領域論壇：最佳化
Session: Optimization

Venue: 數學館 M210

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A method for global minimization of DC functions

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Abstract

In this talk, we consider the difference-of-convex (DC) optimization problems subject to box constraints. First, we discuss necessary and sufficient conditions for local and global optimality. Then we present a method for global minimization of DC functions. This method is based on the use of ε-subdifferentials of DC component functions. The method is the combination of the local optimization methods and a special procedure for escaping from stationary points (including local minimizers) of the DC optimization problems. Results of numerical experiments will be reported.

Keywords Global optimization, Nonsmooth optimization, DC optimization

Joint work with K. Joki, S. Taheri and M. Mäkelä

Optimization Models for Trend Filtering

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Abstract

Trend filtering is a regression problem to estimate underlying trends in time series data. It is necessary to investigate data in various disciplines. We propose a trend filtering method by adaptive piecewise polynomials. More specifically, we adjust the location and the number of breakpoints or knots to obtain a better fitting to given data. The numerical results on synthetic and real data sets show that it captures distinct features such as abrupt changes or kinks and provides a simplified form and brief summary of given data.

Keywords Trend filtering, Piecewise polynomial regression, Nonlinear regression

Assortment Management and Marketing Efforts by Customer Behaviors

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Abstract

In e-commerce, it is crucial to provide customers with customized product assortments. With the advancement of the internet, more and more consumer purchase data is being stored. Retailers can utilize this data to select customized product combinations for customers from alternative items, while leveraging market effectiveness management to enhance customers' willingness to purchase. This study proposes a robust optimization method that integrates product assortment planning and market effectiveness management, which serves as a basis for formulating sales product strategies for retailers.

In this presentation, we will discuss a mathematical model that describes how to provide customers with a robust product assortment. This mathematical model is based on a three-layer optimization problem constructed using the NML approach, and is solved using fractional programming.

Keywords Customized assortment, marketing effort, multinomial logit model, robust optimization

Global Convergence and Acceleration of Fixed Point Iterations of Union Upper Semicontinuous Operators with Applications to Feasibility Problems and Optimization

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Abstract

We propose a unified framework to analyze fixed point iterations of a set-valued operator that is the union of a finite number of upper semicontinuous maps, each with a nonempty closed domain and compact values. We discuss global convergence, local linear convergence under a calmness condition, and component identification, and further propose acceleration strategies that drastically improve the convergence speed. Our framework is applied to analyze a class of proximal algorithms for minimizing the sum of a piecewise smooth function and the difference between pointwise minimum of finitely many weakly convex functions and a piecewise smooth convex function. When realized on two-set feasibility problems, this algorithm class recovers alternating and averaged projections as special cases, and our framework thus equips these classical methods with global convergence and possibilities for acceleration on a broad class of nonconvex feasibility problems. By specializing the framework to a nonconvex feasibility problem reformulation of the linear complementarity problem, we show global convergence to a solution from any initial point, with a local linear rate, of the alternating projection as well as the averaged projection methods, which is difficult to obtain on nonconvex problems. Numerical results further exemplify that the proposed acceleration algorithms significantly improve upon their non-accelerated counterparts in efficiency. This is a joint work with Ching-pei Lee.

Keywords fixed point algorithm, upper semicontinuity, proximal algorithms, feasibility problems, linear complementarity problem