SIAM Conference on Imaging Science
Program Changes

Changes on the following Minisymposia:

MS01 Part I,	MS02 Part II,	MS05 Part II,	MS14 Part II,
MS18 Part I,	MS19 Part I,	MS22 Part II,	MS25 Part II,
MS28,	MS35 Part II,	MS52 Part I,	MS54 Part I,
MS54 Part II,	MS57 Part III		

Changes on the following Contributed Talks:

CT01, CT02, CT05, CT06, CT07, CT08

Monday May 12

MS14 Part II

Manifolds, Shapes and Topologies in Imaging

2:45 PM - 4:45 PM

WLB204

The detection, quantification or comparison of geometrical structures plays a central role in many imaging tasks. Particular examples are related to tomographic shape/topology reconstruction, shape recognition and statistics, based, e.g., on Riemannian geometry, or deformation analysis. In this minisymposium, recent analytical as well as computational approaches to aforementioned problems are addressed. In particular, techniques based on shape and topological sensitivity analysis, level set methods, adaptive geometric approximation, shape geodesics, and problems requiring efficient handling of Riemannian manifolds are emphasized.

Organizer: Günay Doğan, Theiss Research, National Institute of Standards and Technology, USA
Organizer: Michael Hintermüller, Institut für Mathematik, Humboldt-Universität zu Berlin, Germany

14:45-15:15 Computational Metric Geometry in the Natural Space
Ron Kimmel, Computer Science Department, Technion, Israel Institute of Technology, Israel

15:15-15:45 Affine-Invariant Shape Models for Contours and Their Discoveries in Images
Anuj Srivastava, Department of Statistics, Florida State University, USA

15:45-16:15 Smooth or Singular Metamorphoses for Images and Measures
Laurent Younes, Johns Hopkins University, USA

NEW TALK

16:15-16:45 Shape and Topology Optimization Methods for Inverse Problems
Antoine Laurain, TU Berlin, Germany

Monday May 12

MS25 Part II

Mathematical Modeling and Related Inverse Problems in Medical Applications

2:45 PM - 4:45 PM

DLB712

Mathematical methods for modeling and signal analysis have become important tools in medical area. In particular, these require multidisciplinary collaboration accompanied with physics and bio-based modeling, imaging system design, signal image processing, high performance computing as well as experimental validation. In this mini-symposium, mathematical problems and challenges in biomedical problems will be discussed, and current research activities in modeling and inverse problems arising from such problems will be reviewed. Special emphasis will be given on blood flow modeling and signal recovery, sparse image reconstruction and convex optimization in MR, CT, and various imaging modalities. Audiences are expected to learn how sophisticated mathematics can be used for real world applications.

Organizer: Jong Chul Ye, Department of Bio and Brain Engineering, KAIST, Korea
Organizer: Yoon Mo Jung, Computational Science and Engineering, Yonsei University, Korea
Organizer: Kiwan Jeon, National Institute for Mathematical Sciences, Korea

TALK CANCELED

~~**14:45-15:15 Phase Retrieval for Sparse Signals**~~
~~*Zhiqiang Xu, LSEC, Inst. Comp. Math., Academy of Mathematics and System Science, Chinese Academy of Sciences, China*~~

CHANGE OF TIME

14:45-15:15 Vortex Flow Imaging Technique Using Echocardiography
Chi Young Ahn, National Institute for Mathematical Sciences, Korea

Monday May 12

MS05 Part II

Keep the Edge? From Theory to Practice

5:15 PM - 7:15 PM

WLB109

While many important theoretical and numerical advances have been made towards the understanding and numerical realization of structure-preserving methods there are still many open problems and unanswered questions. For instance, how to strike the right balance between structure-preservation and smoothness and how to model it? How can these reconstruction techniques be efficiently and accurately translated into practical applications to deal with corrupted and large-scale data? In this double minisymposium we will bring together researchers working on theory, algorithms and applications of structure-preserving methods to discuss the way forward on those important issues.

Organizer: Marta Betcke, Department of Computer Science, University College London, UK
Organizer: Carola-Bibiane Schönlieb, Department of Applied Mathematics and Theoretical Physics (DAMTP), University of Cambridge, UK

17:15-17:45 Exact Support Recovery for Sparse Spikes Deconvolution
Gabriel Peyré, Ceremade, University Paris-Dauphine, France

17:45-18:15 Aspects of the Total Generalised Variation (TGV) Minimisation Problem
Konstantinos Papafitsoros, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, UK

18:15-18:45 Fast Solvers for Non-convex Edge-preserving/Sparsifying TV^q-regularizations, $q \in (0,1)$, and Issues with Variable Splitting Approaches in $TV(=TV^1)$-regularization
Michael Hintermüller, Department of Mathematics, Humboldt-University of Berlin, Germany

