

# ECE/CS 5510 Multiprocessor Programming

## Project Proposal

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We aim to solve a very well-known optimization problem known as the traveling salesman problem in the context of multiprocessor programming. The traveling salesman problem can be explained as, thinking of a graph scenario, visiting each node at least once and finishing where the traversing started incurring possible minimum cost where the cost can be total time spent, distance crossed, etc. It resembles many computer science and operational research problems, and by the nature of this problem, it is an NP-hard problem. There are many solutions to this problem, but none of them guarantees an optimal solution.

We propose the Simulated Annealing (SA) to solve the traveling salesman problem. The SA is a probabilistic technique for approximating the global optimum of a given function. Specifically, it is a metaheuristic to approximate global optimization in a large search space for an optimization problem.

To briefly explain the algorithm, Algorithm 1 is the higher-level overview of the SA.

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**Algorithm 1** Simulated Annealing

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- 1: Generate a random solution
  - 2: Calculate its cost using some cost function you've defined
  - 3: **for**  $i < max\_iter$  **do** ▷ or until an acceptable solution is found
  - 4:   Generate a random neighboring solution
  - 5:   Calculate the new solution's cost
  - 6:   **if**  $c_{new} < cold$  **then** move to the new solution
  - 7:   **if**  $c_{new} > cold$  **then** maybe move to the new solution
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Since the SA is inherently serial, our team will implement parallelized version.