

Workshop Chile-Australia on Optimization

Fecha: Miércoles 2 Octubre del 2019.

Programa:

14h00 a 14h40: Alex Krueger
14h40 a 15h20 Aris Daniilidis
15h20 a 16h00 Miguel Goberna
16h00 a 16h30 Pausa café
16h30 a 17h10 Vera Roshchina
17h10 a 17h50 Roberto Cominetti

Títulos y resúmenes:

14h00 a 14h40 - Alexander Kruger, Federation University Australia, Ballarat

Extremal Principle

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Since the extremal principle was introduced in 1979, it has proved to be one of the key tools in nonsmooth optimization and variational analysis, serving as a substitution for the classical convex separation theorem when the convexity assumptions are not satisfied. Several extensions of the extremality property of collections of sets have been introduced as well as several extensions of the extremal principle.

After recalling and discussing the conventional extremality, local extremality, stationarity and approximate stationarity properties of collections of sets and the corresponding (extended) extremal principle, we focus on extensions of these properties and the corresponding dual conditions with the goal to expand the applicability of the generalized separability results. The main arguments used in this type of results are refined, and the relationships between different extensions are clarified.

References

Kruger, A.Y., Mordukhovich, B.S.: New necessary optimality conditions in problems of nondifferentiable programming. In: Numerical Methods of Nonlinear Programming, pp. 116–119. Kharkov (1979) In Russian. Available at <https://asterius.ballarat.edu.au/kruger/research/publications.html>

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Kruger, A.Y.: Weak stationarity: eliminating the gap between necessary and sufficient conditions. *Optimization* 53(2), 147–164 (2004)

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Zheng, X.Y., Ng, K.F.: A unified separation theorem for closed sets in a Banach space and optimality conditions for vector optimization. *SIAM J. Optim.* 21(3), 886–911 (2011)

Bui, H.T., Kruger A.Y.: About extensions of the extremal principle. *Vietnam J. Math.* 46(2), 215–242 (2018)

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14h40 a 15h20 - Aris Daniilidis, Universidad de Chile

From the Gradient Dynamics to the Sweeping Process

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In this talk we review the desingularization of the derivative for a gradient system defined by an o-minimal functions (leading to the smooth KL-inequality) and show that a similar process can be done for the co-derivative of the sweeping process map, whenever the latter is assumed to be o-minimal. This leads to the conclusion that bounded trajectories of a tame sweeping process have finite length. In particular, Kurdyka desingularization can be seen as a special case of the co-derivative desingularization.

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15h20 a 16h00 - M. A. Goberna, Universidad de Alicante

Voronoi diagrams of arbitrary sets via linear semi-infinite systems.

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Given an arbitrary set T in the Euclidean space, whose elements are called sites, and a particular site s , the nearest (farthest, resp.) Voronoi cell of s consists of all points which are closer (farther, resp.) from s than from any other site. The nearest (farthest, resp.) Voronoi diagram of T is the family of all nearest (farthest, resp.) Voronoi cells. This talk compares nearest and farthest Voronoi cells and diagrams by exploiting the representations of both types of cells as solutions sets of linear semi-infinite systems.

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16h00 a 16h30 Pausa café

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16h30 a 17h10 – Vera Roshchina, University of New South Wales, Sydney, Australia

Uniqueness of Solutions in multivariate Chebyshev Approximation Problem

Chebyshev approximation refers to finding a polynomial of prescribed degree that has the smallest absolute deviation from a given function on some compact set X . It is well-known due to the result of Mairhuber (1956) that such approximation of any continuous function can be unique only in the case when X is homeomorphic to a subset of a circle, which effectively rules out uniqueness for multivariate problems. However in every particular case uniqueness of best approximation depends on the interplay of several factors, including the geometry of the set X , the properties of the function that is being approximated, and the degree of the polynomial approximant.

We focus on the ill-posed case when the uniqueness of solutions can not be established via strict polynomial separation of points of minimal and maximal deviation. We obtain an upper bound on the dimension of the solution set and show that nonuniqueness is generic for such ill-posed problems on discrete domains. Moreover, given a prescribed set of points of minimal and maximal deviation we construct a function for which the dimension of the set of best approximating polynomials is maximal for any choice of domain. We also present several examples that illustrate the aforementioned phenomena.

The talk is based on a joint work with Nadia Sukhorukova (Swinburne University) and Julien Ugon (Deakin University), arXiv:1908.11570.

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17h10 a 17h50 - Roberto Cominetti (Universidad Adolfo Ibáñez)

Routing games in congested networks: convergence for large games and the price-of-anarchy.

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Congestion is a critical phenomenon in transportation networks, both in large urban areas as well as in telecommunication networks. We revisit the concept of Wardrop equilibria for routing games, as a continuous approximation for finite games with an increasing number of small players.

We consider two scenarios: a deterministic model in which players have a small weight, and also a stochastic scenario in which players have non-negligible weight but are present with a small probability. In both cases we provide a formal proof of convergence towards two different Wardrop models, where in the second case the flows in the network retain their stochastic nature and are described by Poisson distributions. We also discuss some recent results regarding the behavior of the Price-of-Anarchy under these different regimes, both at intermediate levels of congestion as well as in the limit when the network becomes heavily congested.

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