UPDATED INFORMATION
18:45-19:15 Image Reconstruction in Fluorescence Diffuse Optical Tomography Using Patch-based Anisotropic Diffusion Regularisation
Teresa Correia, University College London, UK

Monday May 12

MS28
Image Denoising: Trends, Connections, and Limitations
5:15 PM - 7:15 PM
WLB103

Image denoising has undergone significant advances since the 80s. For example, local stencils have led to non-local patch based techniques, anisotropic diffusion has inspired a well developed line of research in the nonlinear PDE community, and statistics and kernel methods have provided tools for improving all of these techniques. The newest models appear to be closing in on an optimal state, yet new algorithms continue to demonstrate advances. This minisymposium addresses new denoising approaches, what improvements (if any) we can expect to achieve, and connections between these methods that give insight into their potential as well as their limitations.

Organizer: Marcelo Bertalmío, Universitat Pompeu Fabra, Spain
Organizer: Stacey Levine, Duquesne University, USA

17:15-17:45 Denoising an Image by Denoising its Curvature Image
Marcelo Bertalmío, Departamento de Tecnologías de la Información y las Comunicaciones, Universitat Pompeu Fabra, Spain

17:45-18:15 A Spatially Consistent Collaborative Filtering
Alessandro Foi, Department of Signal Processing, Tampere University of Technology, Finland

18:15-18:45 On the Internal vs. External Statistics of Image Patches, and its Implications on Image Denoising
Maria Zontak, Department of Computer Science and Applied Mathematics, Weizmann Institute, Israel

NEW TALK
18:45-19:15 On Covariant Derivatives and Their Applications to Image Regularization
Thomas Batard, Department of Information and Communication Technologies, University Pompeu Fabra, Barcelona, Spain

Tuesday May 13

MS52 Part I

Non-Convex Models in Image Recovery and Segmentation

10:30 AM - 12:30 PM

WLB208

In image recovery and segmentation, non-convex variational models are often closer to the real problems and turn out to perform better numerical results comparing the convex models. But at the same time, non-convexity poses significant challenges with respect to both the existence of solutions and the development of efficient algorithms. This minisymposium aims at bringing together experts in this area to present a series of talks on modeling, theoretical analysis, efficient numerical algorithms and applications.

Organizer: Yiqiu Dong, Technical University of Denmark, Denmark
Organizer: Tieyong Zeng, Hong Kong Baptist University, Hong Kong

10:30-11:00 Non-convex Multiple-objective Image Modeling
Alfred Hero, Dept. of Electrical Engineering and Computer Science, The University of Michigan, USA

11:00-11:30 Multiclass Segmentation by Iterated ROF Thresholding
Xiaohao Cai, Department of Mathematics, University of Kaiserslautern, Kaiserslautern, Germany

UPDATED INFORMATION
11:30-12:00 Restoration of Images Corrupted by Multiplicative Noise
Tieyong Zeng, Department of Mathematics, Hong Kong Baptist University, Hong Kong

Tuesday May 13

MS54 Part I

Optimization in Imaging: Algorithms, Applications and Theory

10:30 AM - 12:30 PM

WLB210

Optimization has been playing an important role in various imaging processing areas; and we have witnessed very active interaction between these two disciplines. This mini-symposium aims to bring together experts to exchange ideas and discuss the most recent advances in optimization techniques for image processing problems. Relevant progresses on algorithmic design, application and theory at the interface of optimization and imaging are all welcome.

Organizer: Xiaojun Chen, The Hong Kong Polytechnic University, Hong Kong
Organizer: Xiaoming Yuan, Hong Kong Baptist University, Hong Kong

10:30-11:00 Implicit Filtering
C. T. Kelley, North Carolina State University, USA

11:00-11:30 A Semismooth Newton-CG Augmented Lagrangian Algorithm for Convex Minimization Problems with Non-separable ℓ_1-regularization
Kim-Chuan Toh, National University of Singapore, Singapore

11:30-12:00 The Augmented-Lagrangian-Type Methods for Low Multilinear-Rank Tensor Recovery
Lei Yang, Tianjin University, China

UPDATED INFORMATION
CHANGE OF TIME
12:00-12:30 Exact Recovery for Sparse Signal via Weighted L1 Minimization
Naihua Xiu, Department of Applied Mathematics, Beijing Jiaotong University, China
Move to Wednesday May 14, MS54 Part II, 11:00-11:30, DLB712

NEW TALK
12:00-12:30 An Algorithm for Variable Density Sampling with Block-constrained Acquisition
Pierre Weiss, University of Toulouse, France

Tuesday
May 13

MS57 Part III
Modeling and Algorithms for Imaging Problems
10:30 AM - 12:30 PM
DLB719

In recent years mainland China has many new developments in modeling and algorithms in imaging sciences. The objectives of this mini-symposium are to bring mainland China researchers in this field together to present their recent research work, to exchange ideas, and explore future collaborations. The topics of this mini-symposium were the latest development of modeling, algorithms and their applications in real-world imaging problems such as image denoising, deblurring, inpainting, decomposition, segmentation, and super-resolution reconstruction, etc. This minisymposium can provide a forum to stimulate discussions and establish collaborations between young Chinese researchers for further developments in this emerging imaging sciences research.

