Center for Scientific Computation And Mathematical Modeling

University of Maryland, College Park

A Program Announcement

"Sparse Representation in Redundant Systems"

CSCAMM Program - Spring 2005

May 9 – May 13, 2005

Organizers: John Benedetto, Ingrid Daubechies, Ron DeVore, David Donoho, Eitan Tadmor

SCIENTIFIC BACKGROUND.

The last decade has seen a dramatic increase in computational power and sensor ubiquity, as well as an ever increasing demand for finer resolution in both scientific and geometric modeling. This has led to the creation of enormously large data sets with exquisite detail. However, these data sets will be useful only if we can process them efficiently, whether it be for storage, transmission, visual display, fast on-line graphical query, correlation, or registration against data from other modalities.

Raw data sets are typically inaccessible and need to be transformed to more efficient representations for further processing. Several competing issues emerge. Sparsity is essential for efficient transmission, storage, and computation. Multiscale representations are critical to extract features at desired scales. Implementation in silicon leads to new issues of robustness in the face of computational error and imprecise circuit implementation.

An emerging technology to address these issues utilizes redundant representations. High oversampling followed by coarse quantization is the preferred method for analog to digital conversion of signals. Sparse representation of images using redundant families of waveforms is effectively utilized in feature extraction and denoising. These redundant families can be frames, dictionaries, or libraries of bases.

On the other hand, there is, at present, no compelling theory to explain the advantages of redundancy in image and signal processing. This program will convene leading experts from data representation into two workshops to describe the current understanding of the benefits of redundancy and to set forward a program for further research. These experts will come from diverse areas such as applied mathematics, statistics, computer science, engineering and circuit design.

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CSCAMM is part of the College of Computer, Mathematical and Physical Sciences

UNIVERSITY OF MARYLAND

Invited Participants

Richard Baraniuk, Rice University
John Benedetto, University of Maryland
Peter Binev, University of South Carolina
Emmanuel Candes, CalTech
Albert Cohen, Universite' Pierre et Marie Curie
Ingrid Daubechies, Princeton University
Ron DeVore, University of Maryland
David Donoho, Stanford University
Ramani Duraiswami, University of Maryland
Glenn Easley, System Planning Corp.
Anna Gilbert, University of Michigan
Christopher Heil, George Institute
Jelena Kovacevic, Carnegie Mellon
Gitta Kutyniok, Justus-Liebig University Glessen
Alexander Petukhov, University of Georgia
Amos Ron, University of Wisconsin-Madison
Naoki Saito, UC Davis
Vladimir Temlyakov, University of S Carolina
Martin Vetterli, Swiss Federal Inst of Technology
Shen Zuowei, National University of Singapore

A limited number of openings are available.
To apply please RSVP at:
www.cscamm.umd.edu/programs/srs05/rsvp.htm

ADDITIONAL INFORMATION is posted at
www.cscamm.umd.edu/programs/srs05/
email: srs05@cscamm.umd.edu

A limited amount of funding for participants is available, especially for researchers in the early stages of their career who want to attend the full program. Partial funding is provided by the University of South Carolina Industrial Mathematics Institute (IMI) and by the Office of Navel Research (ONR).