Women's Workshop on Communications and Signal Processing
July 13-15, 2012

Coffee Breaks will be held in the foyer of the TransCanada Pipeline Pavilion (TCPL)
All lectures will be held in the new lecture theater in the TransCanada Pipelines Pavilion (TCPL). LCD projector and blackboards are available for presentations.

SCHEDULE

Friday	
16:00	Check-in begins (Front Desk - Professional Development Centre - open 24 hours)
19:30	Welcome and Overview of Workshop:
19:45-20:45	Panel session on work/life issues (2nd Floor Lounge; Corbett Hall) Participants: S. Aissa, P. Cosman, S. Kishore, S.K. Wilson, S. Wood, M. Stojanovic Beverages and a small assortment of snacks are available in the lounge on a cash honor system.
Saturday	
7:00-9:00	Breakfast
9:00-9:20	Welcome and 30 second "Elevator pitches" for the posters in the lecture theatre of the TCPL
9:20-10:15	Poster session in the TCPL foyer
10:15-10:45	Coffee Break, TCPL foyer
10:45-11:30	Poster session continues in the TCPL foyer.
11:20-11:55	M. Effros, *Reduction as a Route to a Computational Information Theory*
12:00-1:00 PM	Lunch
1:00-1:35	S. Aissa, *Is cooperation a Must in Future Cognitive radio networks?*
1:35-2:10	S. Kishore, *Smart Electricity Systems and the Role of Communications Engineering*
2:10-2:40	Coffee Break, TCPL foyer
2:40-3:15	S. Wood, *Computational Imaging Challenges*
3:15-3:50	M. Ostendorf, *Human Language: a Signal Processing Perspective*
4:15-6:00	Group Hike (leaving and returning from BIRS)
7:30	Dinner in Banff at the Ptarmigan Inn
Sunday	
7:00-9:00	Breakfast
9:00-9:35	P. Cosman, *Subcarrier Mapping Based on Slice Visibility* *for Video Transmission over OFDM Channels*
9:40-10:15	S.K. Wilson, *Blinded by the Light:* *OFDM and Optical Wireless Communications*
10:10-10:40	Coffee break, TCPL foyer
10:40-11:15	M. Stojanovic, *OFDM over Rapidly Varying Channels:* *Partial FFT Demodulation and its Application to Underwater Acoustic Channels*
12:00-1:00 PM	Lunch Checkout by 12 noon.
1:30-3:00	Group Discussion and Wrap-Up: What kinds of programs would be helpful? Future Directions

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Abstracts and Bios of Speakers
(in alphabetic order by speaker surname)

Speaker: **Sonia Aissa** (University of Quebec, Montreal)
Title: *Is cooperation a Must in Future Cognitive radio networks?*
Abstract: This talk will provide an overview of our recent results in cognitive radio. Of particular interest are models that implement concepts of cooperation between nodes with different priorities and capabilities to increase the transmission reliability and network performance. Issues related to the design and management of future cognitive radio networks will be discussed and several key challenges will be emphasized.

Biography: Sonia Aissa is a Professor at Institut National de la Recherche Scientifique (INRS), University of Quebec, Montreal, Canada. Awards to her credit include the Quebec government strategic fellowship for professors-researchers, the university outstanding performance award twice, five best paper awards, and the NSERC discovery accelerator supplement award. Dr. Aissas research interests are in wireless communications, and include radio resource management, cross-layer design and cooperative transmission techniques, with a current focus on cognitive radio networks. She currently serves on the editorial boards for the two Transactions and the Communication Magazine of the IEEE Communications Society.

Speaker: **Pam Cosman** (University of California, San Diego)
Title: *Subcarrier Mapping Based on Slice Visibility for Video Transmission over OFDM Channels,Authors: Laura Toni, Pamela Cosman, Laurence Milstein*

Abstract: For transmission of video sequences over an OFDM system in a wireless fading environment, we develop a cross-layer technique, based on a slice loss visibility (SLV) model used to evaluate the visual importance of each slice. In particular, taking into account the visibility scores available from the bitstream and the instantaneous channel state information (CSI), we optimize the mapping of video slices within a 2-D time-frequency resource block, in order to better protect more visually important slices. Results demonstrate that, for different physical environments and different video sequences, the proposed algorithm outperforms baseline ones which do not take into account either the SLV or the CSI in the video transmission.

Biography: Pamela Cosman obtained her B.S. in EE from Caltech in 1987, and her Ph.D. in EE from Stanford University in 1993. She joined the faculty of Electrical and Computer Engineering at the University of California, San Diego, where she is currently a Professor and Vice-Chair. She was the Director of the Center for Wireless Communications from 2006 to 2008. Her research interests are in the areas of image and video compression and processing, and wireless communications. She was an associate editor of the IEEE Communications Letters and the IEEE Signal Processing Letters, and was the Editor-in-Chief (2006-2009) as well as a Senior Editor of the IEEE Journal on Selected Areas in Communications. She is a member of Tau Beta Pi and Sigma Xi, and a Fellow of the IEEE.