Organizer: Fang Li, Department of Mathematics, East China Normal University, China
Organizer: Huanfeng Shen, School of Resource and Environmental Science, Wuhan University, China
Organizer: Wei Wang, Department of Mathematics, Tongji University, China
Organizer: Xile Zhao, School of Mathematical Sciences, University of Electronic Science and Technology of China, China

TALK CANCELED
~~**10:30-11:00 Hyperspectral Anisotropic Diffusion for Image Denoising Based on a Novel Diffusion Tensor**~~
~~*Yi Wang, China University of Geosciences, China*~~

NEW TALK
10:30-11:00 Spatially Adaptive Total Variation Model: From Pixel to Regional Perspective
Qiangqiang Yuan, School of Geodesy and Geomatics, Wuhan University, China

11:00-11:30 Separable Tensor Compressive Sensing and Application in Hyperspectral Imaging
Yongqiang Zhao, Northwestern Polytechnical University, China

11:30-12:00 An Online Coupled Dictionary Learning Approach for Remote Sensing Image Fusion
Hongyan Zhang, Wuhan University, China

12:00-12:30 Joint Blind Unmixing and Sparse Representation for Anomaly Detection in Hyperspectral Image
Yuancheng Huang, Xi'an University of Science and Technology, China

Tuesday
May 13

MS02 Part II
Photoacoustic Tomography
1:45 PM - 3:45 PM
SCC2

Photoacoustic Tomography is the leading example of the new class of Imaging from Coupled Physics modalities. It presents challenging problems in both the modelling and reconstruction steps for both the acoustic and optical parts of the problem. In these minisymposia (parts I and II) we bring together leading researchers in both the theoretical and applied aspects of this exciting new imaging technique.

Organizer: Simon Arridge, Department of Computer Science, University College London, UK
Organizer: Ben T Cox, Department of Medical Physics, University College London, UK

13:45-14:15 Algebraic Image Reconstruction in Combined Space for Photoacoustic Tomography
Amir Rosenthal, Helmholtz Zentrum Mnchen and Technische Universitt Mnchen, Germany

TALK CANCELED
~~**14:15-14:45 Computational Aspects of Dynamic Photoacoustics**~~
~~*Simon Arridge, University College London, UK*~~

NEW TALK
14:15-14:45 Compressed Sensing for High Resolution 3D Photoacoustic Tomography Using Data Sparsity
Marta Betcke, University College London, UK

14:45-15:15 Photoacoustic Tomography Image Reconstruction in Heterogeneous Media
Mark Anastasio, Washington University in St. Louis, USA

Tuesday
May 13

MS22 Part II
Variational PDE and Multi-scale Multi-directional Sparse Representation in Imaging
1:45 PM - 3:45 PM
WLB207

After decades of intensive studies, modern image analysis is still facing the challenges of recovering images from their noisy, blurry, and/or incomplete measurements. The precise recovery is especially valuable for images containing important details (including but not limited to medical images). High order regularity and multi-scale multi-directional sparse representation play important roles in these problems and have shown to be very successful. This mini-symposium brings together leading researchers to discuss the state-of-the-art theoretical developments in this two research directions as well as their applications in image denoising, image reconstruction, compressive sensing, image segmentation and compressive feature detection etc.

Organizer: Weihong Guo, Department of Mathematics, Case Western Reserve University, USA
Organizer: Julia Dobrosotskaya, Department of Mathematics, Case Western Reserve University, USA

13:45-14:15 Variational Image Reconstruction Using Composite Wavelets
Benjamin Manning, Department of Mathematics, University of Maryland, College Park, USA

14:15-14:45 α-Molecules: Wavelets, Shearlets, and Beyond
Gitta Kutyniok, Department of Mathematics, Technische Universität Berlin, Germany

14:45-15:15 Compressive Support Detection based on Multiple Hypothesis Testing
Yi (Grace) Wang, Department of Mathematics, Duke University and SAMSI, USA

TALK CANCELED
~~**15:15-15:45 Empirical Wavelet Transforms**~~
~~*Jérôme Gilles, Department of Mathematics, UCLA, USA*~~

Tuesday
May 13

MS35 Part II
Theoretical and Computational Aspects of Geometric Shape Analysis
1:45 PM - 3:45 PM
WLB103

The analysis, classification, and processing of geometric shapes is a timely and increasingly important problem in engineering, computer science, and mathematics. Modern strategies for shape analysis span several disciplines: statistical cliquing, differential geometry, data processing, and numerical optimization. The aim of this minisymposium is to present state-of-the-art methods for geometric shape analysis, and to discuss open problems, applications, and future directions for research of interest to the imaging science community. This minisymposium brings together researchers from diverse backgrounds to foster collaboration between the fields of computer vision, image processing, and mathematical shape analysis.

