

Guest Editorial: Special Issue on Machine Learning Methods in Signal Processing

MUCH of modern statistical and adaptive signal processing relies on learning algorithms of one form or another. While some of the rich literature on machine learning has penetrated the signal processing community in great depth, a variety of new techniques, which offer tremendous potential for signal processing applications, have not enjoyed similar broad acceptance in the signal processing community. Raising awareness and surveying the state of art of machine learning for signal processing applications and theory is both timely and important. This special issue is directed to both signal processing and machine learning researchers, based on our belief that great synergies can be realized by further stimulating the cross-fertilization that has been ongoing between these strong research communities.

The scope of this Special Issue of the IEEE TRANSACTIONS ON SIGNAL PROCESSING covers applications of machine learning methods in signal processing, where the “learning” aspects of the problem are of particular interest. While Bayesian learning has had a rich tradition in the signal processing community, a number of related methods have emerged in the learning literature, enabling the development of a variety of robust algorithms for a wide range of applications. Two papers in this special issue leverage such ideas for dealing with scarcity and uncertainty. Methods from sequential learning and universal data compression have also had a renewed impact on the signal processing literature, and two papers in this issue employ related approaches to obtain bounds on min-max regret. There have been a number of advances dealing with high-dimensional data sets as well as learning both global and local structure from such data. Two papers in this issue use hierarchical pattern learning and clustering methods, and three additional papers study the use of graphical models, manifold learning, and iterative algorithms for such problems. Such structure is studied in three additional papers in this special issue based on kernel learning and support vector machines. Finally, there are two papers on nonparametric and correlation-based methods for statistical learning and two papers centered on applications to speech and image processing.

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MEIR FEDER
Tel Aviv University
Ramat Aviv 69978 Israel
e-mail: meir@eng.tau.ac.il

MARIO A. T. FIGUEIREDO
Institute of Telecommunications
Instituto Superior Tecnico
1049-001 Lisboa Portugal
e-mail: Mario.Figueiredo@lx.it.pt

ALFRED O. HERO
Department of Electrical Engineering and Computer Science
Univ. of Michigan
Ann Arbor, MI 48109-2122 USA
e-mail: hero@eecs.umich.edu

CHIN-HUI LEE
Department of Electrical and Computer Engineering
Georgia Institute of Technology
Atlanta, GA 30332-0360 USA
e-mail: chl@ece.gatech.edu

HANS-ANDREA LOELIGER
(ISI) ETF E101
ETH Zentrum
Zürich, CH-8092 Switzerland
e-mail: loeliger@isi.ee.ethz.ch

ROBERT NOWAK
Department of Electrical and Computer Engineering
University of Wisconsin-Madison
Madison, WI 53706 USA
e-mail: nowak@engr.wisc.edu

ANDREW C. SINGER
Department of Electrical and Computer Engineering
University of Illinois at Urbana-Champaign
Urbana, IL 61820 USA
e-mail: acsinger@uiuc.edu

BIN YU
Department of Statistics
University of California
Berkeley, CA 94720-3860 USA
e-mail: binyu@stat.berkeley.edu