



**SDSU**  
presents  
a thesis defense for  
Master of Science  
degree in  
Computer Science

Thursday,  
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1:00pm  
GMCS 405

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# Rima Soury

*Implementation of Strong Invariance on ACO Algorithms  
And Optimized Routing of Data Packets in Wired Networks*

## Abstract

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Our focus in this thesis is centered on algorithms that are ant-based, meaning that the algorithms were developed after having examined how ants, in nature, accomplish goals such as: foraging for food and resources, finding shelter, etc. There are two distinct parts in this thesis; the first part focuses on implementing the strong invariance on two existing ACO (Ant Colony Optimization) algorithms. The strong invariant algorithms are compared to their originators using a TSP (Traveling Salesperson Problem). We compare the strong invariant algorithms to their original counterparts and discover that the ACO algorithm that has local and global information fairs better in terms of finding the best path in a TSP in a shorter time and with greater frequency.

Based on our findings from the first part of this thesis, we apply the concepts of local and global information with the concepts of strong invariance on an ant-based algorithm used to solve network routing problems, called Antnet. Our optimization is two-fold, in one optimization we focus on the benefits of gathering local information regarding the network, while in our second optimization we focus on the gathering of information based on the collective ant agents in the workspace. When comparing our local and global optimizations versus Antnet, we determined that the local (individual) gathering of information was more advantageous when dealing with wired networks when focusing on packet delay, packet loss and throughput.

## Thesis Committee

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Tao Xie, Thesis Chair, Department of Computer Science  
Carl Eckberg, Department of Computer Science  
Sunil Kumar, Department of Electrical and Computer Engineering