Organizer: Sergey Kushnarev, Singapore University of Technology and Design, Singapore
Organizer: Mario Micheli, Department of Mathematics, University of Washington, USA
Organizer: Akil Narayan, University of Massachusetts Dartmouth, USA

13:45-14:15 Matrix-valued Kernels for Shape Deformation Analysis
Mario Micheli, Department of Mathematics, University of Washington, USA

TALK CANCELED
~~**14:15-14:45 Some Computations Related to Barycenters on Riemannian Manifolds**~~
~~*Facundo Mémoli, Department of Mathematics, The Ohio state University, USA*~~

CHANGE OF TIME
14:15-14:45 Shape Analysis of Cardiac Images
Laurent Younes, Department of Applied Mathematics and Statistics,

Center for Imaging Science, Johns Hopkins University, USA

14:45-15:15 Shape Analysis of Multiply-connected Objects Using Conformal Welding
Ronald Lok Ming Lui, Department of Mathematics, The Chinese University of Hong Kong, Hong Kong

Tuesday May 13

CT01
Contributed Talk I
4:15 PM - 6:15 PM
WLB103

16:15-16:35 Meteorological Data Analysis with Diffeomorphic Demons
Dominique Brunet, Cloud Physics and Severe Weather Research Section, Environment Canada, Government of Canada, Canada

16:35-16:55 Modelling and Analysing Oriented Fibrous Structures
Maaria Rantala, Department of Mathematics and Statistics, University of Helsinki, Finland

16:55-17:15 Fast Optimized Harmonic Registration of Genus-0 Closed Surfaces with Landmark Constraints
Pui Tung Choi, Department of Mathematics, The Chinese University of Hong Kong, Hong Kong

UPDATED INFORMATION
17:15-17:35 Image Inpainting for 3D Conversion
Rob Hocking, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, UK

17:35-17:55 Surface Reconstruction from Parallel Contours with Exact Contour Constraints
Sangun Kim, Department of Mathematical Sciences, KAIST, Korea

17:55-18:15 A Convex Approach to Sparse Shape Composition
Alireza Aghasi, School of Electrical and Computer Engineering, Georgia Institute of Technology, GA, USA

Tuesday May 13

CT02
Contributed Talk 2
4:15 PM - 6:15 PM
WLB104

16:15-16:35 Simulation of Modified Keller-Segel Chemotaxis Model with Stochastic Parameters
Daniel Keegan, Hunter College CUNY, USA

16:35-16:55 Boundary Integral Strategy for Laplace Eigenvalue Problems
Eldar Akhmetgaliyev, Applied and Computational Mathematics, California Institute of Technology, USA

TALK CANCELED
~~**16:55-17:15 Non-local Retinex, A Unifying Framework and Beyond**~~
~~*Giang Tran, Department of Mathematics, UCLA, USA*~~

CHANGE OF TIME
16:55-17:15 Optimal Filters for General-Form Tikhonov Regularization
Malena I. Español, Department of Mathematics, The University of Akron, USA

17:15-17:35 Drift-Diffusion Equations in Image Processing
Martin Schmidt, Department of Mathematics and Computer Science, Saarland University, Germany

17:35-17:55 Near Optimal Parameter Choice for General Spectral Filters
Viktoria Taroudaki, Applied Mathematics and Scientific Computation Program, University of Maryland, USA

Tuesday May 13

CT05
Contributed Talk 5
4:15 PM - 6:15 PM
WLB211

16:15-16:35 An Overview of Kernel Methods for Tensor Based Classification
Boguslaw Cyganek, Department of Electronics, AGH University of Science and Technology, Krakow, Poland

16:35-16:55 Dynamical Estimation of Brain Activities from MEG Data
Lijun Yu, Department of Mathematics, Applied Mathematics and Statistics, Case Western Reserve University, USA

16:55-17:15 A Composition Model Combining Parametric Transformation and Non-parametric Deformation for Effective Image Registration
Mazlinda Ibrahim, Centre for Mathematical Imaging Techniques, Department of Mathematical Sciences, The University of Liverpool, UK

17:15-17:35 Fast Algorithms for Adaptive Temporal Compression in Video Data
Yi Yang, Department of Mathematics, UCLA, USA

17:35-17:55 Computer Vision Applications in Characterizing Melanoma and Moles
Cheri Shakiban, Department of Mathematics, University of St. Thomas, USA

