Workshop on optimization and variational analysis. Tribute in honor of Professor Terry Rockafellar for his 85th birthday
Santiago de Chile, January 20-21, 2020

The Workshop on optimization and variational analysis is organized by the CMM Center for Mathematical Modeling of the University of Chile (Chile) and the University of Perpignan (France), and will be held on January 20-21, 2020 at the Faculty of Physical and Mathematical Sciences of the University of Chile, in Santiago, Chile.

A tribute in honor of Professor Terry Rockafellar for his 85th birthday.

Organizing Committee

- Abderrahim Hantoute (CMM – U. de Chile)
- Didier Aussel (U. de Perpignan)

Monday, January 20

14:10–14:40: **Marco López,** University of Alicante, Spain

Title: ***Lipschitz modulus of linear and convex systems with the Hausdorff metric***

Abstract: In this talk we analyze the Lipschitz behavior of the feasible set in two parametric settings, associated with linear and convex systems in the Euclidean space. More precisely, we deal with the parameter space of linear (finite and semi-infinite) systems identified with the corresponding sets of coefficient vectors. In this framework the size of perturbations is measured by means of the (extended) Hausdorff distance. A direct antecedent comes from considering the parameter space of all linear systems with a fixed index set, T, where the Chebyshev (extended) distance is used to measure perturbations. In the first part of the talk, we present an appropriate indexation strategy which allows us to establish the equality of the Lipschitz moduli of the feasible set mappings in both parametric contexts, as well as to benefit of existing results in the Chebyshev setting for transferring them to the Hausdorff one. The second part of the presentation establishes some new results on the Lipschitz behavior of convex systems via linearization techniques. (*This talk is based on a recent manuscript co-authored by J. Beer, M.J. Cánovas and J. Parra.*)

14:40–15:10: **Fabian Flores-Bazán,** University of Concepción, Chile

Title: ***Sums of quasi-monotone operators and sums of quasi-convex functions via "quasi-monotone family"***

Abstract: Our main concern in this paper is to provide conditions that guarantee the quasiconvexity of a sum of quasi-convex functions. Since the quasiconvexity of a lsc function can be characterized by the quasi-monotonicity of its Clarke-Rockafellar subdifferential (or the quasi-monotonicity of its normal operator), we start by a related problem: we provide conditions for the sum of quasi-monotone operators to be quasi-monotone. To that purpose, the notion of quasi-monotone family is introduced. This is in connection to the quasi-mono-tonicity of unions having that property. For example, we show that if the Clarke-Rockafellar subdifferentials of a finite family of lsc functions are a quasi-monotone family, then the sum of the functions is quasi-convex. Two concrete applications in quasi-convex optimization are presented: we derive conditions that allow us to reduce a constrained optimization problem to one with a single inequality constraint and show a class of quasi-convex minimization problems having zero duality gap. (*This is a joint work with Nicolas Hadjisavvas (Greece) and Yboon García (Perú). Research supported by CONICYT via FONDECYT 1181316 and PIA/Basal AFB 170001.*)

15:10–15:40: **Claudia Sagastizábal,** UNICAMP, Brazil

Title: ***Multi-objective optimization with a twist***

Abstract: The scalarization of nonlinear multi-objective programs results in non-smooth problems with nonconvex constraints whose particular structure can be exploited algorithmically. We show how the Pareto information can be used in energy management problems and discuss a composite-bundle technique that can be applied in the considered setting. (*Joint work with Wim van Ackooij, Ana Paula Chorobura, Elizabeth Karas and Hasnaa Zidani.*)

16:10–16:40: **Aris Daniilidis,** CMM, Chile

Title: ***Pathological dynamical systems***

Abstract: We construct examples of Lipschitz continuous functions, with pathological subgradient dynamics both in continuous and discrete time. In both settings, the iterates generate bounded trajectories, and yet fail to detect any (generalized) critical points of the function. (Joint work with Dmitriy Drusviatskiy).

16:40–17:10: **Marc Quincampoix,** University of Brest, France

Title: ***Bi-metric regularity of affine optimal control***

Abstract: We investigate a type of (strong) metric regularity of the set-valued map associated with the system of necessary optimality conditions for optimal control problems that are affine with respect to the control and are nonlinear with respect to the state variable. It is shown that for such problems it is reasonable to extend the standard notions of metric regularity by involving two metrics in the image space of the map into a so called bi-metric regularity property. We obtain a Lyusternik-Graves-type theorem for (strongly) bi-metrically regular maps, which claim stability of these regularity properties with respect to "appropriately small" perturbations. Based on that, it is proved that in the case of a map associated with affine optimal control problems, the strong bi-metric regularity is invariant with respect to linearization. This allows us to obtain sufficient conditions for strong bi-metric regularity in the nonlinear affine problem.

17:10–17:40: **Rafael Correa,** CMM, Chile

Title: ***Optimality conditions in infinite programming free of qualification conditions***

Abstract: We develop new calculus rules for the supremum of infinitely many convex functions, which are then applied to provide general optimality conditions for infinite convex programming optimization problems. The involved functions are only assumed to be convex, not necessarily continuous.

Tuesday, January 21

09:30–10:00: Stephan Dempe, University of Freiberg, Germany

Title: ***Simple bilevel optimization***

Abstract. In the presentation we will first formulate the simple bilevel optimization problem which consists in finding a best solution within the set of optimal solutions of a second optimization problem. If the second one is a convex optimization problem and the objective function is convex, this is a convex optimization problem having the structure and properties of a bilevel (or hierarchical) optimization problem. After that, necessary (and in most cases also sufficient) optimality conditions are formulated. These conditions use different transformations of the lower level problem and need suitable constraint qualifications. In the last part, we formulate first ideas for solution algorithms. (Joint work with N. Dinh, J. Dutta and T. Pandit.)

10:00–10:30: Patrick L. Combettes, North Carolina State University, USA

Title: ***Variational and proximal analysis of neural networks***

Abstract: We show that proximal calculus and variational inequalities can be used to model and analyze neural networks and better understand the behavior of deep learning structures. (joint work with J.-C. Pesquet)

10:30–11:00: Coffee break

11:00–11:30: Marc Lassonde, University of Clermont-Ferrand, France

Title: ***Closedness and calmness in optimization***
Abstract: We revisit the concepts of closedness and calmness for an extended-real valued function and for a constrained minimization problem. We explore their connections with Wijsman convergence and subdifferential calculus.

11:30–12:00: Didier Aussel, University of Perpignan, France

Title: ***Radner equilibrium and quasi-variational inequalities***
Abstract: A two periods concept of equilibrium of an economy involving the exchange and the allocation of resources with sequential trade and uncertainty was defined by Roy Radner in the 70' just after that J.F. Nash developed his own concept of equilibrium. Whereas the second one became famous, the first one is not so known, and few applications has been developed. Nevertheless, motivated by potential modelling of electricity markets, the Radner equilibrium start again to be studied and applied. Our aim in this talk is to present a reformulation of the Radner equilibrium through quasi-variational inequality and deduce an existence result. Application to electricity market will be considered.