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M.S. Thesis Statement of Research – *Full proposal to follow*

Endorsement(s): Professor Cavdar, Professor Bailey

Signatures \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Use of Traveling-Sales-Person Tour Length Estimators to Find Solutions to the Vehicle Routing Problem

Summary:

Utilize Professor Cavdar’s innovation in distribution free tour-length estimators and other estimation approaches to find solutions to the vehicle routing problem. The vehicle routing problem(VRP) becomes computationally expensive due to the need to recompute traveling-salesperson subtours for each vehicle for each solution. The intuition behind using estimators is to by-pass the need to solve for the subtours until the final step, allowing for a faster computation. This research will test the effectiveness of using estimators for the vehicle routing and develop, implement, and test a heuristic algorithm. The resulting algorithm will be compared against other solution approaches to determine the overall validity of this approach.

Objectives:

1. Select TSP estimators for various problem sizes to develop an objective function for vehicle routing.
2. Create a testing environment by either sourcing or solving VRP instances with current approaches.
3. Compare effectiveness of estimators to known VRP solutions. Does the optimal solution of the estimator function match the optimal solution of the true VRP?
4. Develop and implement a heuristic using estimators to reduce the frequency of finding optimal tours for each vehicle.
5. Compare algorithm performance across various instance sizes and to existing solution approaches (ex: Clark-Wright).

Plan (Brief):

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| Time Period | Description |
| May - June | Identify good estimators and test existing LP solvers to see if they can use new objective functions to find optimal solutions. Acquire a testing data set and assess estimators.  *Partially completed. The LP approach proved infeasible due to the complex nature of the objective function.* |
| July | Test various heuristic approaches to identify promising search techniques along the objective function.  *I have chosen to focus on a targeted search by calculating node weights relative to the objective function.* |
| August | Implement targeted search and begin to formalize findings so far.  *Some bugs in the reporting and implementation need to be fixed.* |
| September | Troubleshoot the heuristic and run comparative tests to see how it compares to existing solvers with the purpose of tuning the heuristic. |
| October | Setup experimental design to formally test the heuristic approach against existing algorithms. Research existing approaches and grab implementations. |
| November | Formalize solution approach, analyze data, and report findings. |
| December | Final paper revisions. |

This plan is tentative and subject to update in the formal project proposal.