UPDATED INFORMATION
17:55-18:15 Artificial Intelligence and Traffic: Problems, Devices, Methods, Theorems
Marina V. Yashina, Mathematical Cybernetics and Information Technologies Department, Moscow Technical University of Communications and Informatics, Russia

Tuesday May 13

CT06
Contributed Talk 6
4:15 PM - 6:15 PM
WLB209

16:15-16:35 Creating and Utilising Prior Anatomical Information for Preclinical Brain Imaging with Fluorescence Molecular Tomography
Athanasios Zacharopoulos, Institute for Electronic Structure and Laser, Foundation for Research and Technology- Hellas, Greece

16:35-16:55 Detection of Bone Profiles in CT Images by Means of the Hough Transform
Cristina Campi, CNR-SPIN, Genova, Italy

16:55-17:15 Physiological Clustering: A noise-reduction approach in Quantitative Myocardial Perfusion PET
Hassan Mohy-ud-Din, Department of Electrical and Computer Engineering, Department of Applied Mathematics and Statistics, and Department of Radiology and Radiological Sciences, Johns Hopkins University, USA

17:15-17:35 Quantification of Glucose Metabolism with Nuclear Imaging PET Data
Sara Garbarino, Dipartimento di Matematica, Universitá degli Studi di Genova, Italy

17:35-17:55 Spontaneous Brain Activity Detection in Functional Magnetic Resonance Imaging Using Finite Rate of Innovation
Zafer Dogan, Institute of Bioengineering EPFL, Switzerland

NEW TALK
17:55-18:15 Manifold Embedding Model of Image Patches and Its Application
Jianzhong Wang, Department of Mathematics and Statistics, Sam Houston State University, Texas, USA

Tuesday May 13

CT07
Contributed Talk 7
4:15 PM - 6:15 PM
WLB202

16:15-16:35 Imaging Strong Localized Scatterers
Anwei Chai, Stanford University, USA

16:35-16:55 Laplacian Colormaps: a Framework for Structure-preserving Color Transformations
Davide Eynard, Institute of Computational Science, Faculty of Informatics University of Lugano, Switzerland

16:55-17:15 On Best Basis Selection from Basis Dictionaries on Graphs
Naoki Saito, Department of Mathematics, University of California, Davis, USA

17:15-17:35 Real-time Compressed Imaging Of Scattering Volumes
Ohad Menashe, Department of Electrical Engineering, Tel Aviv University, Israel

UPDATED INFORMATION
17:35-17:55 Recovering Rank-One Matrices via Rank-r Matrices Relaxation
Pengwen Chen, National Chung Hsing University, Taiwan

17:55-18:15 Fourier-Bessel Rotational Invariant Eigenimages
Zhizhen Zhao, Courant Institute of Mathematical Sciences, New York University, USA

Tuesday May 13

CT08
Contributed Talk 8
4:15 PM - 6:15 PM
WLB206

16:15-16:35 Removing Simultaneous Gaussian and Salt-and-pepper Noise by Minimizing a Combined L^1-L^2-TV Functional
Andreas Langer, Institute of Mathematics and Scientific Computing, University of Graz, Austria

16:35-16:55 Efficient Smoothing Method for Image Restoration Using Nonsmoooth Regularization
Chao Zhang, Department of Applied Mathematics, Beijing Jiaotong University, China

16:55-17:15 Total Variation based Speckle Reduction Method
Hyenkyun Woo, School of Computational Sciences, Korea Institute for Advanced Study, Korea

UPDATED INFORMATION
17:15-17:35 Denoising Results Using Image Reconstruction Techniques Based on Legendre Polynomials Approximation of Continuous Prolate Spheroidal Functions (CPSF)
Maria C. Gonzalez, Department of Mathematics, University of California, Davis, USA

17:35-17:55 Exploiting Sparsity in Remote Sensing for Earth Observation
Xiaoxiang Zhu, Remote Sensing Technology, German Aerospace Center (DLR) & Technical University of Munich, Germany

17:55-18:15 Image De-noising Using Discrete Spectrum of a Schrödinger Operator
Zineb Kaisserli, Mathematical and Computer Science Division, University of Mostaganem Abdelhamid Ibn Badis University (UMAB), Algeria

Wednesday May 14

MS01 Part I
Beyond Single Shot Imaging: Academic and Industrial Points of View
10:30 AM - 12:30 PM
WLB210

With the advent of computational imaging, the frontiers between optics, electronics and image processing are becoming thinner: in modern image acquisition devices, all three elements are viewed as a whole that should be optimized jointly. In particular modern cameras tend to take bursts of images that are jointly restored, thus allowing to go beyond the physical limitations of single-shot sensors (dynamic range, resolution, noise, blur, specularities, over-exposure). As a counterpart, multi-image restoration faces specific challenges (motion, outliers, illuminant modifications, etc.), that are being addressed by industry and academia using innovative tools from applied mathematics and image processing.

