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PREFACE

# Preface

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This special issue on "Convex Analysis, Optimization and Applications" is the ideal continuation of the like-titled conference held in Les Houches, France, in January 2010. The aim of the conference was to bring together researchers working on the many branches and areas of optimization, both from the methodological and from the applied viewpoint, that are deeply influenced by, if not outright based on, convex analysis. In particular, the focus of the workshop was on the very many topics, such as convex programming, nonlinear programming, combinatorial optimization, and convex, nonsmooth and variational analysis, that have been heavily influenced by the work of Claude Lemaréchal, whose 65th birthday was celebrated at the conference.

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The contributions in this volume are in accordance with the broad spectrum of such topics:

- D. Drusvyatski and A.S. Lewis' study on subdifferentials in variational analysis shows in particular that semi-algebraic functions have a finite number of critical points.
- M. Dür and J.-B. Hiriart-Urruty use conjugate duality to characterize copositivity of matrices by means of difference-of-convex minimization.
- A. Frangioni and B. Gendron handle large-scale structured programs by an extension of Dantzig-Wolfe decomposition that is stabilized using tools from convex analysis.
- P. Hungerländer and F. Rendl investigate theoretically and computationally the use of semidefinite relaxations to solve ordering problems.
- J. Malick and F. Roupin propose new efficient algorithms based on convex analysis tools to compute tight semidefinite bounds for 0–1 quadratic programming problems.
- Yu. Nesterov analyzes the complexity of several gradient methods for a class of composite optimization objectives of the form $f(x) + \Psi(x)$ where $f$ is smooth and possibly nonconvex and $\Psi$ is convex with special structure.
- A. Ouorou exploits additive structure of the objective function to improve the performances of proximal cutting-plane method using Chebyshev centers.
- C. Sagastizábal considers a specialized bundle method, applicable to a class of composite optimization objectives of the form $\Psi(f(x))$ where $f$ is smooth and possibly nonconvex and $\Psi$ is convex with special structure.

Most of the authors of this issue participated in the workshop. At Les Houches, researchers from all over the world gathered to exchange views on the past and future of the influence of convex analysis on optimization, and to pay hearty homage to one of the most influential researchers in this field for the last four decades. The affection shown to Claude by so many prominent researchers is not only to be attributed to his many and fundamental technical contributions, but also to his style of research and passionate attention to the human component of scientific work, which have had a profound and lasting influence on so many of those who have had the fortune to interact with him. This is best described by the short talk (Claude jokingly called it "his sermon") that he was asked to give at the conclusion of the conference, the transcript of which follows.

> Your presence here testifies that I have achieved some success in my career. I believe that, more than my scientific achievements, this is due to a certain attitude I have with respect to mathematics. I thought it would be worth analyzing this, mainly for the younger among you.
>
> First, when doing mathematics, I have always tried to let prevail The Advancement of Science over my personal glory. Paraphrasing a musical critic speaking of certain performers,[1] I tried to serve mathematics, rather than use mathematics.

[1] French original: il y a les interprètes qui servent la musique et ceux qui se servent de la musique.

Actually, this technique eventually pays, because you are respected for it, and your own glory increases.

My fundamental attitude, however, was a constant willingness to look through things, in order to unveil their real "raison d'être". When you see some item of our profession coming, say a proof technique, an algorithm, . . ., always try to understand where it is coming from, what general class (of proof techniques, of algorithms, . . .) it belongs to. Only then, will you understand what you are doing, instead of contemplating "a tree hiding the forest."[2] In my opinion, a researcher in mathematics should be obsessively concerned with this attitude.

Writing clearly is a third important thing for us. After all, our production consists mainly of papers, which are not final consumable products, unlike vegetables, say. The purpose of a paper is to be taken by somebody else (another researcher, an industrial user, . . .) who applies to it a transformation to make another product: another paper, computer software, . . . For this, the paper must be understood, otherwise it is pure loss. By contrast, when you buy vegetables, you eat them without really understanding what they are made of. Incidentally, this third point goes together with the first two: (i) you can be the best researcher in the world, but if nobody else knows it, your glory is null; and (ii) if you do not understand yourself, the others will not either.

Here are, in my opinion, the main qualities that a researcher in (applied) mathematics should care for.

We are grateful to the authors for their contributions to this volume, to the reviewers whose invaluable help, even if bound to remain anonymous, is greatly appreciated, and to Danny Ralph and the Editorial Office of Mathematical Programming for having made this special issue possible.

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[2] French original: l'arbre qui cache la forêt.