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Transactions on Computational Collective Intelligence XIII
Preface

This volume of TCCI is dedicated to the workshop on "Optimization and Machine Learning," which took place at the Laboratory of Theoretical and Applied of Computer Science, University of Paul Verlaine-Metz, France, during May 23–24, 2011 (OPML 2011), as part of our annual OPML series of workshops that started in 2010. The OPML series is motivated by the close relationship between optimization and machine learning, which constitutes one of the most important developments of modern computational science: Optimization models and methods are vital in designing machine learning algorithms, while machine learning techniques can be exploited to generate new optimization methodologies.

The volume includes five interesting and original papers that were selected after the peer-review process. The first two papers deal with the two state-of-the-art optimization approaches, the third one discusses models and optimizations methods for RNA molecules, and the last two papers focus on machine-learning techniques.

The first paper "Recent Advances in DC Programming and DCA" by Tao Pham Dinh, and Hoai An Le Thi, is devoted to the state of the art in difference of convex functions (DC) programming and DC algorithms (DCA) - which constitute the backbone of nonconvex programming and global optimization - with recent advances to meet the growing need for nonconvex optimization and global optimization, in terms of mathematical modeling as in terms of efficient scalable solution methods. After a brief summary of these theoretical and algorithmic tools and a discussion of key issues, and open problems, the authors present recent advances and ongoing works in DC programming and DCA including the convergence of DCA in DC programming with subanalytic data, exact penalty techniques with/without error bounds in DC programming with mixed integer DC programming, DCA for general DC programs with DC constraints, and DC programming involving the zero-norm. The paper provides a better understanding of the foundations of DC programming and DCA, their ?exibility, versatility, scalability, and e?ciency, condition sine qua non for successful applications of these tools to model and solve real-world nonconvex programs.

The second paper titled "Nature-Inspired Intelligent Optimisation Using the Bees Algorithm" describes the Bees Algorithm, and compares its functioning and performance with those of other state-of-the-art nature-inspired intelligent optimization methods. The authors, Duc Truong Pham, Marco Castellani, and Hoai An Le Thi, have shown (via two application cases, the minimization of a set of well-known benchmark functions, and the training of neural networks to reproduce the inverse kinematics of a robot manipulator), that the performance

of the Bees Algorithm was very competitive compared with other state-of-the-art methods.

In the third paper, "Optimisation Problems for Pairwise RNA Sequence and Structure Comparison: A brief Survey," Alain Denise and Philippe Rinaudo present a short survey of RNA structure comparison, a major issue of RNA molecules, which is reduced to a very challenging optimization problem from the computer science point of view. They focus on computational complexity results, and the algorithmic and heuristic solutions that have been developed so far for this problem.

The fourth paper, "Model Selection for the l2-SVM by Following the Regularization Path" by Rémi Bonidal, Samy Tindel, and Yann Guermeur discusses model selection for a support vector machine (SVM). The authors propose an algorithm fitting the entire regularization path of the l2-SVM, and use it to perform a comparative study involving state-of-the-art alternatives of different criteria (radius-margin bound, test error predictions) available to tune the value of the corresponding penalization coefficient.

In the last paper, "DC Programming and DCA for Solving Minimum Sum-of-Squares Clustering Using Weighted Dissimilarity Measures, "Hoai Minh Le and Minh Thuy Ta develop two algorithms based on DC programming and DCA for clustering using weighted dissimilarity measures. DCA has been successfully applied to many large-scale nonconvex programs in various domains of applied sciences, and, in particular, in machine learning. This paper proves once again the power and the usefulness of DCA in large-scale machine-learning techniques.

We would like to thank everyone, who contributed to the success of the workshop and to this special issue. In particular, we want to mention the authors as well as the members of the scientific committee and the referees, for their contributed papers as well as their helpful comments and suggestions that guaranteed the high quality of the selected papers. Finally, the interest of the sponsors in the meeting and their assistance, in particular Fonds Européen de Développement Régional via the project InnoMaD "Innovations techniques d'optimisation pour le traitement Massif de Données," are gratefully acknowledged. Last but not least, we thank the Editor-in-Chief, Prof. Ngoc Thanh Nguyen, for editing the special issue volume, and the LNCS editorial staff of Springer with Alfred Hofmann for their support of the TCCI journal.

August 2013 Hoai An Le Thi

Transactions on Computational Collective Intelligence

This Springer journal focuses on research on the applications of the computer-based methods of computational collective intelligence (CCI) and their applications in a wide range of fields such as the Semantic Web, social networks and multi-agent systems. It aims to provide a forum for the presentation of scientific research and technological achievements accomplished by the international community.

The topics addressed by this journal include all solutions to real-life problems, for which it is necessary to use CCI technologies to achieve effective results. The emphasis of the papers is on novel and original research and technological advancements. Special features on specific topics are welcome.

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