OPTIMIZATION AND RELATED TOPICS

A Workshop in honor of **Giorgio Giorgi** e **Piera Mazzoleni**

May 17-18, 2018

A few words about the workshop

We are pleased to organize a workshop on optimization and related topics honouring the long and fruitful scientific and academic careers of two colleagues: Giorgio Giorgi and Piera Mazzoleni. Inspired by their attitudes towards scientific research and academic life, we have organized a simple workshop focused on the topics that they have been studying along all their work. Even if it would not be grammatically correct, we should have used the present tense in the previous sentence as a wish that their contribution to these studies will continue also in the future.

Finally we would like to thank all the speakers and the participants that have greatly contributed to the success of our workshop.

The members of the organizing committee:
Monica Bianchi
Elisa Caprari
Enrico Miglierina
Fausto Mignanego
Elena Molho

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Abstracts

Optimal Level Solutions Method in Large Dimension Low Rank Problems

17 May
4:30pm
NI110
Milano

Riccardo Cambini
Universitá degli Studi di Pisa

Low rank problems are nothing but nonlinear minimization problems over polyhedrons where a linear transformation of the variables provides an objective function which actually depends on very few variables.

These problems appear quite easily in applications, for example in concave quadratic minimization problems, location-allocation models, Data Envelopment Analysis, multiobjective/bicriteria programs (see for all the book by Konno, Thach and Tuy (1997)).

Classical approaches for these problems are based on outer approximations, branch and bound, branch and select. In some cases, the optimal level solutions method can be used too, guaranteeing in a simplex-like way that the global optimal solution will be found.

The aim of this talk is to provide some preliminary results concerning the use of optimal level solutions method in solving some particular classes of low rank large dimension problems. In particular, it deserves to be studied how the exploitation of the low rank structure of the objective function could improve the performance of the optimal level solutions method.

Ekeland's principle for cyclically antimonotone equilibrium problems

18 May
10:45am
Sala Lettura
Pavia

Marco Castellani - with M. Giuli
Universitá degli Studi dell'Aquila

We deal with equilibrium problems without convexity assumptions either for the domain or for the function involved.

First we give an Ekeland's variational principle for equilibrium problems on complete metric spaces which generalizes some recent results. The main improvement consists in widening the class of bifunctions for which the variational principle holds: instead of a triangle inequality property a suitable approximation from below of the bifunction f is required and we show that this condition is equivalent to the cyclic antimonotonicity of f.

Moreover we furnish a simple and direct proof of the existence of equilibria for such equilibrium problems in presence of a compact feasible set without passing through the existence of approximate solutions. This fact allows us to remove the metric structure on the topological space and additional technical conditions.

Subsequently, a weak coercivity condition is introduced to deal with a weakly closed feasible region in reflexive Banach space.

Transformation of Quasiconvex Functions to Eliminate Local Minima

17 May
3:15pm
NI110
Milano

Nicolas Hadjisavvas - with S. Al-Homidan and L. Shaalan
University of the Aegean

Quasiconvex functions present some difficulties in global optimization, because their graph contains "flat parts", thus a local minimum is not necessarily the global minimum. In this talk, we show that any lower semicontinuous quasiconvex function may be written as a composition of two functions, one of which is nondecreasing, and the other is quasiconvex with the property that every local minimum is global minimum. Thus, finding the global minimum of any lower semicontinuous quasiconvex function is equivalent to finding the minimum of a quasiconvex function, which has no local minima other than its global minimum.

The construction of the decomposition is based on the notion of "adjusted sublevel set". In particular, we study the structure of the class of adjusted sublevel sets, and the continuity properties of the sublevel set operator and its corresponding normal operator.

On a new kind of Henig approximate proper solutions in vector optimization

17 May
5:15am
NI110
Milano

Lidia Huerga - with C. Gutiérrez, B. Jiménez and V. Novo
UNED - Madrid

We present a notion of approximate proper efficiency in the sense of Henig for vector optimization problems. The error of this type of solutions is given by a non negative scalar and a nonempty set that represents an approximation of the ordering cone of the final space.

We study the properties of these solutions, their limit behaviour and we characterize them through linear scalarization, under generalized convexity hypotheses.

Bruno de Finetti, Pareto optimal points and optimality conditions

17 May
2:30pm
NI110
Milano

Angelo Guerraggio
Universitá degli Studi dell'Insubria

During the 1930s, the young de Finetti engaged in the lively debate by Italian economic scholars on the relevance of Paretian heritage in the context of the political, economic, and cultural background of the Italian fascist regime. De Finetti wrote numerous papers on the matter, including two notes - Problemi di "ottimo" and Problemi di " ottimo " vincolato - in which he got to demonstrate a necessary optimality condition for an unconstrained, and then constrained, vector optimization problem based on the definition of Paretian optimum. In a surprising way, this Kuhn-Tucker-like condition anticipated, 15 years before, the classic theorem demonstrated by Albert W. Tucker and Harold W. Kuhn in 1950.

The emergence of nonlinear programming: Duality and WWII - The significance of internal and external driving forces in the history of mathematics

17 May
9:45am
Sala lettura
Pavia

Tinne H. Kjeldsen
University of Copenhagen

In this talk we will discuss the emergence of nonlinear programming as a research field in mathematics in the 1950s. We will especially focus on various kind of driving forces both from inside and outside of mathematics, and discuss the significance of their influence on its development. The term nonlinear programming entered into mathematics when the two Princeton mathematicians Albert W. Tucker and Harold W. Kuhn at a conference in 1950 proved what became know as the Kuhn-Tucker theorem. Later it turned out that a similar result had been proved earlier, even twice: in 1939 and 1948, but nothing came of it. Kuhn and Tuckers work on nonlinear programming grew out their work on duality in linear programming, which in itself originated from investigations of a mathematical model of a logistic problem in the US Air Force from the Second World War. This short outline prompts several questions: Why could the result of the Kuhn-Tucker theorem all of a sudden launch a new research field in mathematics in 1950? How did ideas of duality emerge in linear programming, and what role did they play for the development of nonlinear programming? How did the Air Force logistic problem cross the boundary to academic research in mathematics? What role did the military play and what influence did it have for the emergence of mathematical programming as a research area in mathematics in academia? The talk will be governed by these questions, and the answers will show that both internal and external factors influenced the mathematicians work in crucial ways, illustrating the interplay between developments of mathematics and the historical conditions of its development.

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18 May
11:30am
Sala Lettura
Pavia

A production control problem with a quality parameter

Bruno Viscolani - with L. Grosset
Universitá degli Studi di Padova

Quality has a central role in Operations Management as it is a relevant issue on which the customers of an organization focus their judgement. In a short term production model, quality may be dealt with as a constant. We consider the optimal choices of production rate and constant quality level in a finite time production process as an optimal control problem with a parameter. We characterize and discuss the optimal solution through the infrequently used necessary conditions for optimal processes with parameters provided by the Pontryagins school.

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