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Guest editorial

Gianni Di Pillo · Massimo Roma

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This issue of Computational Optimization and Applications collects a selection of papers that have been presented at the Workshop on *New Problems and Innovative Methods in Nonlinear Optimization* held in Erice, Italy, on July 31–August 9, 2007, at the "G. Stampacchia" International School of Mathematics established within the "E. Majorana" Centre for Scientific Culture. The Workshop was the fifth in a series of Workshops on Nonlinear Optimization held in Erice from 1995 every three years. In the tradition of these meetings, the purpose of the Workshop was to review and discuss recent advances and promising research trends in the development of methods and algorithms for Nonlinear Optimization and its applications.

The meeting was attended by 40 people from 14 countries, with 17 invited lectures and 22 contributed talks. Besides the lectures, several formal and informal discussions took place, providing a forum for fruitful interactions in strictly related fields of research. We wish to express our appreciation to all the participants for their active contribution to the success of the Workshop.

This special issue includes 10 papers selected after a peer revision. They represent a wide and deep review of recent developments in Nonlinear Optimization, from different standpoints. Both theoretical analyses and algorithmic developments are considered, as well as some significant real world applications.

In particular, large scale general nonlinear programming problems are considered in the paper by Di Pillo, Liuzzi, Lucidi and Palagi, where a primal–dual algorithm within the augmented Lagrangian framework is proposed. The method relies on a truncated procedure for computing the search direction in the local algorithm and therefore it is suitable for problems of large dimension. In the context of constrained

G. Di Pillo (✉) · M. Roma
SAPIENZA, University of Rome, Rome, Italy
e-mail: gianni.dipillo@uniroma1.it

optimization, Andreani, Birgin, Martínez and Schuverdt propose an augmented Lagrangian algorithm for general constrained problems, based on the box–constrained minimization of a class of functions that do not possess continuous second order derivatives. Convergence to second-order stationary points is exhibited. The multi-standard quadratic optimization problem, consisting in maximizing a (possibly indefinite) quadratic form over the Cartesian product of standard simplices, is considered in the paper by Bomze and Schachinger.

As well known, in constrained optimization the solution of KKT systems plays a fundamental role, mainly in the large scale settings. It is devoted to this topic the paper by D'Apuzzo, De Simone and Di Serafino, where linear algebra aspects are emphasized and critical issues are addressed focusing on interior point methods and iterative solution of the KKT system.

Three papers are devoted to global optimization. The first one by Cassioli, Locatelli and Schoen aims at tackling very hard global optimization problems, i.e. problems with a large number of variables and local minima, by using the so called *Population Based Approach* based on a dissimilarity measure among the individuals of the population. Different dissimilarity measures are compared in the application to molecular cluster optimization. Large scale global optimization problems are also considered in the second paper, by Lucidi, Liuzzi and Piccialli, but here a different approach is used. In fact, the authors propose an extension of the `DIRECT` algorithm and show the efficiency of the new algorithm by means of a large numerical investigation. Finally, in the third paper, by McAllister and Floudas, a hybrid global optimization method is proposed for minimizing the energy of a protein conformation subject to geometric constraints. These three papers witness the importance of global optimization for solving problems arising in real world applications.

An important application in finance is considered in the paper by Qi and Sun. In fact, an unconstrained convex optimization approach is proposed for tackling the correlation stress testing employed in several financial models for determining the value-at-risk of a financial institution's portfolio. This approach is based on the recently developed theory of strongly semismooth matrix valued functions.

Variational inequalities have also been among the topics of interest of the Workshop. The paper by Pappalardo, Panicucci and Passacantando is in this context. The authors propose a class of differentiable gap functions in order to reformulate a generalized variational inequality as an optimization problem. A descent method for the gap function is then described and its global convergence is proved.

Finally, in the paper by Wan, Du, Pardalos and Wu, a greedy algorithm for the minimal submodular cover problem with a (possibly nonlinear) submodular cost is considered, and its application to a power assignment problem is described.

We are indebted to many anonymous referees who took care of reviewing all the papers submitted for publication in this special issue.

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