2009 Mini Workshop on Optimization (2)

Department of Mathematics
National Taiwan Normal University

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Sponsored by

Division of Mathematics, National Center for Theoretical Sciences, Taipei Office
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Organized by

Jein-Shan Chen

Schedule of Programs
Place : M210, Mathematics Building

June 15	Speakers	Titles of Talks
13:10 - 13:50	Yongdo Lim	Todd's maximum-volume ellipsoid problem on symmetric cones
13:50 - 14:30	Jeng-Huei Chen	Introduction to the Trust-Tech method, its recent advances and application
14:30 - 14:40	*Break*	
14:40 - 15:20	Sangho Kum	Necessary and sufficient conditions for Farkas' lemma for cone systems and second-order cone programming duality
15:20 - 16:00	Jen-Yen Lin	Augmented Lagrange Dual Approach for Generalized Fractional Programming
16:00 - 16:10	*Break*	
16:10 - 16:50	Feng-Sheng Tsai	Spontaneous Synchronization of Pulse-Coupled Neurons
16:50 - 17:30	Baojun Bian	Some Partial Differential Equations in Mathematical Finance

Some Partial Differential Equations in Mathematical Finance

Baojun Bian
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Abstract. In this talk, we will discuss some financial problems which can be modeled and treated by PDE approach. The first is claims pricing such as European option, American style option and credit derivatives pricing. These problems are related to well-known Black-Scholes equation and free boundary problem. We will review some mathematical theories for HJB equation and HJBI equation, and then discuss optimal portfolio selection and related risk management problem. Finally, we discuss jump diffusion model briefly.

Introduction to the Trust-Tech method, its recent advances and application

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Abstract. A great variety of scientific and engineering problems can be formulated as general nonlinear programming problems. Among many of these problems, the assumption of convexity does not hold and there exist multiple local optimal solutions. To locate high-quality or global optimal solutions (if possible), traditional optimization algorithms usually rely on some stochastic or heuristic methods.

In this talk, I will give an overview of the Trust-Tech method. This method is distinguished from other methods in that it systematically and deterministically searches all or multiple local optimal solutions in a tier-by-tier manner. With this approach, high-quality or even global optimal solutions can be obtained such that they provide better options to the target real-world problems.

The presentation will start with some earlier theoretical results followed by the recent developments of numerical procedures. Its application to neural network training problems will be illustrated and some numerical results will be presented to demonstrate the efficacy of this method.

Necessary and sufficient conditions for Farkas' lemma for cone systems and second-order cone programming duality

Sangho Kum
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Abstract. We present conditions, which completely characterize Farkas' lemma for cone-convex systems, and obtain strong duality characterizations for convex optimization problems. In particular, we establish a necessary and sufficient closed cone condition for the Farkas lemma. As an application, we obtain necessary and sufficient conditions for the strong duality of convex second-order cone programming problems.

Todd's maximum-volume ellipsoid problem on symmetric cones

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Abstract.

Augmented Lagrange Dual Approach for Generalized Fractional Programming

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Abstract. In this talk, we plan to use augmented Lagrange methods for solving generalized fractional programming problem. Augmented Lagrange methods can help us to face the non-differentiability of finite min-max programming problem. By augmented Lagrange methods, we obtain some approximating programming which can help us to obtain some dual information. These dual information can be combined with dual algorithm for generalized fractional programming. We also compare it with the other existing dual algorithms.

Spontaneous Synchronization of Pulse-Coupled Neurons

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Abstract. We explore an evolutionary network model of pulse-coupled neurons in which the changes of evolutionary coupling strengths are based on algorithmic Hebbian synaptic plasticity. A mathematical proof asserts that the ongoing changes of the evolutionary network's nodal-and-coupling dynamics will spontaneously result in group synchrony and sync-dependent circuits. Moreover, we study the problem of the stability of neural synchrony and the problem of determining the size of synchronously firing neural groups. This leads to describing a phenomenon underlying synchrony and stability of synchrony that neural synchrony allows positive feedback from which a monotonically increasing sequence of coupling strengths and a monotonically increasing region of states for initializing the stability process arise.