Speaker: **Michelle Effros** (California Institute of Technology)
Title: *Reduction as a Route to a Computational Information Theory*
Abstract: Expanding information theory's domain from very small to very large networks is simultaneously understood to be critically important and insurmountably difficult. This talk proposes a path to enable that expansion. Central to this approach is a simple reduction strategy that can be used both to answer very basic questions about communication networks (e.g., the nature of noise, the impact of dependence, and the consequences of delay) and to build computational tools that derive provable bounds on the capacities of large (and small) communication networks.

Biography: Michelle Effros received the B.S. degree with distinction in 1989, the M.S. degree in 1990, and the Ph.D. degree in 1994, all in electrical engineering from Stanford University. During the summers of 1988 and 1989 she worked at Hughes Aircraft Company, researching modulation schemes, real-time implementations of fast data rate error-correction schemes, and future applications for fiber optics in space technology.

She is currently Professor of Electrical Engineering at the California Institute of Technology; from 1994 - 2000 she was Assistant Professor of Electrical Engineering; and from 2000 - 2005, Associate Professor. Her research interests include information theory, data compression, communications, pattern recognition, speech recognition, and image processing.

Professor Effros received Stanford's Frederick Emmons Terman Engineering Scholastic Award (for excellence in engineering) in 1989, the Hughes Masters Full-Study Fellowship in 1989, the National Science Foundation Graduate Fellowship in 1990, the AT&T Ph.D. Scholarship in 1993, the NSF CAREER Award in 1995, the Charles Lee Powell Foundation Award in 1997, and the Richard Feynman-Hughes Fellowship in 1997. She is a member of Tau Beta Pi, Phi Beta Kappa, Sigma Xi, and IEEE Information Theory, Signal Processing, and Communications societies. She served as the Editor of the IEEE Information Theory

Society Newsletter from 1995-1998, as Co-Chair of the NSF Sponsored Workshop on Joint Source-Channel Coding in 1999, and has been a Member of the Board of Governors of the IEEE Information Theory Society since 1998.

Speaker: **Shalinee Kishore** (Lehigh University)
Title: *Smart Electricity Systems and the Role of Communications Engineering*
Abstract: One of the most pressing concerns for our society is to find ways to meet our skyrocketing energy demands. The answers we seek must not only be efficient both technically and economically but also limit our impact on the environment. The overhaul of our national electrical grid, which will produce a Smart Grid, will necessarily be a key part of this solution. The Smart Grid will leverage advances in information technology to make the grid infrastructure and service resilient. At the generation side, the Smart Grid will permit integration of distributed and renewable energy sources. At the consumption end, it will enable greater consumer participation in how we use, manage and store electricity. In between, it will exploit deployments of enhanced sensory and telemetry systems to make electricity flow more adaptable, efficient, and self-healing. This talk will overview the vision for tomorrow's Smart Grid, how it will enable a more energy-efficient future, and how communication engineering will play a key role in that.

Biography: Shalinee Kishore is an Associate Professor in the Department of Electrical and Computer Engineering at Lehigh University in Bethlehem, Pennsylvania. She obtained the Ph.D. and M.A. degrees in Electrical Engineering from Princeton University in 2003 and 2001, respectively, and the M.S. and B.S. degrees in Electrical Engineering from Rutgers University in 1999 and 1996, respectively. From 1994 to 2002, she has held numerous internships at AT&T, Bell Labs, and AT&T Labs-Research. Prof. Kishore is the recipient of the Presidential Early Career Award for Scientists and Engineers, the National Science Foundation CAREER Award, the P.C. Rossin Assistant Professorship, and the AT&T Labs Fellowship Award. She has also served as a Kavli Fellow for the National Academy of the Sciences. Her research interests are in communications theory, networks, and signal processing, with emphasis on wireless systems and smart electricity grid systems.

Speaker: **Mari Ostendorf** (University of Washington)
Title: *Human Language: a Signal Processing Perspective*
Abstract: Automatic speech recognition has long leveraged ideas from signal processing and communications, dating back to the Jelineks source-channel model of speech. Spoken words are generated by a source

and communicated via the noisy channels of a vocal tract and the recording environment and can be decoded using detection theory if we can learn the source and channel distributions. The same source-channel model has since been applied to many other language processing problems. Traditionally, the source word sequence has been modeled as a Markov process or higher-order n-gram, which is very effective when a large amount of transcribed text is available for the source domain, but the high-dimensional non-parametric model is not well suited to leveraging regularities in language in sparse training conditions. As a result, many different efforts have investigated alternative statistical models for characterizing naturally occurring word sequences. In this talk, we consider stochastic models that effectively map words to a continuous space, showing that we can learn about both the bursty, topical nature of language as well as rough syntactic/semantic categories.

