PROJECT PROPOSAL: FUNSEARCH ON TRAVELING SALESMAN PROBLEM

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1 INTRODUCTION

1.1 BACKGROUND AND THE IMPORTANCE

The Traveling Salesman Problem (TSP) is a classic combinatorial optimization problem that seeks the shortest possible route visiting a set of cities and returning to the starting point. It is NP-hard, with applications in logistics, transportation, and manufacturing.

FunSearch is an AI-driven heuristic optimization method that explores the solution space by iteratively generating and refining programs using a large language model (LLM). It is well-suited for TSP because it can adaptively optimize heuristics, potentially discovering novel, high-quality solutions that traditional methods may miss. FunSearch's iterative nature makes it ideal for solving complex, large-scale optimization problems like TSP.

1.2 PROJECT DESCRIPTION

Our project is to apply the modified FunSearch on TSP problem and explore its performance compared with the other well-known heuristic algorithms.

2 IMPLEMENTATION

Our tentative plan for solving the problem includes the following steps:

- Step 1: Initial Solution Generation
- Step 2: Local Search and Global Optimization
- Step 3: Hybrid Strategy Implementation
- Step 4: Termination and Evaluation

3 EVALUATION

3.1 DATASET

We have chosen TSPLib Symmetric as our dataset. TSPLib is a library of sample instances for the TSP and related problems. It contains instances from various sources and of different types.

3.2 BASELINE/COMPARISON

We take two existing algorithms for comparison:

- Constructive Heuristics: At each step, select the unvisited city (Nearest, Cheapest, Farthest) to the current city.
- Attention Model: Apply an attention mechanism that allows neural networks to focus on the most relevant information when processing input data.