Organizer: Andrés Almansa, LTCI, Telecom ParisTech, CNRS, France
Organizer: Julie Delon, MAP5, Université Paris Descartes, CNRS, France
Organizer: Pablo Musé, IIE, Fac. de Ingeniería, Universidad de la República, Uruguay

CHANGE OF TIME
10:30-11:00 Simultaneous HDR Image Reconstruction and Denoising for Dynamic Scenes
Pablo Musé, Universidad de la República, Uruguay

11:00-11:30 How to Trade Signal Sparsity for Outlier Resistance in Convex Reconstruction from Linear Measurements?
Saïd Ladjal, LTCI, Télécom ParisTech, France

NEW TALK
11:30-12:00 Foreground and Background Reconstruction in High-Speed Photon-Limited Motion Imagery
Rebecca Willett, University of Wisconsin-Madison, USA

CHANGE OF TIME
12:00-12:30 Color Transfer Between Close Views of the Same Scene
Stacey Levine, Duquesne University, USA

Wednesday
May 14

MS18 Part I

Super-Resolution: Theoretical and Numerical Aspects
10:30 AM - 12:30 PM
WLB211

The goal of this mini-symposium (split into two parts) is to present state of the art results, on both theoretical guarantees and numerical algorithms, for inverse problems regularization using low complexity models (sparsity, bounded variation, low rank, etc.). These results attempt to bridge the gap between the surprising efficiency of recent regularization methods, and our theoretical understanding of their super-resolution effectiveness. While many theoretical guarantees rely on uniform analysis with with hypotheses requiring randomness or global incoherence of the measurements, real-life problems in imaging sciences (e.g. deconvolution, tomography, MRI, etc.) require more intricate theoretical tools and algorithms to capture the geometry of signals and images that can be stably recovered. This includes for instance variational methods over spaces of measures (e.g. sum of Dirac measures, bounded variation functions, etc.) and the development of novel recovery algorithms that can cope with the strong coherence of the measurement operator. The mini-symposium will gather talks by leading experts in the field.

Organizer: Jalal Fadili, CNRS-ENSICaen, Caen, France
Organizer: Gabriel Peyré, CNRS and Université Paris-Dauphine, France

10:30-11:00 Inverse Problems in Spaces of Measures
Kristian Bredies, University of Graz, Austria

11:00-11:30 Super-Resolution from Noisy Data
Carlos Fernandez-Granda, University of Stanford, USA

11:30-12:00 Exact Support Recovery for Sparse Spikes Deconvolution
Vincent Duval, University Paris-Dauphine, France

TALK CANCELED
~~**12:00-12:30 Going off the Grid**~~
~~*Gongguo Tang, Colorado School of Mines, USA*~~

Wednesday
May 14

MS19 Part I

Wave-based Imaging
10:30 AM - 12:30 PM
WLB207

Wave-based imaging is an interdisciplinary area in applied mathematics, with roots in hyperbolic partial differential equations, probability theory, statistics, optimization, and numerical analysis. This minisymposium will present some of the latest advances in this area including source and reflector imaging in random media with arrays, imaging with cross correlation techniques, imaging through the turbulent atmosphere, and imaging methods based on spectral decompositions of the scattering operator.

Organizer: Knut Sølna, University of California at Irvine, USA
Organizer: Josselin Garnier, Paris Diderot University, France

10:30-11:00 Generalized Row-Action Methods for Tomographic Imaging
Knut Sølna, University of California at Irvine, USA

11:00-11:30 Interferometric Waveform Inversion
Laurent Demanet, MIT, USA

11:30-12:00 Shape Identification and Classification in Echolocation
Han Wang, ENS Paris, France

TALK CANCELED
~~**12:00-12:30 Geometric Distortion Correction and Deblurring by Fried Deconvolution**~~
~~*Jérôme Gilles, UCLA, USA*~~

NEW TALK
12:00-12:30 Wave Luminescence Imaging
Kui Ren, Department of Mathematics, University of Texas at Austin, USA

Wednesday May 14

MS54 Part II

Optimization in Imaging: Algorithms, Applications and Theory

10:30 AM - 12:30 PM

DLB712

Optimization has been playing an important role in various imaging processing areas; and we have witnessed very active interaction between these two disciplines. This mini-symposium aims to bring together experts to exchange ideas and discuss the most recent advances in optimization techniques for image processing problems. Relevant progresses on algorithmic design, application and theory at the interface of optimization and imaging are all welcome.