Biography: Mari Ostendorf is a Professor of Electrical Engineering at the University of Washington. After receiving her PhD in electrical engineering from Stanford University, she worked at BBN Laboratories, then Boston University, and then joined the University of Washington (UW) in 1999. She has also been a visiting researcher at the ATR Interpreting Telecommunications Laboratory and at the University of Karlsruhe. At UW, she is currently an Endowed Professor of System Design Methodologies in Electrical Engineering and an Adjunct Professor in Computer Science and Engineering and in Linguistics. She also served as the Associate Dean for Research and Graduate Studies in the College of Engineering. Prof. Ostendorf's research interests are in dynamic and linguistically-motivated statistical models for speech and language processing. Her work has resulted in over 200 publications and 2 paper awards. Prof. Ostendorf has served as co-Editor of Computer Speech and Language, as the Editor-in-Chief of the IEEE Transactions on Audio, Speech and Language Processing, and is currently the VP Publications for the IEEE Signal Processing Society and a member of the ISCA Advisory Council. She is a Fellow of IEEE and ISCA, a recipient of the 2010 IEEE HP Harriett B. Rigas Award, and a 2012 Fulbright Scholar.

Speaker: **Milica Stojanovic** (Northeastern University)
Title: *OFDM over Rapidly Varying Channels: Partial FFT Demodulation and its Application to Underwater Acoustic Channels*
Abstract: Orthogonal Frequency Division Multiplexing (OFDM) is widely used in wireless radio systems, but is still under investigation for underwater acoustic (UWA) communication, where legacy systems are based on single-carrier broadband modulation. While single-carrier acoustic systems must employ accurate phase tracking and equalization to overcome the motion-induced Doppler distortion and the multipath-induced frequency selectivity of the UWA channel, multicarrier modulation offers the advantage of simple, FFT-based processing that eliminates the need for explicit equalization. In additionand perhaps more importantlyit supports differentially coherent detection, which eliminates the need for explicit phase tracking. These benefits, however, are contingent upon the channel staying constant over the duration of each OFDM block, which may not hold true in all UWA conditions. The performance of partial FFT demodulation and differentially coherent detection is discussed using synthetic, as well as real data. The latter come from a series of at-sea experiments, recently conducted off the shores of New England and Hawaii, with varying transmission distances, conditions of mobility, and acoustic bands. Experimental results clearly

demonstrate superiority of differentially coherent detection in conditions when rapid time-variation challenges channel tracking and coherent detection. These results also demonstrate the effectiveness of partial FFT demodulation as a low-complexity technique that enables bandwidth-efficient system design with a large number of carriers.

Biography: Milica Stojanovic graduated from the University of Belgrade, Serbia, in 1988, and received the M.S. and Ph.D. degrees in electrical engineering from Northeastern University, Boston, MA, in 1991 and 1993. After a number of years with the Massachusetts Institute of Technology, where she was a Principal Scientist, she joined the faculty of Electrical and Computer Engineering Department at Northeastern University in 2008. She is also a Guest Investigator at the Woods Hole Oceanographic Institution, and a Visiting Scientist at MIT. Her research interests include digital communications theory, statistical signal processing and wireless networks, and their applications to mobile radio and underwater acoustic communication systems. Milica is an Associate Editor for the IEEE Journal of Oceanic Engineering and the IEEE Transactions on Signal processing and a Fellow of the IEEE.

Speaker: **Katie Wilson** (Santa Clara University)
Title: *Blinded by the Light: Local Area Wireless Optical Communications and OFDM*

Abstract: For the past ten years, wireless local area networks have operated successfully in the 2.4 GHz band and the 5 GHz bands. Signals from these bands do not confine themselves to a given room or even household, so security and frequency re-use are issues for concern. Alternative frequencies such as 60 GHz or optical wireless links are currently being investigated as alternatives to these leaky lower bands. This talk will focus on intensity-modulated Orthogonal Frequency Division Multiplexing (OFDM) and diffuse optical wireless communications. Unlike baseband radio frequency OFDM, intensity modulated OFDM must be real and positive. In addition, the channel is real and positive. This leads to interesting twists in how OFDM is generated and processed.

