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IEEE SIGNAL PROCESSING MAGAZINE
Special Issue on Advances in Kernel-based Learning for Signal Processing

The importance of learning and adaptation in statistical Signal Processing creates a symbiotic relation with Machine Learning. However, the two disciplines possess different momentum and emphasis, which makes it attractive to periodically review trends and new developments in their overlapping spheres of influence. Looking at the recent trends in Machine Learning, we see increasing interest in kernel methods, Bayesian reasoning, causality, information theoretic learning, reinforcement learning, non numeric data processing, just to name a few. While some of the machine learning community trends are clearly visible in Signal Processing, such as the increase popularity of the Bayesian methods and graphical models, others such as the kernel approaches are still less prominent. Kernel methods have a number of very attractive merits for Signal Processing. More specifically:

- Linear operators in RKHS naturally yield nonlinear filters in the input space, so this opens up many possibilities for optimum nonlinear system design.
- Kernels simplify the computation and bear the promise of on-line nonlinear optimal filter implementations.
- Recent advances on embedding probability distributions into RKHS bring the promise of nonparametric statistical inference with functional methods.
- Complementing the previous point, kernel methods may yield a practical alternative to perform functional data analysis.
- A link between Information Theoretic Learning and RKHS theory was established using Renyi's entropy, which suggests other connections and potential impact both on Information Theory and Signal Processing.
- Since positive definite functions can be defined in abstract spaces, RKHS yields new opportunities to expand signal processing algorithms beyond numerical data.

Scope of Topics of the Special Issue include:
- Nonlinear Adaptive Filtering using learning methods (e.g., kernels, GPs, neural networks, etc.)
- On-line Learning with kernels
- Hypothesis testing with kernels
- Bayesian filtering in kernel spaces
- Information theory in RKHS
- Sampling theory using RKHS
- Analysis of non-numerical data in kernel spaces
- Issues in kernel design
- Optimization in kernel spaces
- Information fusion with kernels for example in multi-modal data
- Applications (e.g, Biology, Social Media, Engineering)

Tentative Schedule:
• White paper due: July 15, 2012
• Invitation notification: August 7, 2012
• Manuscript due: October 15, 2012
• Acceptance notification: November 31, 2012
• Revised manuscript due: December 30, 2012
• Final Acceptance notification: January 31, 2013
• Final manuscript due: February 20, 2013
• Publication data: July 2013

Submission procedure:
White papers, limited to 2 single-space double-column pages, should summarize the motivation, the significance of the topic, a brief summary, an outline of the content and key references. Prospective authors should use the web submission system at: http://mc.manuscriptcentral.com/spmag-ieee.

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