



Software Engineering

Wednesday, November 13, 2013, 1 PM
Building 23, Room N305 (GMSEC Lab)

TEAS Seminar
(BYOL, Cookies provided)

University of Maryland/Research at the Norbert Wiener Center
Compressive Sensing and Image Recovery and Data Fusion

John J. Benedetto, Wojciech Czaja, Kasso Okoudjou
Alfredo Nava-Tudela and Michael Dellomo

We begin with a overview of active research projects at the Norbert Wiener Center (NWC) and the research and computational capability of NWC. We discuss two specific topics:

- First, we show our technique associated with compressive sensing to recover images that have been degraded by individual random loss at the pixel level. Computationally we use orthogonal matching pursuit (OMP) as well as technology associated with non-uniform random sampling, image compression, and in-painting.
- Second, the problem of data integration and fusion is a longstanding problem in many fields, ranging from remote sensing to biomedical applications. Our goal is to find effective ways to integrate information from heterogeneous sources to improve outcomes of such applications as, e.g., classification or detection. We present a deterministic approach which exploits fused representations of certain well known data-dependent operators, such as graph Laplacian and graph Schroedinger operators and their corresponding semi-groups. Through the eigen-decomposition of these operators we introduce the notion of fusion/integration of heterogeneous data. This requires new fusion metrics, fusion embeddings of Coifman and Hirn, approximate inverses of nonlinear dimension reduction techniques, and reductions in computational complexity. Our theory is applied to spatial-spectral fusion or to fusion of hyperspectral satellite imagery (HSI) and LIDAR data.

The Norbert Wiener Center (NWC), in the Department of Mathematics at the University of Maryland, College Park, reflects the importance of integrating new mathematical technology and algorithms in the context of current industrial and academic needs and problems. The NWC has three goals: Research Activities in harmonic analysis and applications; Education - undergraduate to post doctoral; Interaction within the International Harmonic Analysis Community. Mathematical Engineering in the 21st century is analogous to Mathematical Physics of the 20th century. Applied harmonic analysis and its theoretical underpinnings form the technological basis for Mathematical Engineering. The Norbert Wiener Center advances research, education, and interaction for this emerging field. <http://www.norbertwiener.umd.edu>