The 10th International Conference on Energy Minimization Methods in Computer Vision and Pattern Recognition (EMMCVPR 2015)

13 – 16 January 2015

The Hong Kong University of Science and Technology

Organizers

Xue-Cheng Tai (Chair)	*University of Bergen*
Egil Bae	*University of California at Los Angeles*
Tony F. Chan	*The Hong Kong University of Science and Technology*
Shingyu Leung	*The Hong Kong University of Science and Technology*
Marius Lysaker	*Telemark University College*

Keynote Speakers

Andrea L. Bertozzi	*University of California at Los Angeles*
Ron Kimmel	*Technion – Israel Institute of Technology*
Yi Ma	*ShanghaiTech University*
Long Quan	*The Hong Kong University of Science and Technology*

13 January 2015 (Tuesday)		
Time	*Event*	*Presenter*
9:00 – 9:20	Registration	
9:20 – 9:30	Welcome Remarks	Tony F. Chan *[HKUST]* and Xue-Cheng Tai *[University of Bergen]*
9:30 – 10:20	Keynote #1: "Geometric Graph-based Methods for High Dimensional Data"	Andrea L. Bertozzi *[University of California at Los Angeles]*
	Image Restoration and Inpainting I	
	Session Chair: Andrea L. Bertozzi	
10:20 – 10:45	Presentation #1: "Why Does Non-binary Mask Optimisation Work for Diffusion-Based Image Compression?"	Laurent Hoeltgen and Joachim Weickert
10:45 – 11:10	Presentation #2: "Expected Patch Log Likelihood with a Sparse Prior"	Jeremias Sulam and Michael Elad
11:10 – 11:25	Refreshments	
11:25 – 11:50	Presentation #3: "Blind Deconvolution via Lower-Bounded Logarithmic Image Priors"	Daniele Perrone, Remo Diethelm and Paolo Favaro
11:50 – 12:15	Presentation #4: "Low Rank Priors for Color Image Regularization"	Thomas Moellenhoff, Evgeny Strekalovskiy, Michael Moeller and Daniel Cremers
12:15 – 12:40	Presentation #5: "Discrete Green's Functions for Harmonic and Biharmonic Inpainting with Sparse Atoms"	Sebastian Hoffmann, Gerlind Plonka and Joachim Weickert
12:40 – 14:25	Lunch (Venue: IAS 1/F Open Area)	

	Discrete and Continuous Optimization ***Session Chair: Shingyu Leung***	
14:25 – 14:50	Presentation #6: "Convex Envelopes for Low Rank Approximation"	Viktor Larsson and Carl Olsson
~~14:25 – 14:50~~	~~Presentation #7: "Maximizing Flows with Message-Passing: Computing Spatially Continuous Min-Cuts"~~ **[POSTPONED]**	~~Egil Bae, Xue-Cheng Tai and Jing Yuan~~
14:50 – 15:15	Presentation #8: "A Compact Linear Programming Relaxation for Binary Sub-modular MRF"	Junyan Wang and Sai-Kit Yeung
15:15 – 15:40	Presentation #9: "How Hard Is the LP Relaxation of the Potts Min-Sum Labeling Problem?"	Daniel Prusa and Tomas Werner
15:40 – 15:55	Refreshments	
15:55 – 16:20	Presentation #10: "On the Link between Gaussian Homotopy Continuation and Convex Envelopes" ***(via Skype)***	Hossein Mobahi and John W. Fisher III
16:20 – 16:45	Presentation #11: "Coarse-to-Fine Minimization of Some Common Nonconvexities" ***(via Skype)***	Hossein Mobahi and John W. Fisher III
17:00	***Shuttle bus to hotels***	

