

# AI: Search Methods for Problem Solving - Programming Assignment 1

## Implementation of TSP Solver Algorithms

This code implements two algorithms for solving the Traveling Salesman Problem (TSP): Simulated Annealing and Branch and Bound. The TSP is a classic problem in computer science and optimization, where the goal is to find the shortest possible route that visits each city exactly once and returns to the original city. The challenge of the TSP lies in its combinatorial nature, as the number of possible solutions grows factorially with the number of cities.

## Approach Overview

The implemented solution combines two distinct algorithms to tackle the complexity of the TSP. Here's an overview of the approach:

### 1. Simulated Annealing:

- Utilizes Simulated Annealing to generate an initial solution for the TSP. Simulated Annealing is a probabilistic optimization algorithm inspired by the process of annealing in metallurgy. It starts with an initial solution and iteratively explores the solution space by making random changes. It allows for escaping local optima by accepting worse solutions with a certain probability.

### 2. Branch and Bound:

- Another approach to optimize the initial solution is through the Branch and Bound algorithm.
- Branch and Bound is a systematic enumeration algorithm that builds up solutions while discarding those that are clearly suboptimal. It maintains a tree of partial solutions and prunes branches that are guaranteed to lead to solutions worse than the current best solution found so far.

## Conclusion

In conclusion, the implemented solution leverages Simulated Annealing and Branch and Bound algorithms to efficiently solve the Traveling Salesman Problem. By combining stochastic search techniques with systematic optimization methods, the approach can navigate through the vast solution space of the TSP and converge to near-optimal solutions.

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