic drilling of printed circuit boards and threading of scan cells in a testable Very-Large-Scale-Integrated (VLSI) circuits, for example.

STEP 1 METAHEURISTICS

Experimental setup

Implement and apply Simulated Annealing, Tabu search, Genetic Algorithms and Particle Swarm Optimization to find an optimal or quasi-optimal solution to this problem.

- ⇒ For each strategy, specific parameters and methods/operators must be established to find the best solutions as well as optimize their performance.
- ⇒ It is necessary to carefully choose the representation and the generation of successors (neighborhood in each iteration).
- ⇒ The report and final presentation will adequately justify all the decisions made, adjustment of parameters, modifications, improvements and contributions made to the complete optimization process of a strategy.
- ⇒ The stopping conditions must also be chosen appropriately to find the balance between computational cost and quality of the solutions found.
- ⇒ Minimum cost to be reached: 7013.
- ⇒ Repeat for each strategy 30 times with different initial states (set the random seed in order to have the same initial conditions for each repetition and each search procedure) and complete the following table:

	SA	Tabu	GA	PSO
Best Solution				
Cost (Best)				
Number of times				
Averaged Cost				
Averaged time				

All members of the group must know and be involved in all the tasks of the activity, and the decisions should be taken together. It is not recommended that each member of the group individually, and independently, develops a search strategy and then the three parts are joined at the end.