14 January 2015 (Wednesday)		
Time	*Event*	*Presenter*
9:00 – 9:10	Registration	
9:10 – 10:00	Keynote #2: "A Spectral Perspective on Invariant Structures of Shapes"	Ron Kimmel *[Technion – Israel Institute of Technology]*
	Segmentation ***Session Chair: Ron Kimmel***	
10:00 – 10:25	Presentation #12: "A Fast Projection Method for Connectivity Constraints in Image Segmentation"	Jan Stuehmer and Daniel Cremers
10:25 – 10:50	Presentation #13: "Two-Dimensional Variational Mode Decomposition"	Konstantin Dragomiretskiy and Dominique Zosso
10:50 – 11:05	Refreshments	
11:05 – 11:30	Presentation #14: "Multi-class Graph Mumford-Shah Model for Plume Detection Using the MBO Scheme"	Huiyi Hu, Justin Sunu and Andrea L. Bertozzi
11:30 – 11:55	Presentation #15: "A Novel Active Contour Model for Texture Segmentation"	Aditya Tatu and Sumukh Bansal
11:55 – 12:20	Presentation #16: "Segmentation Using SubMarkov Random Walk"	Xingping Dong, Jianbing Shen and Luc Van Gool
12:20 – 12:45	Presentation #17: "Automatic Shape Constraint Selection Based Object Segmentation"	Kunqian Li, Wenbing Tao, Xiangli Liao and Liman Liu
12:45 – 14:00	Lunch (Venue: IAS 1/F Open Area)	

14:00 – 14:50	Keynote #3: “Pursuit of Low-dimensional Structures in High-dimensional Data”	Yi Ma *[ShanghaiTech University]*
	Motion, Tracking and Multiview Reconstruction	
	Session Chair: Yi Ma	
14:50 – 15:15	Presentation #18: “A Convex Solution to Disparity Estimation from Light Fields via the Primal-Dual Method”	Mahdad Hosseini Kamal, Paolo Favaro and Pierre Vandergheynst
15:15 – 15:40	Presentation #19: “Optical Flow with Geometric Occlusion Estimation and Fusion of Multiple Frames”	Ryan Kennedy and Camillo Taylor
15:40 – 16:05	Presentation #20: “Adaptive Dictionary-Based Spatio-Temporal Flow Estimation for Echo PIV”	Ecaterina Bodnariuc, Arati Gurung, Stefania Petra and Christoph Schnoerr
16:05 – 16:30	Presentation #21: “Point Sets Matching by Feature-Aware Mixture Point Matching Algorithm”	Kun Sun, Peiran Li, Wenbing Tao and Liman Liu
16:30 – 16:45	Refreshments	
	PDE and Variational Methods	
	Session Chair: Yi Ma	
16:45 – 17:10	Presentation #22: “Justifying Tensor-Driven Diffusion from Structure-Adaptive Statistics of Natural Images”	Pascal Peter, Joachim Weickert, Axel Munk, Tatyana Krivobokova and Housen Li
17:10 – 17:35	Presentation #23: “An Efficient Curve Evolution Algorithm for Multiphase Image Segmentation”	Gunay Dogan
17:35 – 18:00	Presentation #24: “A Tensor Variational Formulation of Gradient Energy Total Variation”	Freddie Astroem, George Baravdish and Michael Felsberg
18:00 – 18:25	Presentation #25: “Color Image Segmentation by Minimal Surface Smoothing”	Zhi Li and Tieyong Zeng
18:40	***Shuttle bus to hotels***	

