
Editorial

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This special issue is dedicated to the workshop on ‘Optimisation and learning’ which took place at the Laboratory of Theoretical and Applied of Computer Science, University Paul Verlaine-Metz, France during 17–18 June 2010. The workshop covers all the topics of optimisation and learning, from the theory to applications, and from sequential to parallel algorithms. Contributions to the solution of real-life problems are particularly appreciated.

We received abundant responses from researchers for the special issue, among them, five papers were accepted and are included in this volume.

Non-convex programming and global optimisation have known, during the past two decades, dramatic developments around the world. A variety of non-convex optimisation techniques have been recently developed by researchers, among them difference of convex (DC) functions programming and DC algorithm (DCA) have been successfully investigated to a lot of non-convex programmes in various fields of applied sciences. In the two first papers, two challenging problems in transport-logistic are studied for which new and efficient DCA-based algorithms are proposed.

In the paper ‘Scheduling of lifting vehicle and quay crane in automated port container terminals’, Le Hoai Minh, Adnan Yassine and Moussi Riadh consider a real application in Normandy-Le Havre port: the problem of assigning optimal delivery tasks to lifting vehicles. The problem is formulated as a mixed integer linear programming which is known to be NP-hard. The authors propose to use DCA, an efficient and scalable approach for solving this problem and combine DCA with the classical Branch and Bound (BB) method for finding global solutions. Preliminary numerical results show that the combination BB-DCA realises a good trade-off between the quality of solution and CPU time comparing to classical BB and the state of art software CPLEX.

In the same field, the paper ‘Single straddle carrier routing problem in port container terminals: mathematical model and solving approaches’ of Babacar Mbaye Ndiaye, Hoai An Le Thi and Tao Pham Dinh treats the problem of routing straddle carriers during the loading operations of export containers. The problem is formulated as a mixed integer linear programme and two new approaches based on DC programming and DCA are investigated. The first is DCA and the second is a cutting plane technique, called DCA_CUT, where the cuts are built from current infeasible local solutions computed by DCA. DCA_CUT improves seeking a feasible local solution by tightening the outer approximation of the feasible set. It converges, after a finite number of iterations, to a global solution of the mixed integer linear programme.

Computational experiments show the efficiency and the scalability of the proposed algorithms.

It is worth to mention the original of DCA scheme used in these two papers for the mixed integer linear programme: DCA is a continuous approach but it can solve this combinatorial optimisation problem, thank to reformulation techniques based on an exact penalty result. Moreover, although DCA works on a continuous domain, it provides an integer solution.

The third paper ‘A generic model of multi-class support vector machine’ by Yann Guermeur deals with an important topic of supervised learning. During the last decade, many multi-class support vector machines (M-SVMs) and decomposition methods involving bi-class SVMs have been introduced and evaluated. Roughly speaking, there is one main model of pattern recognition support vector machine, with several variants of lower popularity. On the contrary, among the different multi-class support vector machines which can be found in literature, none is clearly favoured. In this article, the author introduces a generic model of multi-class support vector machine. It provides the first unifying definition of all the machines of this kind published so far. This contribution makes it possible to devise new machines meeting specific requirements as well as to analyse globally the statistical properties of the multi-class support vector machines.

The fourth paper ‘An evolutionary approach for high dimensional attribute selection’ by Lydia Boudjeloud-Assala presents a semi interactive genetic algorithm to select a relevant dimension subset (with few or no loss of information) for clustering and outlier detection in high dimensional datasets. This is a relevant topic in unsupervised learning. The proposed algorithm allows outlier detection in dataset having a large number of dimensions by using only some attributes of the initial data. It also allows to discover subspace of restricted dimensions to carry out clustering. Its performance is evaluated on simulations with different high dimensional datasets for the two applications (clustering and outlier detection).

In the last paper ‘Pattern discovery in annotated dialogues using dynamic programming’, Thierry Lecroq, Alexandre Pauchet, Émilie Chanoni and Gerardo Ayala Solano describe a new heuristic to discover patterns in annotated dialogues using dynamic programming with the help of a substitution matrix specifically designed for the task. The authors focus on the method developed for extracting the patterns and show some extracted patterns on annotations of dialogues between parents and children during the narration of child stories. The design method is sufficiently generic to align any kind of two dimensional patterns in quadratic time and space. Applications of this problem include computational biology, computation linguistics or speech recognition.

It is interesting to note that these five papers cover a large spectrum in the two important and strictly related domains – optimisation and learning: from combinatorial to continuous optimisation, from local to global optimisation approaches, from heuristic to deterministic optimisation, from unsupervised to supervised learning, from the theory to algorithms and until real applications.

We would like to thank all persons, who contribute 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 on these that guarantee 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

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