



**University  
of Victoria**

Graduate Studies

Notice of the Final Oral Examination  
for the Degree of Doctor of Philosophy

of

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MSc (University of Victoria, 2008)

BSc (University of Victoria, 2004)

**“The Role of the Goal in Problem Solving Hard Computational  
Problems: Do People Really Optimize?”**

Interdisciplinary Studies (Departments of Computer Science and Psychology)

Thursday, July 30, 2015

1:00pm

Engineering/Computer Science Building  
Room 468

Supervisory Committee:

Dr. Ulrike Stege, Department of Computer Science, University of Victoria (Co-Supervisor)

Dr. Michael Masson, Department of Psychology, UVic (Co-Supervisor)

Dr. Margaret-Anne Storey, Department of Computer Science, UVic (Member)

Dr. Anthony Marley, Department of Psychology, UVic (Member)

External Examiner:

Dr. Zygmunt Pizlo, Department of Psychological Sciences, Purdue University

Chair of Oral Examination:

Prof. Jennifer Stillwell, Department of Visual Arts, UVic

## **Abstract**

Understanding how humans cope with complexity is perhaps one of the most important targets of scientific research. Humans not only excel at solving complex tasks in their day to day life, but also take on objectively difficult problems recreationally. Research, which has focused to date on the famous hard optimization problem the Euclidean Traveling Salesperson problem (E-TSP), has indicated that humans are able to find near optimal solutions in linear time to hard optimization problems, despite the objective difficulty of the task. The research presented this work contributes to this research by comparing human performance on the search and optimization versions of two other visually presented computationally hard problems: Vertex Cover and Independent Set. These two problems were selected in part to explore how human performance might differ on non-Euclidean problems. Performance on the optimization version of the problems used in this study is in keeping the previously reported results, however performance on the search version is even better, suggesting that previous problem solving research might have underestimated the power of the human problem solving system. A key result of this work is that differences in performance between the optimization and search versions of these hard problems can be attributed to differences in how problem solvers encode goal of the task. Consequentially, subjects in these conditions, tasked with identical instances of two very nearly identical versions a problem, are in fact solving very different problems. This work presents a framework to improve how human performance results on hard optimization problems is interpreted. It also demonstrates how the search version of hard computational problems can be used to investigate how people cope with complexity, free of the confounding aspect of an ill-defined goal.