2016 4th International Workshop on Compressed Sensing Theory and its Applications to Radar, Sonar and Remote Sensing (CoSeRa 2016)

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Monday, September 19

Monday, September 19, 15:00 - 16:30

Tutorial - Part I

A guided tour of algorithms for sparse recovery

Sparsity is a very powerful prior for the identification of signals from noisy indirect measurements.The recovery of the signal is usually performed by suitable linearly constrained optimizations with additional sparsity enforcing convex or nonconvex objective functions. Depending on the specific formulation, one can produce a variety of different algorithms. In this tutorial the numerical realizations of such linear and nonlinear programs are reviewed and compared with respect to different noisy scenarios. With the intention of providing a useful guide to users, we provide a sound mathematical introduction with rigorous derivations and proofs of convergence of all algorithms and we illustrate in detail their behaviour by extensive numerical experiments. (Massimo Fornasier (TU Munich, Germany))

Monday, September 19, 16:30 - 16:45

Coffee Break

Monday, September 19, 16:45 - 18:15

Tutorial - Part II

A guided tour of algorithms for sparse recovery

Monday, September 19, 18:15 - 19:30

Welcome Reception

Tuesday, September 20

Tuesday, September 20, 08:45 - 09:00

Opening

Tuesday, September 20, 09:00 - 10:00

Keynote I

Sparse signal separation and imaging in Synthetic Aperture Radar

Synthetic Aperture Radar offers the capability of all-weather, day-or-night remote imaging. Since its first development in the 1950s researchers have sought to advance the technology to encompass more advanced imaging applications, including foliage penetrating radar, volumetric and dynamic imaging. Such applications present significant technological challenges including the problem of severe undersampling. This talk will describe work we have done at the University of Edinburgh in conjunction with the UK Defence Science and Technology Laboratories (Dstl) to develop advanced compressed sensing inspired solutions for airborne low frequency SAR imaging and to a new approach for moving target and background signal separation and imaging in multi-channel SAR. (Mike Davies (University of Edinburgh, United Kingdom))

Tuesday, September 20, 10:00 - 11:00

A.1: Mathematical CS Tools

Chair: Laurent Jacques (University of Louvain, Belgium)

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Mostafa H. Mohamed, Henning Zörlein and Martin Bossert (Ulm University, Germany)

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Masoud Farshchian (Empyreal Waves, LLC, USA); Ivan Selesnick (New York University, USA)

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Yongsung Park, Woojae Seong and Youngmin Choo (Seoul National University, Korea)

Tuesday, September 20, 11:00 - 11:30

Coffee Break

Tuesday, September 20, 11:30 - 12:50

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Chair: Holger Rauhut (RWTH Aachen, Germany)

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Dominik Stöger (Technical University of Munich, Germany); Peter Jung (TU-Berlin, Communications and Information Theory Group & Fraunhofer HHI - Heinrich Hertz Institute, Germany); Felix Krahmer (Technische Universität München, Germany)

Estimation of the Scattering Function of Overspread Radar Targets   N/A
Götz Pfander (Uni. Marburg, Germany); Pavel Zheltov (Palantir Technologies, USA)

Tuesday, September 20, 12:50 - 14:00

Lunch Break

Tuesday, September 20, 14:00 - 15:40

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Chair: Michael Davis (Georgia Institute of Technology, USA)

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Filippo Biondi (University of L'Aquila & Italian Ministry of Defence, Italy)

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Qian Bao and Yun Lin (Institute of Electronics, Chinese Academy of Sciences, P.R. China); Wen Hong (National Key Laboratory of Microwave imaging Technology & Institute of Electronics, Chinese Academy of Scienecs, P.R. China); Bingchen Zhang (Institute of Electronics, Chinese Academy of Sciences, P.R. China)

Tuesday, September 20, 15:40 - 16:10

Coffee Break

Tuesday, September 20, 16:10 - 17:50

A.4: Hardware + Tracking

Chair: Radmila Pribić (Thales Nederland BV Delft, The Netherlands)

Wednesday, September 21

Wednesday, September 21, 09:00 - 10:40

A.5: Sparse Reconstruction in Remote Sensing (Invited)

Chair: Ludger Prünte (Fraunhofer-Institut für Hochfrequenzphysik und Radartechnik FHR, Germany)

Wednesday, September 21, 10:40 - 11:10

Coffee Break

Wednesday, September 21, 11:10 - 12:30

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Chair: Athina Petropulu (Rutgers, The State University of New Jersey, USA)

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Ahmed Al Hilli (Rutgers University & Al Furat Al-Awsat Technical University, Iraq., USA); Athina Petropulu (Rutgers, The State University of New Jersey, USA); Laleh Najafizadeh (Rutgers University, USA)

Wednesday, September 21, 12:30 - 13:40

Lunch Break

Wednesday, September 21, 13:40 - 14:40

Keynote II

Compressive Imaging and Resolution

While compressed sensing theory is discrete and linear, imaging models are typically continuous and nonlinear. Proper discretization must consider the representation and the sampling schemes in light of the resolution limit. In some cases, new sparse reconstruction methods are needed to treat the transition from discrete to continuous models. This talk reviews compressive techniques for achieving the resolution limit and discusses examples of super-resolution and multiple scattering imaging. (Albert Fannjiang (University of California, Davis, USA))

Wednesday, September 21, 14:40 - 15:50

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A.7-II: Poster: CS for Multi-Target and Multistatic

Chair: Matthias Weiß (Fraunhofer FHR, Germany)

A.7-III: Poster: Sparse Reconstruction Aspects

Chair: Joachim H. G. Ender (Fraunhofer FHR & Universität Siegen, Germany)

Wednesday, September 21, 15:50 - 17:30

A.8: Antenna and DOA Estimation

Chair: Gianfranco Fornaro (CNR-IREA, Italy)

Wednesday, September 21, 19:00 - 23:00

Conference Dinner

Thursday, September 22

Thursday, September 22, 09:00 - 10:40

A.9: ISAR (Invited)

Chair: Marco Martorella (University of Pisa, Italy)

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Compressive Sensing Methods for Radar Cross Section ISAR Measurements 237
Christer Larsson (Lund University & Saab Dynamics, Sweden)

Thursday, September 22, 10:40 - 11:10

Coffee Break

Thursday, September 22, 11:10 - 12:30

A.10: Special Aspects

Chair: Emre Ertin (The Ohio State University, USA)

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Thursday, September 22, 12:30 - 13:40

Lunch Break

Thursday, September 22, 13:40 - 14:40

Keynote III

Compressive Sensing and the Real World of Sensors

The original theory of compressive sensing (CS) emphasizes the perfect reconstruction of the unknown sparse coefficient vector given a reduced number of linear measurements. Under these conditions, CS offers a great variety of theorems, algorithms and criteria for the sensing matrix to guarantee recovery.

While this discrete CS model is appropriate for image processing, encoding and decoding, it differs considerably from the real world of sensors. Especially the positions of sources are normally continuously distributed and don't lie on a grid. This often is called the 'off-grid problem'. But it is not a problem of the sources not to keep with the demands of CS to be located on the grid points, it is a problem of the wrong model of the real world.

This will be addressed in the presentation; ways are shown to sparse recovery closer to the real world. We will further discuss the ' random projection' approach, which is nice for the establishment of theorems, but by far not the most efficient way to get good results. (Joachim Ender (Fraunhofer FHR, Germany))

Thursday, September 22, 14:40 - 15:00

Closing Remarks