Organizer: Xiaojun Chen, The Hong Kong Polytechnic University, Hong Kong
Organizer: Xiaoming Yuan, Hong Kong Baptist University, Hong Kong

10:30-11:00 Functional-Analytic and Numerical Issues in Splitting Methods for Total Variation-based Image Reconstruction
Michael Hintermueller, Humboldt-Universität zu Berlin, Germany

CHANGE OF TIME
11:00-11:30 An Algorithm for Variable Density Sampling with Block-constrained Acquisition
Pierre Weiss, University of Toulouse, France
Move to Tuesday May 13, MS54 Part I, 12:00-12:30, WLB210

NEW TALK
11:00-11:30 Exact Recovery for Sparse Signal via Weighted L1 Minimization
Naihua Xiu, Department of Applied Mathematics, Beijing Jiaotong University, China

11:30-12:00 A Nonmonotone Approximate Sequence Algorithm for Unconstrained Nonlinear Optimization
Maryam Yashtini, Department of Mathematics, University of Florida, USA

12:00-12:30 Proximal Linearized Alternating Direction Method for Image Restoration
Sangwoon Yun, Sungkyunkwan University, Korea

Abstracts of Minisymposia Talks

MS01 Part I
Foreground and Background Reconstruction in High-Speed Photon-Limited Motion Imagery

Image foreground and background separation is an essential step in a variety of image processing, video analysis, and computer vision tasks. Typically, these methods accept streaming video data, compute an estimate of the background, and subtract this from the observed frames to generate a foreground scene. While such methods are very effective in high SNR regimes, they face serious limitations in low-light settings occurring in night vision surveillance and astronomy. Existing methods cannot be easily modified to yield good results. Therefore, new methods must be created to specifically deal with the low light setting. This work specifically addresses the problem of foreground and background separation and reconstruction in the case of Poisson distributed observations. The proposed approach builds upon recent advances in both the online learning community and sparse reconstruction methods for Poisson images. To aid in the reconstruction and separation tasks, the method learns and incorporates the dynamics of objects in both the background and foreground in real time. This is joint work with Eric Hall.

Rebecca Willett Department of Electrical and Computer Engineering, University of Wisconsin, Madison, USA rmwillett@wisc.edu

MS02 Part II
Compressed Sensing for High Resolution 3D Photoacoustic Tomography Using Data Sparsity

We present a new compressed sensing photoacoustic scanner based on optically addressed Fabry-Perot interferometer. Instead of slow raster acquisition the new scanner interrogates the whole sensor with a series of independent illumination patterns, each individual measurement being a scalar product of the illumination pattern and the acoustic field on the sensor. We discuss various aspects of compressed data acquisition and image reconstruction for this novel device on both simulated and real data.

Marta Betcke Department of Computer Science, University College London, UK M.Betcke@cs.ucl.ac.uk
Ben Cox Department of Medical Physics, University College London, UK B.Cox@ucl.ac.uk
Nam Huynh
Edward Zhang
Paul Beard
Simon Arridge Department of Computer Science, University College London, UK S.Arridge@cs.ucl.ac.uk

MS14 Part II
Shape and Topology Optimization Methods for Inverse Problems

In numerous image processing problems, the objects to be reconstructed have a nonsmooth structure. Typically, they may present piecewise constant or piecewise smooth features. Many well-established reconstruction algorithms rely on smooth functions for the approximation of the solution. In the past few years, reconstruction algorithms based on nonsmooth techniques to treat such cases have allowed to obtain more accurate reconstructions and therefore have drawn a considerable interest. In this talk, we propose a general shape optimization approach for the resolution of severely ill-posed inverse problems in tomography. For instance, in the case of Electrical Impedance Tomography, we reconstruct a piecewise constant electrical conductivity while in the case of Fluorescence Diffuse Optical Tomography, the unknown is a fluorophore concentration.

Antoine Laurain TU Berlin, Germany
laurain@math.tu-berlin.de

MS19 Part I
Wave Luminescence Imaging

In wave-luminescence imaging (WLI), we use waves such as ultrasound and microwaves to generate luminescent light inside a scattering medium. We then measure on the surface of the medium outgoing photon density. From this measurement, we intend to image the distribution of the luminescence source inside the medium. We present here some recent theoretical and numerical results on WLI in various simplified settings. We show how to construct "good" probing waves for stable reconstructions.

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MS28
On Covariant Derivatives and Their Applications to Image Regularization

We present a generalization of the Euclidean and Riemannian gradient operators to a vector bundle, a geometric structure generalizing the concept of manifold. One of the key ideas is to replace the standard differentiation of a function by the covariant differentiation of a section. Dealing with covariant derivatives satisfying the property of compatibility with vector bundle metrics, we construct generalizations of existing mathematical models for image regularization that involve the Euclidean gradient operator, namely the linear scale-space and the Rudin-Osher-Fatemi denoising model. For well-chosen covariant derivatives, we show that our denoising model outperforms state-of-the-art (local) variational denoising methods both in terms of PSNR and Q-index.

