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IEEE JOURNAL OF SELECTED TOPICS IN SIGNAL PROCESSING

Special Issue on Signal Processing in Smart Electric Power Grid

The signal processing research community is poised to make important contributions to evolving the existing electric power grid into a smarter and greener grid. The nature of signal processing research deals with signals and is particularly adept at extracting information from noisy contaminated signals emitting from dynamic and uncertain systems. The smart grid is a dynamic, time-varying system with many uncertainties, especially if integration of distributed renewable energy sources is included. The operation of smart grid will feature bi-directional digital communication, bi-directional power flow, and consumer empowerment with enhanced situation awareness. As such, adaptive signal processing, distributed detection and estimation, statistical signal processing, signal representation and data compression, machine learning, optimization methods, efficient computational algorithms, etc., will all prove to be important tools to make possible some of the important features envisioned for the smart grid - demand response, distribution automation, self-healing, improved security, etc.

This special issue will focus on novel theory and applications of signal processing research for smart grid. Papers that present novel research ideas, theory and applications are solicited on, but not limited to, the following topics:

- Power grid state estimation - novel methods and applications;
- Adaptive filters and statistical signal processing for smart grid;
- Distributed methods for smart grid - detection, estimation, forecasting;
- Sensor fusion, data analytics, data mining, and machine learning for smart grid;
- Demand response, load management and pricing;
- Security and privacy issues in smart grid;
- Forecasting models and methods for renewable generation and for loads;
- Impacts of large scale renewable energy integration;
- PHEV charging infrastructure and scheduling algorithms, V2G algorithms;
- Cyber-physical systems models for smart grid;
- Data compression, storage and transmission;
- Signal processing for smart appliances, smart meters, and sensors

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Schedule:
Manuscript due: October 1, 2013.
Manuscript due: October 1, 2013.
Revised Manuscript due: February 1, 2014.
Final Manuscript due: May 1, 2014.
Publication: 3rd Quarter, 2014.
Aims and Scope
We live in an era of data deluge. Pervasive sensors collect massive amounts of information on every bit of our lives, churning out enormous streams of raw data in various formats. Mining information from unprecedented volumes of data promises to limit the spread of epidemics and diseases, identify trends in financial markets, learn the dynamics of emergent social-computational systems, and also protect critical infrastructure including the smart grid and the Internet’s backbone network. While Big Data can be definitely perceived as a big blessing, big challenges also arise with large-scale datasets. The sheer volume of data makes it often impossible to run analytics using a central processor and storage, and distributed processing with parallelized multi-processors is preferred while the data themselves are stored in the cloud. As many sources continuously generate data in real time, analytics must often be performed “on-the-fly” and without an opportunity to revisit past entries. Due to their disparate origins, the resultant datasets are often incomplete and include a sizable portion of missing entries. In addition, massive datasets are noisy, prone to outliers, and vulnerable to cyber-attacks. These effects are amplified if the acquisition and transportation cost per datum is driven to a minimum. Overall, Big Data present challenges in which resources such as time, space, and energy, are intertwined in complex ways with data resources. Given these challenges, ample signal processing opportunities arise. This special issue seeks to provide a venue for ongoing research in novel models applicable to a wide range of Big Data analytics problems, as well as algorithms and architectures to handle the practical challenges, while revealing fundamental limits and insights on the mathematical trade-offs involved.

Topics of interest include (but are not limited to):

- Theoretical foundations and algorithms for Big Data analytics
  - Compressive sampling, matrix completion, low-rank models, and dimensionality reduction
  - Graph, latent factor, tensor, and multirelational data models
  - Robustness to outliers and misses; convergence and complexity issues; performance analysis
  - Scalable, online, active, decentralized, deep learning and optimization
  - Randomized schemes for very large matrix, graph, and regression problems
  - Human-machine learning systems with limited labeled and massive unlabeled data

- Architectures and applications for large-scale data analysis and signal processing
  - Scalable, distributed computing, e.g., Mapreduce, Hadoop
  - Streaming for real time-analytics and graph processing, e.g., Pregel, Giraph
  - Systems biology; genomics; bioinformatics; semantics; sentiment and natural language processing
Submission Process
Articles submitted to this special issue must contain significant relevance to signal processing. All submissions will be peer reviewed according to the IEEE and Signal Processing Society guidelines for both publications. Submitted articles should not have been published or under review elsewhere. Manuscripts should be submitted online at http://mc.manuscriptcentral.com/sps-ieee using the Manuscript Central interface. Submissions to this special issue of the IEEE SIGNAL PROCESSING MAGAZINE should have significant tutorial value. Prospective authors should consult the site http://www.signalprocessingsociety.org/publications/periodicals/spm/ for guidelines and information on paper submission.

Important Dates: Expected publication date for this special issue is September 2014.
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IEEE Journal of Selected Topics in Signal Processing
Special Issue on Signal Processing for Large-Scale MIMO Communications

Recently, large-scale or massive MIMO techniques have been proposed to tremendously improve the performance of wireless networks. For networks with massive MIMO, base stations are equipped with a very large number of antennas, possibly tens to hundreds of antennas communicating with multiple users on the same frequency band simultaneously. When the number of antennas grows very large or tends to infinity, the effects of noise and fast fading vanish and intra-cell interference can be mitigated using simple linear precoding and detection methods. Large-scale MIMO, therefore, is becoming an increasingly important technique for wireless communications. To practically implement such large-scale MIMO techniques, several critical issues must be addressed, such as channel estimation and efficient modulation design. In traditional MIMO systems, OFDM-based estimation and transmission is used. However, as the number of antennas at the base station grows large, the computational complexity of OFDM increases dramatically. Other practical issues, such as low-complexity precoding, detection algorithms and energy-efficient designs, should be investigated. In multi-cell large-scale MIMO systems, the pilot contamination issue is a bottle-neck. Efficient signal processing and scheduling schemes are needed to conquer this problem. Issues regarding cell size design and network planning should be also considered.

With large-scale MIMO systems, a number of paradigm-shifting technical approaches can be expected. This special issue will focus on signal processing issues for practical design of large-scale MIMO networks. The objective of this special issue is to bring together the state-of-art research results and industrial applications. Original contributions, which are previously unpublished and not currently under review by another journal, are solicited in relevant areas including (but not limited to) the following:

- Efficient channel estimation for large-scale MIMO systems
- Low-complexity modulation design for large-scale MIMO systems
- Practical precoding design for large-scale MIMO systems
- Effective detection algorithms for large-scale MIMO systems
- Mitigating pilot contamination in multi-cell large-scale MIMO systems
- Energy-efficient signal processing for large-scale MIMO systems
- Joint PHY-MAC layer transmission schemes for large-scale MIMO systems
- Distributed large-scale MIMO system design
- Practical network planning and optimization for large-scale MIMO systems
- Applications of large-scale MIMO techniques
- Metrics and methodologies for evaluating large-scale MIMO system performance
- Limitation of large-scale MIMO systems

Prospective authors should visit http://www.signalprocessingsociety.org/publications/periodicals/jstsp/ for information on paper submission. Manuscripts should be submitted using the Manuscript Central system at http://mc.manuscriptcentral.com/jstsp-ieee.
Manuscripts will be reviewed via the standard IEEE process according to the following timetable:

- Manuscript submission due: September 15, 2013
- First review due: December 1, 2013
- Revised manuscript due: January 1, 2014
- Second review due: March 1, 2014
- Final manuscript due: April 1, 2014

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