Optimization, Convex and Variational Analysis – Volume II

Didier Aussel¹ · Abderrahim Hantoute² · Marco López² · Claudia Sagastizábal³

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1 PREFACE TO “Optimization, Convex and Variational Analysis” (Second Volume)

This collection of works in the honor of professor Terry Rockafellar is a follow-up of the “Workshop on Optimization and Variational Analysis”, dedicated to Terry’s 85th birthday. The meeting, jointly organized by the CMM Center for Mathematical Modeling of the University of Chile (Chile) and the University of Perpignan (France), was held in Santiago on January 20–21, 2020.

That workshop was one of the last meetings we could attend physically, before Coronavirus changed our lives in so many ways. Globetrotting has become virtual since then. Suddenly, the beauty of the world found itself flattened to a screen. Fortunately, some things have not changed: our admiration and appreciation for Terry’s unique career has remained intact, as has the momentum to duly celebrate his birthday, through the edition of this special volume.

We are very grateful to the authors and referees for their valuable contributions and careful work.

The two volumes that make up the special issue in Terry’s honor sample the tremendous breadth of subjects where Terry has made fruitful contributions. This special issue is a modest

✉ Didier Aussel
aussel@univ-perp.fr

Abderrahim Hantoute
hantoute@ua.es

Marco López
marco.antonio@ua.es

Claudia Sagastizábal
sagastiz@unicamp.br

¹ University of Perpignan, Laboratoire PROMES UPR 8521 Tecnosud Rambla de la Thermodynamique, 66100 Perpignan, France

² University of Alicante, Department of Mathematics, Carretera de San Vicente de Raspeig, s/n, 03080 Alicante, Spain

³ UNICAMP - IMECC, rua Sergio Buarque de Holanda, 652, Campinas 13083-859, Brazil

gift for someone who has gifted us with seminal textbooks, whose content has marked generations of researchers, influencing the way of doing mathematics when it involves “variations”, regarding not only theory or analysis in optimization but also applications.

Thank you Terry and happy birthday,

Didier Aussel
Abderrahim Hantoute
Marco López
Claudia Sagastizábal

2 The Second Volume of this Special Issue Includes the Following Works

In *Variational analysis perspective on linear convergence of some first order methods for nonsmooth convex optimization problems*, Jane J. Ye, Xiaoming Yuan, Shangzhi Zeng and Jin Zhang propose a unified convergence theory based on error bound, calmness, and metric subregularity. These variational analysis concepts provide some concrete sufficient conditions for linear convergence and applicable approaches for calculating linear convergence rates of popular first-order convex methods, such as the LASSO and its variants.

The work *Alternating projections with applications to Gerchberg-Saxton error reduction*, by Dominikus Noll, studies convergence properties of methods based on potentially set-valued orthogonal projections onto non-convex sets. The infeasible case is included in the analysis, thanks to geometric conditions expressed in terms of the involved sets.

In *Convergence of the gradient sampling algorithm on directionally Lipschitz functions*, James V. Burke and Qiuying Lin extend the convergence theory of the gradient sampling algorithm for functions that may have unbounded or empty Clarke’s subdifferentials.

In *Risk-averse stochastic programs and distributionally robust optimization via operator splitting*, Welington de Oliveira proposes a Douglas-Rachford approach to separate the random cost mapping from the risk function composing the problem’s objective. The approach enjoys significant flexibility and opens the way to handle, in a single algorithm, several classes of risk measures and ambiguity sets.

The Elicited Progressive Decoupling Algorithm: A Note on the Rate of Convergence and a Preliminary Numerical Experiment on the Choice of Parameters, by Jie Sun and Min Zhang, studies the elicited version of the progressive decoupling algorithm of Rockafellar. Based on a generalized Yosida-regularization of Spingarn’s partial inverse of an elicitable operator, it is shown that, in a particular nonmonotone setting, the method converges at a linear rate. The approach is assessed on preliminary numerical results that put in evidence the impact that the choice of the proximal and the elicitation parameters have on the algorithm’s performance.

Superquantiles at Work: Machine Learning Applications and Efficient Subgradient Computation, by Yassine Laguel, Krishna Pillutla, Jérôme Malick, and Zaid Harchaoui deals with conditional-value-at-risk objective functions (the superquantiles) from a machine-learning perspective. In order to make such functions amenable to the gradient-based algorithms popular in machine learning, they propose a smoothing based on infimal convolutions.

Calmness of linear constraint systems under structured perturbations with an application to the path-following scheme, by Carlos Argáez, Maria Josefa Cánovas, and Juan Parra, focuses on feasibility set mappings related to finite linear constraint systems in a parametric

framework. The analysis leads to an explicit computation for the calmness modulus that depends only on the nominal data.

Didier Aussel, Maria Bernadette Donato, Monica Milasi, and Asrifa Sultana are the authors of *Existence results for quasi-variational inequalities with applications to Radner equilibrium problems*. The work identifies a class of quasi-variational inequalities for which each solution of an auxiliary (classical) Stampacchia variational inequality provides a solution. The setting, known as Radner equilibrium problem, is suitable to model economies involving sequential trade under uncertainty.

Duality between Multi-Output Production, Correspondences and Cost Functions, a work by Abelardo Jordán and Juan Enrique Martínez-Legaz, characterizes a bijection between (micro)economics input-output concepts in the quasi-concave case. In particular, the cost function paired with some production level is associated with a unique quasi-concave production correspondence that is the largest possible, in the pointwise sense.

Finally, the work *Differential stability properties in convex scalar and vector optimization*, by Duong Thi Viet An and César Gutiérrez provides formulas for the ε -subdifferential of the optimal value function of scalar and vector convex optimization problems. These formulas can be applied when the set of solutions of the problem is empty. For scalar problems with an inclusion constraint, limiting results require no qualification conditions.

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