Feature-Based Selection of Bio-Inspired Algorithms for Constrained Continuous Optimisation

Shayan Poursoltan

A thesis submitted for the degree of

Doctor of Philosophy (Ph.D.)

School of Computer Science
Faculty of Engineering, Computer, and Mathematical Sciences

The University of Adelaide

March 2016

THE UNIVERSITY OF ADELAIDE

Abstract

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Constrained continuous optimisation problems are widespread in the real-world and often very complex. Bio-inspired algorithms such as evolutionary algorithms (EAs) or particle swarm optimisation (PSO) algorithms have been successful in solving these problems. Recently, there has been an increasing interest in understanding the features of problems that make them hard to solve. These studies have been carried out for discrete and unconstrained continuous optimisation problems, to find the relationship between problem features and algorithm performance.

To study the connection between algorithms and constrained optimisation problems (COPs), more practical perspectives of problem features analysis and their relations to algorithms are essential. Thus, this thesis contributes to the understanding of constrained optimisation problems and their constraint features that make them hard to solve by algorithms. We introduce an empirical feature-based analysis for COPs and bio-inspired algorithms. Furthermore, the relationships between the constraint features of given COPs and algorithms are studied here. By linking the features of the constraints and different bio-inspired algorithms, we design a new model for predicting the algorithm performance for COPs based on their constraint features. In this thesis, we present a novel approach to analyse constrained continuous optimisation problems based on their constraint features. Furthermore we use this knowledge to implement an automated feature-based algorithm selection model for constrained continuous optimisation.

Declaration

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Acknowledgements

I would like to acknowledge the following people who helped me through the various stages of this PhD:

- My supervisor, Professor Frank Neumann, for his sharp insights, clear guidance and his all time support. Without his support, no doubt I could not finish this chapter of my life. I am grateful to him for holding me to a high research standard and enforcing strict validations for each research result, and thus teaching me how to do research.
- My co-supervisor, Professor Zbigniew Michalewicz, for his encouragement and practical advice. I am also thankful to him for encouraging me to start my PhD studies in the optimisation field.
- The optimisation and logistic research group with the countless benefits that come from their brainstorming sessions
- My parents, for all the moral support and the amazing chances they have given me over these years. Without them, I could not be the person I am today. In addition I want to thank my brother for sharing the highs and lows of my and his PhD.
- To all managers and staff in Bradford college and University of Adelaide to give me the chance of teaching and improving my confidence.
- All my teachers from the elementary school to the university for cherishing my intellect, passion and discipline that lead to a PhD,
- My friends, for the memorable moments they shared with me, helping me to forget the stressful life even for a second.

Statements of Authorships

This thesis is based on one book chapter and four conference papers. The book chapter and three conference papers are already been published. One conference paper is accepted for publication. I have provided a statement of authorship for each of these articles to certify that I was actively involved in the process of preparing each article.

The following is the list of all publications included in this thesis. For three of the conference papers the extended versions are included in this thesis.

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