Information Science and Technology Seminar Speaker Series

Hamid Krim
North Carolina State University

Efficient Analysis of High Dimensional Data: A Geometric Perspective

Wednesday, February 18, 2015

3:00 - 4:00 PM

TA-3, Bldg. 1690, Room 102 (CNLS Conference Room)

Abstract: High dimensional data exhibit distinct properties compared to its low dimensional counterpart; this causes a common performance decrease and a formidable computational cost increase of traditional approaches. Novel methodologies are therefore needed to characterize data in high dimensional spaces.

Considering the parsimonious degrees of freedom of high dimensional data compared to its dimensionality, we study the union-of-subspaces (UoS) model, as a generalization of the linear subspace model. The UoS model preserves the simplicity of the linear subspace model, and enjoys the additional ability to address nonlinear data. We show a sufficient condition to use l1 minimization to reveal the underlying UoS structure, and further propose a bi-sparsity model (RoSure) as an effective algorithm, to recover the given data characterized by the UoS model from errors/corruptions.

As an interesting twist on the related problem of Dictionary Learning Problem, we discuss the sparse null space problem (SNS). Based on linear equality constraint, it first appeared in 1986 and has since inspired results, such as sparse basis pursuit, we investigate its relation to the analysis dictionary learning problem, and show that the SNS problem plays a central role, and may naturally be exploited to solve dictionary learning problems.

Substantiating examples are provided, and the application and performance of these approaches are demonstrated on a wide range of problems, such as face clustering and video segmentation.

Biography: Hamid Krim (ahk@ncsu.edu) received his BSc. MSc. and Ph.D. in Electrical Engineering. He was a Member of Technical Staff at AT&T Bell Labs, where he has conducted R&D in the areas of telephony and digital communication systems/subsystems. Following an NSF postdoctoral fellowship at Foreign Centers of Excellence, LSS/University of Orsay, Paris, France, he joined the Laboratory for Information and Decision Systems, MIT, Cambridge, MA as a Research Scientist and where he was performing and supervising research.

He is presently Professor of Electrical Engineering in the ECE Department, North Carolina State University, Raleigh, leading the Vision, Information and Statistical Signal Theories and Applications group. His research interests are in statistical signal and image analysis and mathematical modeling with a keen emphasis on applied problems in classification and recognition using geometric and topological tools. He has served and is currently serving on the IEEE editorial board of SP, and the TCs of SPTM and Big Data Initiative, as well as an AE of the new IEEE Transactions on SP on Information Processing on Networks, and of the IEEE SP Magazine. He is also one of the 2015-2016 Distinguished Lecturers of the IEEE SP Society.

For more information contact the technical host James Theiler, jtheiler@lanl.gov, 665-5682.

Hosted by the Information Science and Technology Institute (ISTI)

Los Alamos
NATIONAL LABORATORY
EST.1943

ISTI
INFORMATION SCIENCE & TECHNOLOGY INSTITUTE