

数学与系统科学研究院

计算数学所学术报告

报告人: **Prof. Chong-Yung Chi**

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报告题目:

**Blind Deconvolution Based
Super-resolution Imaging with
ROSIS/HYDICE/AVIRIS Sensors
via Big Data Convex Optimization**

邀请人: 刘亚锋 副研究员

报告时间: **2018年7月6日 (周五)**

下午 16:00-17:00

报告地点: 科技综合楼三层

311 报告厅

Abstract:

Direct acquisition of hyperspectral and high-spatial-resolution (HSR) image data (target images) with remote-sensing sensors is expensive, while such images play an essential role in accurate identification/classification of the underlying materials in the scene of interest. In this talk, we present a newly invented *convex optimization based coupled non-negative matrix factorization (CO-CNMF)* algorithm to fuse two different datasets, one captured by HSR multispectral sensor and the other by low-spatial-resolution (LSR) hyperspectral sensor. With *sparsity-promoting* l_1 -norm regularization and *simplex* (of materials' spectral signatures) *volume-demoting* regularization, this algorithm solves a *large-scale bi-convex problem*, by the alternating direction method of multipliers (ADMM), where two *non-negative matrix factorizations* are intrinsically coupled by a low-rank model of the target image, one for extracting the *spectral* information from the LSR hyperspectral image and the other for extracting the *spatial* information from the HSR multispectral image. The CO-CNMF algorithm can be shown to converge to a stationary-point solution together with a carefully designed ADMM that are practically applicable to fusion of *million-scale* datasets. Finally, experiments designed based on the Wald's protocol are presented to demonstrate that the CO-CNMF algorithm yields much superior fusion performance over six benchmark super-resolution methods on ROSIS, HYDICE and AVIRIS datasets, in terms of several performance measures including peak signal-to-noise ratio (PSNR) and root mean square error (RMSE), with lower or comparable computational load.

Note: The CO-NMF algorithm is detailed in the following paper:

C. -H. Lin, F. Ma, Chong-Yung Chi, and C. -H. Hsieh, "[A convex optimization-based coupled nonnegative matrix factorization algorithm for hyperspectral and multispectral data fusion](#)," IEEE Trans. Geoscience and Remote Sensing, vol. 56, no. 3, pp. 1652-1667, Mar. 2018.

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