15 January 2015 (Thursday)		
Time	*Event*	*Presenter*
9:00 – 9:10	Registration	
9:10 – 10:00	Keynote #4: "Large-scale 3D Reconstruction from Images"	Long Quan *[HKUST]*
	Image Restoration and Inpainting II ***Session Chair: Long Quan***	
10:00 – 10:25	Presentation #26: "A Novel Framework for Nonlocal Vectorial Total Variation Based on L^{p,q,r}–norms"	Joan Duran, Michael Moeller, Catalina Sbert and Daniel Cremers
10:25 – 10:50	Presentation #27: "Inpainting of Cyclic Data Using First and Second Order Differences"	Ronny Bergmann and Andreas Weinmann
10:50 – 11:05	Refreshments	
	Statistical Methods and Learning ***Session Chair: Long Quan***	
11:05 – 11:30	Presentation #28: "Multi-utility Learning: Structured-Output Learning with Multiple Annotation-Specific Loss Functions"	Roman Shapovalov, Dmitry Vetrov, Anton Osokin and Pushmeet Kohli
11:30 – 11:55	Presentation #29: "Mapping the Energy Landscape of Non-convex Optimization Problems"	Maria Pavlovskaia, Kewei Tu and Song-Chun Zhu
11:55 – 12:20	Presentation #30: "Marked Point Process Model for Curvilinear Structures Extraction"	Seong-Gyun Jeong, Yuliya Tarabalka and Josiane Zerubia
12:20 – 12:45	Presentation #31: "Randomly Walking Can Get You Lost: Graph Segmentation with Unknown Edge Weights"	Hanno Ackermann, Bjoern Scheuermann, Tat-Jun Chin and Bodo Rosenhahn
12:45 – 14:30	Lunch (Venue: China Garden Restaurant)	

	Medical Image Analysis ***Session Chair: Egil Bae***	
14:30 – 14:55	Presentation #32: "Training of Templates for Object Recognition in Invertible Orientation Scores: Application to Optic Nerve Head Detection in Retinal Images"	Erik Bekkers, Remco Duits and Marco Loog
14:55 – 15:20	Presentation #33: "Variational Time-Implicit Multiphase Level-Sets: A Fast Convex Optimization-Based Solution"	Martin Rajchl, John S.H. Baxter, Egil Bae, Xue-Cheng Tai, Aaron Fenster, Terry M. Peters and Jing Yuan
15:20 – 15:45	Presentation #34: "A Technique for Lung Nodule Candidate Detection in CT Using Global Minimization Methods"	Noirin Duggan, Egil Bae, Shiwen Shen, William Hsu, Alex Bui, Edward Jones, Martin Glavin and Luminita Vese
15:45 – 16:10	Presentation #35: "Hierarchical Planar Correlation Clustering for Cell Segmentation"	Julian Yarkony, Chong Zhang and Charless C. Fowlkes
16:10 – 17:15	Refreshments and Poster Session	
18:15 – 21:00	Dinner Banquet (Venue: Sai Kung)	

16 January 2015 (Friday)		
Time	*Event*	
9:30 – 14:30	Sightseeing Tour and (Vegetarian) Lunch (Venue: Lantau Island)	

Abstracts – Keynote Speakers

Geometric Graph-based Methods for High Dimensional Data

(Keynote #1)

Andrea L. Bertozzi

University of California at Los Angeles

We present new methods for segmentation of large datasets with graph based structure. The method combines ideas from classical nonlinear PDE-based image segmentation with fast and accessible linear algebra methods for computing information about the spectrum of the graph Laplacian. The goal of the algorithms is to solve semi-supervised and unsupervised graph cut optimization problems. I will present results for image processing applications such as image labeling and hyperspectral video segmentation, and results from machine learning and community detection in social networks, including modularity optimization posed as a graph total variation minimization problem.

A Spectral Perspective on Invariant Structures of Shapes

(Keynote #2)

Ron Kimmel

Technion – Israel Institute of Technology

We explore the power of the Laplace Beltrami Operator (LBO) in processing and analyzing visual and geometric information. The decomposition of the LBO at one end, and the heat operator at the other end provide us with efficient tools for dealing with images and shapes. Denoising, segmenting, filtering, exaggerating are just few of the problems for which the LBO provides a solution. We will review the optimality of a truncated basis provided by the LBO, and a selection of relevant metrics by which such optimal bases are constructed. Specific example is the scale invariant metric for surfaces that we argue to be a natural selection for the study of articulated shapes and forms.

