Workshop on **Operator Algebras and Representation Theory: Frames, Wavelets and Fractals**

Banff International Research Station

October 9– 10, 2010

Marcin Bownik – University of Oregon date posted: 09/28/2010

Existence of frames with prescribed norms and frame operator

Abstract: We present a generalization of Kadison's theorem describing diagonals of self-adjoint operators with 3 point spectrum. As a consequence, we characterize sequence of norms of a frame whose frame operator has 2 point spectrum. This talk is based on the work of my Ph.D. student John Jasper.

Pete Casazza – University of Missouri date posted: 09/18/2010

Kadison-Singer: A few results and a lot of questions

Abstract: We will look at the latest developments surrounding the Kadison-Singer Problem with an emphasis on open questions surrounding the problem.

Jens Gerlach Christensen – University of Maryland date posted: 09/17/2010

Sampling and representations of Lie groups

Abstract: We present some recent results obtained for sampling in reproducing kernel Banach spaces on Lie groups and give applications to wavelet theory. In particular we use the results to obtain frames and atomic decompositions for coorbit spaces without the requirement that the representations are integrable.

Dorin Dutkay – University of Central Florida date posted: 09/17/2010

Fourier bases on fractal measures

Abstract: We will present some recent results on frames and orthonormal bases of exponential functions on fractal measures, and their relation to Beurling dimension, Cuntz algebras and reproducing kernels.

Jean Pierre Gabardo – McMaster University date posted: 09/16/2010

Convolution inequalities and Beurling density of wavelet systems

Abstract: We consider certain convolution inequalities for positive measures on the $a\,x+b$ group. We show how such inequalities lead to a natural generalization for the $a\,x+b$ group of the notion of Beurling density in Euclidean spaces. Applications of these results to irregular wavelet systems will be given.

Bin Han – University of Alberta date posted: 09/16/2010

Some Results and Open Problems on Nonhomogeneous Wavelet Systems

Abstract: Linked with discretization of continuous wavelet transforms, most wavelets and framelets studied in the literature are homogeneous wavelet systems generated by square integrable functions. However, in this talk, we show that nonhomogeneous wavelet systems play a fundamental role by naturally linking many aspects of wavelet analysis together. In this talk, we shall present some recent results and discuss several open problems on nonhomogeneous wavelet systems.

Deguang Han – University of Central Florida date posted: 09/17/2010

Group representation frames: questions and partial results

Abstract: We will briefly discuss a couple of problems and partial results related to the frame decomposition conjecture and parameterizations of frame generators for group representations. The focus will be free groups.

Keri Kornelson – University of Oklahoma date posted: 09/20/2010

Operators on Bernoulli measures spaces

Abstract: There are a number of results about Fourier bases on Hilbert spaces arising from Bernoulli affine iterated function systems on the real line. When one space has a variety of such orthonormal bases, there are naturally arising isometric operators on the Hilbert L^2 space. We examine these operators, discovering information about their spectra. This is joint work with Palle Jorgensen and Karen Shuman.

Shidong Li – San Francisco State University date posted: 09/22/2010

Sparse dual frames and the most compact dual Gabor function

Abstract: In applications a frame is oftentimes prescribed by the physics of the system. Succinct representations of functions/signals in such applications will depend on good choices of dual frames. Sparse dual frames have values in such concise function/signal representations. We present a study on sparse dual frames using the popular l^1-minimization formulation. Duals of substantial sparsity are obtained. Given a Gabor frame, studies on dual Gabor wave functions result in the most compact dual Gabor function in a probabilistic sense. There are still open problems about the analysis of the bound for the most sparse dual frames from either deterministic or probabilistic senses. Current results and open problems will be discussed. This is a joint work with T. Mi.

Judith Packer – University of Colorado date posted: 09/28/2010

Operators arising from generalized multiresolution analyses.

Abstract: Generalized multiresolution analyses (GMRAs) corresponding to a discrete abelian translation group Γ and a dilation operator δ defined on abstract Hilbert spaces can be described by their multiplicity functions m defined on $\widehat{\Gamma}$ and matrix-valued filter functions H defined on appropriately chosen set related to m and $\widehat{\Gamma}$. We discuss the isometry S_H associated to a specified filter system H, a construction having its origins in the work of Bratteli and Jorgensen, and give necessary and sufficient conditions for this isometry to be pure. A construction that produces an abstract GMRA from any functions m and H meeting required conditions is described. An equivalence relation is defined the collection of all matrix-valued filter systems H associated to the same multiplicity function m; and all equivalence classes of GMRA's associated to a specified m are described by cohomological conditions. This talks is based on joint work with L. Baggett, V. Furst, and K. Merrill.

Sergei Silvestrov – Lund University date posted: 09/16/2010

Wavelets, commutants, and representations of generalized crossed products

Abstract: Interplay between wavelets and commutants and representations of generalized crossed product algebras. Recent join works with Dorin Dutkay; and also results from joint works with Toke Meyer Carlsen, Christian Svensson and Johan Öinert

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Qiyu Sun – University of Central Florida date posted: 09/16/2010

Nonlinear Wiener's lemma and numerical implementation

Abstract: The classical Wiener's lemma says that if a periodic function does not vanish on the real line and has absolutely convergent Fourier series, then its reciprocal has absolutely convergent Fourier series too. In this talk, I will introduce a nonlinear version of the classical Wiener lemma, and apply it to solve a nonlinear distortion problem in signal processing.