Biography: Sarah Kate Wilson received her A.B. from Bryn Mawr College with honors in Mathematics in 1979 and her Ph.D. from Stanford University in Electrical Engineering in 1994. She has worked in both industry and academia. She is currently an associate professor of Electrical Engineering at Santa Clara University. Her research interests include OFDM, optical wireless communications and scheduling. From 2009 to 2011 she was the Editor-in-Chief of IEEE Communications Letters and is currently the Director of Journals for the IEEE Communications Society.

Speaker: **Sally Wood** (Santa Clara University)

Title: *Computational Imaging Challenges*

Abstract:Computational imaging methods are used to create image pixels or voxels from sets of measurements that are not localized to the desired individual image elements. Applications of these methods are widespread and are found, for example, in medical, geophysical and astronomical imaging. Well understood signal processing estimation techniques can be used for arbitrary measurement geometries, and strategic use of structured geometries leads to algorithms with improved efficiencies. Performance advances are often based on improved sensors as well as improved algorithms. Recent work in super-resolution imaging over the past decade has shown that the noise level of the low resolution pixels is a significant obstacle to computing desired higher resolution pixels. New approaches using micro-mirrors or controlled nanostructures have the potential to improve sensor performance, and algorithms can be developed for application specific adaptation of these sensors to improve computational imaging results.

Biography: Sally Wood is a Professor and Chair of the Electrical Engineering Department at Santa Clara University where she has been a member of the faculty since 1985. She received the Ph.D. and M.S.E.E. degrees from Stanford University and the B.S.E.E. degree from Columbia University School of Engineering. Her recent research has focused on computational imaging and super-resolution image reconstruction. She is a Fellow of the IEEE and has served on the board of the Electrical and Computer Engineering Department Heads Association, the Board of Governors of the IEEE Signal Processing Society, the Board of Governors of the Engineering in Medicine and Biology Society, and the NSF Committee on Equal Opportunity in Science and Engineering. She has also chaired the IEEE Jack S. Kilby Signal Processing Medal Selection Committee and the IEEE James H. Mulligan, Jr. Education Medal Selection Committee. Recently she was an NSF Program Director in the Division of Engineering Education and Centers of the Directorate of Engineering.

Posters
(in alphabetic order by presenter surname)

Poster: **Zahra Ahmadian** (University of British Columbia)
Pre-Rake DS-UWB System Design - an Overview

Poster: **Nasim Arianpoo** (University of British Columbia)
Network Coding in Wireless Mesh Networks

Poster: **Yue Chen** (Queen Mary University of London)
Cooperative User Relay Assisted Load Balancing in LTE Networks

Poster: **Arsenia Chorti** (Princeton University)
Physical Layer Security in Wireless Networks with Active Eavesdroppers

Poster: **Aakanksha Chowdhery** (Stanford University)
Compatibility of Vectored and Non-vectored DSL

Poster: **Raja Ghozi** (ENIT, Tunis)
Elderly Altered Auditory Perception in Urban Spaces

Poster: **Cristina Gomez Santamaria** (Universita Pontifica Bolivariana-Colombia)
Combining Eigenbeamforming and OSTBC in a MU Macrocell scenario with Partial CSITx

Poster: **Sumana Gupta** (IIT Kanpur)
A Novel Technique for Color Video Compression

Poster: **Julie Jackson** (AFIT)
Exploitation of OFDM Communications for Passive Radar Imaging

Poster: **Victoria Kostina** (Princeton University)
Lossy joint source-channel coding in the finite blocklength regime

Poster: **Abbie Kressner** (George Tech)
Causal Locally Competitive Algorithm for the sparse decomposition of audio signals

Poster: **Yao Li** (Rutgers University)
Enhancing Throughput-Complexity Tradeoff in Coded Content Distribution

Poster: **Sandra Roger** (Technical University of Valencia)
Rapid Prototyping of MIMO Detectors Using Graphic Processing Units

Poster: **Neveen Shlayaan** (University of Nevada, Las Vegas)
The Ill-posed Inverse Radon Problemin Neutron Tomography

Poster: **Samantha Summerson** (Rice University)
Parkinsons Disease: Interference in the Neural Communications Channel

Poster: **Vanessa Testoni** (University of California, San Diego)
The Hierarchical Signal Depedent Transform: A Framework for Creating Orthonormal Basis Matching the Local Signal Characteristics

Poster: **Preetha Thulasiraman** (US Naval Postgraduate School)
Interference Aware Resource Allocation Using Multiobjective Optimization for Mobile Wireless Networks

Poster: **Laura Toni** (University of California, San Diego)
Channel Coding Optimization Based on Slice Visibility for Transmission of Compressed Video over OFDM Channels

Poster: **Hongmie Xie** (Lehigh University)
Distributed Storage Codes Based on Evaluation of Linearized Polynomials

Poster: **Hao Zhu** (University of Minnesota)
Signal Processing Algorithms for Smart Power System Monitoring