DEPARTMENT OF APPLIED MATHEMATICS
應 用 數 學 系

The Hong Kong Polytechnic University
Department of Applied Mathematics

Colloquium

Some Remedies for Some Intractable Optimization Problems

by

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Abstract

The need to solve real-life optimization problems poses frequently a severe challenge, as the underlying mathematical programs threaten to be intractable. The intractability can be attributed to any of the following properties: large dimensionality of the design dimension; lack of convexity; parameters affected by uncertainty. In problems of designing optimal mechanical structures (truss topology design, shape design, free material optimization), the mathematical programs typically have a large dimensional Semi- Definite Program. Some Signal Processing and Estimation problems may result in nonconvex formulations. In the wide area of optimization under uncertainty, some classical approaches, such as chance (probabilistic) constraints, give rise to nonconvex NP-hard problems.

In all the above applications we explain how the difficulties were resolved. In some cases this was achieved by mathematical analysis (notoriously duality theory) which converted the problems (or its dual) to a tractable convex program. In the Robust Control example, a reparameterization scheme is developed under which the problem is converted to a tractable deterministic convex program. In a classical linear estimation problem a new modelling of the problem based on Robust Optimization was successfully employed. In a Machine Learning problem a chain of duality arguments was used to bring the problem to a formulation which is amenable to the use of efficient algorithms.

Date : 15 September, 2016 (Thursday)
Time : 11:00a.m. – 12:00noon
Venue : TU801, The Hong Kong Polytechnic University

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