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# PREFACE
# Special Issue on Nonlinear Programming dedicated to the ALIO-INFORMS Joint International Meeting 2010

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This Special Issue is dedicated to the ALIO-INFORMS Joint International Meeting, held at the University of Buenos Aires, in Buenos Aires, Argentina, between the 6th and the 9th of June, 2010. This joint conference consisted of the INFORMS International Conference and XV CLAIO, the biannual conference organized by ALIO.

The ALIO-INFORMS 2010 focused on topics such as services, logistics and transportation, manufacturing, supply chain management, environment, natural resources, biotechnology, and healthcare, emphasizing the importance of the relationship between basic research and the practice of OR/MS. This time, the Conference also included a Cluster dedicated to Nonlinear Programming, co-chaired by Ernesto G. Birgin and José Mario Martínez.

The Cluster overviewed a broad range of Nonlinear Programming aspects, ranging from theory to practice and applications. It consisted of thirty presentations divided into nine special sessions. The Cluster chairs are thankful to the sessions organizers, Ana Friedlander, Andreas Griewank, Cristina Maciel, Elvio Pilotta, Luis Mauricio Graña Drummond, Natasa Krejic, Nélida Echebest, and Susana Scheimberg, whose effort greatly contributed to the successful realization of the Cluster. The Cluster chairs are also thankful to the General Chair

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of ALIO-INFORMS 2010, Irene Loiseau, for inviting them to organize the Cluster. I would also like to thank the ALIO-INFORMS 2010 Publications Chairs, Lorena Pradena Rojas and María Urquhart, and the Computational & Applied Mathematics editors, J.M. Martínez, A. Nachbin, L.F.F. Pereira, G. Buscaglia, and D.A. Tarzia, for allowing me to prepare this Special Issue dedicated to the Nonlinear Programming Cluster of ALIO-INFORMS 2010.

This Special Issue features ten papers submitted by participants of the Nonlinear Programming Cluster of the Conference. The papers, which were reviewed according to the usual high standards of the journal, covers a wide range of theoretical, practical, and applied topics in optimization.

Three papers deal with topology optimization and related topics. A. Friedlander and F.A.M. Gomes present a bilevel formulation of a truss topology problem. The paper shows numerical experiments and implementation details of the problem resolution by an inexact restoration method. F.A.M. Gomes and T.A. Senne also deal with topology optimization. They introduce a globally convergent sequential linear programming method for nonlinear programming that is then applied to the solution of classic topology optimization problems. They conclude that the introduced algorithm is faster than the globally convergent version of the method of moving asymptotes (MMA). M.A. Gomes-Ruggiero, M. Sachine, and S.A. Santos deal with the MMA. They propose a strategy based on trust regions to solve the dual of the MMA subproblems. Moreover, they also tackle theoretical and practical aspects of the MMA. On one hand, they suggest a globally convergent modification of the MMA method relaxing the conservative condition by means of a summable controlled forcing sequence. On the other hand, aiming to improve the efficiency of the method, a modification based on the spectral steplength for updating the MMA models is proposed.

Other three papers tackle the derivative-free optimization problem. Two derivative-free methods for solving underdetermined systems of nonlinear equations are presented by N. Echebest, M.L. Schuverdt, and R.P. Vignau. A method without derivatives for bound-constrained minimization is introduced by Ma. Belén Arouxét, N. Echebest and E.A. Pilotta. In fact, they propose to use an active-set strategy to solve the model-based sup-norm trust-region subproblems. Numerical experiments compare the introduced method with NEWUOA

and BOBYQA for the unconstrained and bound-constrained cases, respectively. Finally, M.A. Diniz-Ehrhardt, J.M. Martínez, and L.G. Pedroso introduce an augmented Lagrangian method with general lower-level constraints for derivative-free optimization. Feasible limit points of the sequence generated by the method satisfy the KKT conditions under the Constant Positive Linear Dependence constraint qualification. Presented numerical experiments show that the method seems to be promising.

N. Krejić, Z. Lužanin, and Z. Ovcin provide a methodology for solving equilibrium models in which the model parameters are random variables with known distributions. Newton's method is applied to a sequence of equilibrium problems generated by simulation. The presented numerical experiments show that high quality solutions are obtained with the proposed approach. Nonsmooth equilibrium problems are tackled by P. Santos and S. Scheimberg. An inexact subgradient projection type method is proposed. As only one inexact projection is done per iteration, the method has a low iteration cost. Convergence analysis and some numerical examples are presented.

A. Griewank and N. Strogies deal with an application of nonlinear programming to open pit mine planning problems. They present a continuous framework to a problem that is usually modeled and solved by mixed integer programming techniques. The nonlinear approach presented allows for the sensitivity analysis of the optimal solutions with respect to small perturbations on the problem data. R. Gárciga Otero and A. Iusem extend the concept of monotonicity of point-to-set operators, deduce necessary conditions for semimonotonicity, and establish surjectivity results.

Together, these articles overview several current lines of research in Nonlinear Programming, evidencing it is a vigorous research area. This special issue could not have happened without the effort of the anonymous referees, who invested their time and energy in reviewing the submitted articles in detail. To all of them, I would like to extend my gratitude.