SSP’14: Special Session Proposal
Random Matrix Advances in Signal Processing

Organizer: R. COUILLET on behalf of the French ANR DIONISOS Project.

I. Description

Random matrix theory addresses the study of the eigen-spectrum of large dimensional matrices with random entries. The interest of this field to engineering started in the early 2000’s with numerous results on the performance of large dimensional wireless communication networks, with the wireless channels being the large matrices under study. Surprisingly, only recently has random matrix theory made its way to statistical signal processing, with large dimensional sample covariance matrices as the main objects of interest. So far, random matrix theory has mostly brought to signal processing new detection and estimation schemes, often revisiting very classical techniques by considering that the sample size is not much larger than the population size, as opposed to classical works. Many advances in this field are however yet to arise. The candidate special session aims to advertise these works to the SP community and help future interactions with new topics in SP.

As such, this special session has the following main objectives:

- Gathering world experts on applied random matrix theory to share their works with the SP community;
- Further fostering the interactions between classical signal processing tools and the large dimensional random matrix regime;
- Opening the area of random matrix theory for signal processing to a wider audience, which SSP can uniquely provide.

The workshop will encompass six invited paper presentations around the following main areas:

- Source detection schemes in large sensor arrays;
- Statistical inference (estimation) in large dimensional systems;
- Covariance matrix estimation in vector time series;
- Beamforming and subspace methods in large arrays;
- Applications of random matrix theory to array processing, finance, robust estimation, etc.

Tentative list of speakers:

- Matthew McKay (HKUST, Hong Kong) on random matrices applied to finance/or detection. (ACCEPTED)
- Jianfeng Yao (HKUST, Hong Kong) on random matrices applied to detection and estimation in spiked models. (ACCEPTED)
- Raj Rao Nadakuditi (University of Michigan, USA) on eigen-inference in large sensor arrays. (ACCEPTED)
- Alfred Hero (University of Michigan, USA) on Toeplitz-type covariance matrix estimation. (ACCEPTED)
- Yuri Abramovich (University of South Australia) on subspace methods for radar applications. (ACCEPTED or co-authors)
- Frédéric Pascal (Supelec, France) on robust estimation of large covariance matrices and applications. (ACCEPTED or co-author)

II. Organizers

The DIONISOS project, funded by the French Agence Nationale de la Recherche (ANR) in the scope of the Digital Models program, is a four-year project (2012-2016). The objectives of this project are to develop mathematical tools issued from large dimensional random matrix theory to handle statistical signal processing questions related to large sample and population size scenarios.

Romain Couillet will be representing the DIONISOS project for this special session. He is currently an assistant professor in the Telecommunication department of Supélec, France. His research topics are in information theory, signal processing, and random matrix theory. He is the recipient of the Valuetools 2008 best student paper award, the 2011 EEA/GdR ISIS/GRETSI best PhD thesis award, the 2013 CNRS Bronze Medal, and the 2013 IEEE ComSoc Outstanding Young Researcher Award.

Contact Information:

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III. LIST OF REFERENCES RELATED TO THE SPECIAL SESSION


