A VU-Point of View of Nonsmooth Optimization

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ENSTA ParisTech, Palaiseau

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This lecture is jointly organized by ENSTA ParisTech, École polytechnique and the master program "Optimization" of Université-Paris Saclay, in the framework of the PGMO lecture series of Fondation Mathematique Jacques Hadamard, with the support of Fondation de l'École polytechnique through the Gaspard Monge Visiting Professor Program, and of the PGMO sponsors, EDF, Orange, Thales and Criteo.

Lectures are open to researchers and graduate students.
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Lecture 1 - Monday, January 14, 09h30-12h30, Room 2.2.13
Lecture 2 - Monday, January 14, 14h00-17h00, Room 2.2.13
Lecture 3 - Tuesday, January 15, 09h30-12h30, Room 2.2.13
Lecture 4 - Tuesday, January 15, 14h00-17h00, Room 2.2.13

When minimizing a nonsmooth convex function bundle methods are well known by their robustness and reliability, a feature related to global convergence properties of the algorithm. Speed of convergence is a different matter, as in principle fast rates cannot be expected if the objective function lacks smoothness. Moving from the first-order method realm to the world of superlinear speed was made possible when realizing that nonsmoothness often appears in a structured manner that can be exploited algorithmically. This is the basis of the VU-decomposition approach. that makes a Newton-like move in certain U-shaped subspace, concentrating the function "smoothness", at least locally. On its orthogonal complement, the "sharp" V-subspace, an intermediate iterate is defined in such a way that the overall speed of convergence is driven by the (superlinear) U-step. By focusing on the proximal variants of bundle methods, the mini-course will introduce gradually the VU-theory and the ingredients needed to build superlinearly convergent schemes in nonsmooth optimization. Relations with the proximal point algorithm as well as applications in Machine Learning and Derivative Free Optimization will also be discussed.

The course will be delivered in four lectures:
Lecture 1: Introduction to nonsmooth convex optimization
Lecture 2: Models and the proximal point algorithm.
Lecture 3: Bundle methods and the Moreau-Yosida regularization
Lecture 4: Beyond first order: VU-decomposition methods

Organizers:
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