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MS52 Part I
Restoration of Images Corrupted by Multiplicative Noise

In this talk, a new variational model for restoring blurred images with multiplicative noise is proposed. Based on the statistical property of the noise, a quadratic penalty function technique is utilized in order to obtain a strictly convex model under a mild condition, which guarantees the uniqueness of the solution and the stabilization of the algorithm. For solving the new convex variational model, a primal-dual algorithm is proposed, and its convergence is studied. The talk ends with a report on numerical tests for the simultaneous deblurring and denoising of images subject to multiplicative noise. A comparison with other methods is provided as well.

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MS54 Part II
Exact Recovery for Sparse Signal via Weighted L1 Minimization

Numerical experiments have indicated that the reweighted L1 minimization perform exceptionally well in recovering sparse signal. In this talk, we want to develop new exact recovery conditions and algorithm for sparse signal via weighted L1 minimization. We first introduce the concept of WNSP (weighted null space property) and reveal that it is a necessary and sufficient condition for weighted L1 exact recovery. We then show that the RIC (restricted isometry

constant) bound by weighted L1 minimization trends to 1 under some situations which is greater than the existing RIC bound 0.4343. Finally, we propose a modified iterative reweighted L1 minimization (MIRL1) algorithm based on our selection principle of weight, and the numerical experiments demonstrate that our algorithm MIRL1 behaves much better than the existing weighted L1 minimization algorithms.

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MS57 Part III
Spatially Adaptive Total Variation Model: From Pixel to Regional Perspective

Total variation is a popular and effective image prior model. However, as it favors a piecewise constant solution, the result under high noise intensity is often poor. Therefore, we develop a regional adaptive total variation (RATV) model, in which the spatial information weight is constructed and classified with k-means clustering, and the regularization strength in each is controlled regionally. Experimental results, on both image denoising and super-resolution, verified its effectiveness.

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Abstracts of Contributed Talks

CT01
Image Inpainting for 3D Conversion

Despite the explosion in popularity of 3D movies over the past five years, many directors prefer to shoot in 2D and convert after the fact. "Conversion" means the construction of the right eye view given the left (or vice versa), and involves inpainting the background behind occluding objects. This inpainting problem is unique in that one boundary of the inpainting domain must be handled differently, necessitating the development of specialized algorithms.

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CT05
Artificial Intelligence and Traffic: Problems, Devices, Methods, Theorems

We present problems and models discussed recently. Pattern recognition problems first of all are connected with necessity of model parameter identification and verification. Next problems include real-time methods for traffic. Main goal of these methods is to provide traffic safety. In this direction we define recognition methods of wide range of traffic violations, leading to road accidents or creating critical situations. Also problems of development of mobile monitoring system of urban road network in seasons (winter-summer), including pavement, traffic control signs, are considered.

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CT06
Manifold Embedding Model of Image Patches and Its Application

Recently, the patch ordering method has been introduced in image processing. In this method, the patches of an image are sorted to a sequence so that the relatively simple 1-D operators can be applied for image processing. In this talk, we introduce a 1-D manifold embedding model for the image patches. In the model, the patches of an image is considered to reside on a 1-D manifold in a high dimensional space. Then image procession can be realized by operators on the manifold. Since the metric relation among the patched is well established in the model, interpolation, filtering, and other operators will perform more accurately. Several examples in image inpainting are presented to show the validity of the model.

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CT07
Recovering Rank-One Matrices via Rank-r Matrices Relaxation

PhaseLift, proposed by E.J. Candes et al is one convex relaxation approach for phase retrieval. The relaxation enlarges the solution set from rank one matrices to positive semidefinite matrices. In this talk, we study a novel relaxation applied to non convex minimization approaches, for instance, alternating minimization methods. A generic measurement matrix is standardized to consist of orthogonal columns. The standardized frames are employed to recover

the rank-one matrix among the rank-r matrices, and the desired rank one matrix is the one with the maximal leading eigenvalue. Besides, with sufficient amount of nearly orthogonal sensing vectors, we show that the corresponding singular vector is close to the unknown signal and thus it can be a good initialization. Some empirical studies are conducted to illustrate the effectiveness of this relaxation approach.

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CT08
Denoising Results Using Image Reconstruction Techniques Based on Legendre Polynomials Approximation of Continuous Prolate Spheroidal Functions (CPSF)

Performance of images denoising techniques varies depending on noise type. A general assumption is that the noise spectrum is uniformly distributed while image spectrum is not. Imaging filtering permits discards part of the noise localized at high frequencies. For images with transitions, this approach causes blurring, which can be information loss. Our work uses a set of CPSF to represent the image and evaluate the denoising capabilities for salt & pepper, Gaussian, speckle, and Rician noise.

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