



## **MATH TIME**

### ***Minisymposium on Variational Analysis and Applications***

**Friday, March 3<sup>rd</sup>, 2023, 2:30 PM, Sala della Biblioteca, San Faustino Building**

**Chair: Domenico Scopelliti**

**2:30 – 2:40**      ***Elisabetta Allevi, University of Brescia***

➤ Introduction

**2:40 – 3:15**      ***Massimiliano Giuli, University of L'Aquila***

➤ A continuity result for the adjusted normal cone operator

**3:15 – 3:50**      ***Irene Benedetti, University of Perugia***

➤ Parametric set-valued equilibrium problems under K-convexity type condition

**3:50 – 4:25**      ***Maede Ramazannejad, University Cattolica del Sacro Cuore, Milano***

➤ On projected solutions for quasi equilibrium problems with non-self constraint map

**4:25 – 5:00**      ***Sara Latini, University of L'Aquila***

➤ Projected solutions for finite-dimensional quasiequilibrium problems

**Live presentation on Google Meet**      **Registration form here >>**

**Organizing Committee:** E. Allevi, M.R. Dominguez, G. Oggioni,  
R. Riccardi, D. Scopelliti



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# ABSTRACTS

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# A continuity result for the adjusted normal cone operator

Massimiliano Giuli

The concept of adjusted sublevel set for a quasiconvex function was introduced by Aussel and Hadjisavvas in 2005 and the local existence of a norm-to-weak\* upper semicontinuous base-valued submap of the normal operator associated to the adjusted sublevel set was proved. When the space is finite dimensional, a globally defined upper semicontinuous base-valued submap is obtained taking the intersection of the unit sphere, which is compact, with the normal operator, which is closed. Unfortunately, this technique does not work in the infinite dimensional case. We propose a partition of unity technique to overcome this problem in Banach spaces. Application is given to a quasiconvex quasioptimization problem through the use of a new existence result for generalized quasivariational inequalities which is based on the Schauder fixed point theorem.



# A Parametric set-valued equilibrium problems under K-convexity type conditions

Irene Benedetti

The talk deals with existence results for solutions to parametric strong/weak equilibria under suitable convexity and semicontinuity type properties induced by a cone  $K$ . More precisely, given two Hausdorff topological vector spaces  $X$  and  $Y$  and considering a parameter-multivalued map (multimap for short)  $\Gamma: \Lambda \multimap H$ , where  $\Lambda$  is a nonempty set,  $H$  a subset of  $X$ , a convex cone  $K \subset Y$  and a multivalued map  $F: H \times H \times \Lambda \multimap Y$  the proposed problems are the following:

- **Parametric strong equilibrium problem:**

$(SEP)_\lambda$  for every  $\lambda \in \Lambda$ , find  $\bar{x} \in \Gamma(\lambda)$  such that  $F(\bar{x}, y, \lambda) \subset K$ , for every  $y \in \Gamma(\lambda)$ ,

- **Parametric weak equilibrium problem:**

$(WEP)_\lambda$  for every  $\lambda \in \Lambda$ , find  $\bar{x} \in \Gamma(\lambda)$  such that  $F(\bar{x}, y, \lambda) \cap K \neq \emptyset$ , for every  $y \in \Gamma(\lambda)$ .



The non-parametric set valued equilibrium problems are classical and widely studied in literature, their importance lies in the fact that they can unify the formulation of several problems in nonlinear analysis, for instance optimization problems, complementarity problems, fixed point problems and Nash equilibrium problems. The parametric equilibrium problems have been introduced in (L. Q. Ahn, P. T. Duoc, T. N. Tam and N. C. Thang, Stability analysis for set-valued equilibrium problems with applications to Browder variational inclusions, Optimizations letters, 15 (2020) 613-626) since they are more suitable to analyze real world-problems. The presented results are obtained in collaboration with Nicolò Biccheri and Tiziana Cardinali and are contained in (I. Benedetti, N. Biccheri, T. Cardinali, Parametric set-valued equilibrium problems under K-convexity type conditions, submitted). We have studied the equilibrium problems for one multimap, distributing the assumptions on two multimaps in order to enlarge the class of multimaps under consideration. In the case of one multivalued map we obtain also the compactness of the solution sets. In the talk some examples are also provided in order to compare the obtained results with classical and recent theorems present in literature and to highlight the differences between the various hypothesis considered.



# On projected solutions for quasi equilibrium problems with non-self constrain map

Monica Bianchi, Enrico Miglierina, Maede Ramazannejad

In a normed space setting, this paper studies the conditions under which the projected solutions to a quasi equilibrium problem with non-self constraint map exist. Our approach is based on an iterative scheme which gives rise to a sequence weakly converging to a projected solution. Finally, as a particular case, we discuss the existence of projected solutions to a quasi variational inequality problem.



# Projected solutions for finite-dimensional quasiequilibrium problems

Sara Latini

The concept of projected solution has been recently introduced for studying quasivariational problems where the constraint map may not be a self-map. In this talk, we will see a new result on the existence of projected solutions for finite-dimensional quasiequilibrium problems without any monotonicity assumptions and without assuming the compactness of the feasible set. Additionally, we deduce the existence of projected solutions for quasivariational inequalities, quasioptimization problems and generalized Nash equilibrium problems.