Pursuit of Low-dimensional Structures in High-dimensional Data

(Keynote #3)

Yi Ma

ShanghaiTech University

In this talk, we will discuss a new class of models and techniques that can effectively model and extract rich low-dimensional structures in high-dimensional data such as images and videos, despite nonlinear transformation, gross corruption, or severely compressed measurements. This work leverages recent advancements in convex optimization for recovering low-rank or sparse signals that provide both strong theoretical guarantees and efficient and scalable algorithms for solving such high-dimensional combinatorial problems. These results and tools actually generalize to a large family of low-complexity structures whose associated regularizers are decomposable. We illustrate how these new mathematical models and tools could bring disruptive changes to solutions to many challenging tasks in computer vision, image processing, and pattern recognition. We will also illustrate some emerging applications of these tools to other data types such as web documents, image tags, microarray data, audio/music analysis, and graphical models.

This is joint work with John Wright of Columbia University, Emmanuel Candes of Stanford University, Zhouchen Lin of Peking University, and my students Zhengdong Zhang, Xiao Liang of Tsinghua University, Arvind Ganesh, Zihan Zhou, Kerui Min and Hossein Mobahi of UIUC.

Large-scale 3D Reconstruction from Images

(Keynote #4)

Long Quan

The Hong Kong University of Science and Technology

In the first part of the talk, I will review the state of the art of the three dimensional reconstruction from images or photographs developed in the past three decades in computer vision. I will focus on the unique quasi-dense approach that we have developed over a long period of time. The quasi-dense approach is unique in that it is the most suitable for building up large-scale 3D reconstruction and the objectization applications. In the second part of the talk, I will present a series of applications we have been pursuing in the recent years. I will focus on the most recent exciting work of large-scale 3D reconstruction from aerial oblique photographs, and showcase the performances of our approach over a large sample of case studies of hundreds square kilometers in both high-rise metropolitan areas and low-rise rural areas in different cities of different countries.

Poster Presentations

Venue: IAS Lobby, Lo Ka Chung Building, Lee Shau Kee Campus, HKUST

15 January 2015 (Thursday)		
Time	*Event*	*Presenter*
16:10 – 17:15	Presentation #1: "In Vitro Validation of Dictionary-Based Spatio-Temporal Poiseuille Flow Estimation"	Ecaterina Bodnariuc, Arati Gurung, Stefania Petra and Christoph Schnoerr
	Presentation #2: "Image Compression with Sparse Vector Fields"	Eva-Maria Brinkmann
	Presentation #3: "Convergence Rate Analysis For Total Variation Minimization With Domain Decomposition Methods"	Huibin Chang, Xue-Cheng Tai and Danping Yang
	Presentation #4: "Learning Better Image Regularizers Using Bi-level Optimization"	Yunjin Chen, Rene Ranftl and Thomas Pock
	Presentation #5: "A Python Toolbox for Shape Optimization in Image Processing"	Gunay Dogan
	Presentation #6: "Regularisation by Circular Hough Transform"	Joana Grah
	Presentation #7: "Primal Domain Decomposition Methods for the Total Variation Minimization, Equivalent to Dual Nonoverlapping Methods"	Chang-Ock Lee and Changmin Nam
	Presentation #8: "How Does Energy Minimization Improve Recognizing Human Poses for Safe Human-Robot Collaboration?"	Vivek Sharma, Frank Dittrichy, Sule Yildirim-Yayilgan and Heinz Woern
	Presentation #9: "(p; q)-Laplace Operators for Image Enhancement"	George Baravdish, Yuanji Cheng and Olof Svensson
	Presentation #10: "CGIHT: Conjugate Gradient Iterative Hard Thresholding"	Jeff Blanchard, Jared Tanner and Ke Wei
	Presentation #11: "An Efficient Primal-Dual Hybrid Gradient Descent Method for Total Variation-Based Image Processing"	Mingqiang Zhu