Time	18 December 2019	19 December 2019
9:30 - 10:00	Registration	
10:00 -10:45	Barry Simon	Sameer Chavan
10:45-11:30	Barry Simon	Arup Pal
11:30-11:45	Tea	
11:45-12:30	Kumarjit Saha	Priyanka Grover
12:30-13:15	Tanvi Jain	Pankaj Jain
13:15-14:30	Lunch	
14:30-15:15	Ranjana Jain	Ved Prakash Gupta
15:15-15:30	Tea	
15:30-16:15	Dhriti Ranjan Dolai	Peter Hislop

Titles and abstracts

Barry Simon , IBM Professor of Mathematics, CALTECH

Title: Tales of Our Forefathers

Abstract: This is not a mathematics talk but it is a talk for mathematicians. Too often, we think of historical mathematicians as only names assigned to theorems. With vignettes and anecdotes, I'll convince you they were also human beings and that, as the Chinese say, “May you live in interesting times" really is a curse.

Kumarjit Saha, Ashoka University

Title: Scaling limit of a dynamical drainage network model and application to convergence to the Brownian net in models with crossing paths.

Abstract: We consider a dynamic version of Howard's drainage network model and prove that under diffusive scaling this model converges to the dynamic Brownian web (DyBW). We propose a new topology and observe that the DyBW as a process with RCLL paths. We develop a convergence criteria to study convergence to the DyBW over this space. This is the first rigorous convergence result for the dynamic

Brownian web. This invariance principle proves tameness of the dynamical Howard's model with respect to certain graphical properties. We consider another dynamic model of independent coalescing non-simple random walks and show that in terms of finite dimensional distributions, this scales to the DyBW as well. We use this finite dimensional convergence to show that the corresponding branching model converges to the Brownian net. This is the first instance of convergence to the Brownian net for a model with crossing paths. This is a joint work with Krishnamurthy Ravishankar.

Tanvi Jain, Indian Statistical Institute, New Delhi

Title: Symplectic eigenvalues of positive definite matrices

Abstract: For every positive definite matrix of order 2n, there exist n positive numbers associated with it. We call these numbers the symplectic eigenvalues of the matrix. Symplectic eigenvalues are important in different areas such as classical (Hamiltonian) mechanics, quantum information and symplectic topology. Recently there has been a heightened interest in the study of symplectic eigenvalues both by mathematicians and physicists due to their important applications in quantum information. In this talk, we discuss some fundamental inequalities, variational principles involving these numbers and their relationship with ordinary eigenvalues.
The talk is based on joint works with Rajendra Bhatia and Hemant Kumar Mishra.

Ranjana Jain, Mathematics Department, Delhi University.

Title : Lie ideals of certain tensor products of C*-Algebras

Abstract: Lie structures in associative algebras have been studied for a long time. In the C*-
algebra context, Lie ideals provide a closer examination to the exalted question: When is a C*-algebra linearly spanned by its projections? In this talk, we will discuss Lie ideals of certain C*-algebras. We will investigate the relationship between (closed) ideals and Lie ideals of certain Banach algebras, mainly those arising from the tensor products of C*-algebras. As a consequence, we will analyse all closed Lie ideals of (a) Banach algebra B(H) ⊗α B(H) where H is separable and α is either the Haagerup norm, Banach space projective norm or the C*-minimal norm; (b) A ⊗min C(X), where A is a simple unital C*-algebra with at most one tracial state and X is any locally compact Hausdorff space.

Dhriti Ranjan Dolai, Indian Institute of Technology, Dharwad

Title: Multiplicity bound of singular spectrum for general Anderson type Hamiltonian.

Abstract : We consider the random operators of the form $A^\omega=A+\sum_n \omega_nP_n$ on a separable Hilbert space $\mathcal{H}$, where A is a self adjoint operator and $\{P_n\}_n$ is a countable collection of finite rank projections such that $\sum_nP_n=I$. When $\{\omega_n\}_n$ are absolutely continuous i.i.d random variables, we show that the multiplicity of the singular spectrum is bounded above by $\mathcal{M}$ a.e ω, $\mathcal{M}$ (independent of ω) is given by
\begin{equation*}
\mathcal{M}:=\sup_n \bigg(\underset{{z\in\mathbb{C}\setminus \mathbb{R}}}{ess-sup}~~Mult^\omega_n(z)\bigg).
\end{equation*}
In the equation above $Mult^\omega_n(z)$ denote the maximum algebraic multiplicity of eigenvalues of the matrix $P_n(A^\omega-z)^{-1}P_n$.\\~\\~\\

This is a joint work with Anish Mallick.

Sameer Chavan, Indian Institute of Technology, Kanpur

Title: A complex moment problem in several variables and joint m-isometries

In this talk, we discuss a complex moment problem in several variables arising naturally in the study of joint m-isometries. It turns out that a vector-valued kernel function on a d-fold Cartesian product of non-negative integers is a complex moment sequence if and only if it is spherically balanced. This fact leads to a characterization of joint m-isometries. Further, we exhibit a family of complex moment sequences arising from certain Hilbert spaces of holomorphic functions on the open unit ball. It is worth noting that the d-tuple of multiplication by coordinate functions acting on these Hilbert spaces is a joint 2-isometry.

This talk is based on a joint work with Rajeev Gupta and Md. Ramiz Reza.

Arup Pal, Indian Statistical Institute, New Delhi

Title : Approximate decomposition for certain C^*-algebra representations

Abstract: The C^*-algebra of continuous functions on the homogeneous spaces of compact quantum groups admit a natural representation on the L^2 space of the invariant state. For certain families of such spaces, we give an `approximate decomposition' of the above representation in terms of a minimal faithful representation.

Priyanka Grover, Shiv Nadar Univeristy, UP

Title: Orthogonality and distance problems in C*-algebras

Abstract: Birkhoff-James orthogonality is a generalization of Hilbert space orthogonality to normed spaces. In a given normed space X, an element x is said to be Birkhoff-James orthogonal to another element y if $\|x+\lambda y\|\geq \|x\|$ for all scalars λ. We discuss characterizations for this orthogonality to hold when X is a C^*-algebra. These characterizations give rise to interesting distance formulas for an element x of X to the one dimensional subalgebra $\mathbb C. y$, generated by an element y. More generally, orthogonality to a subspace can be defined and subsequently distance formulas for x to a subspace B of X can be obtained, when best approximation from x to B exists. We start our discussion by well-known results in this area for $M_n(\mathbb C)$, moving onto some recent advances made in this direction for general C^*-algebras.

Pankaj Jain, South Asian University, New Delhi

Title: Duality and Extrapolation in Certain Function Spaces

Abstract: In this talk, we shall target two function spaces, namely, Lebesgue space and grand Lebesgue space. Along with Hardy type inequalities in these spaces, the aim would be to discuss the duality and extrapolation properties in these spaces. Of particular interest, in duality, is the Sawyer's duality principle which deals with function spaces consisting of monotone functions. As for the extrapolation is concerned, we would talk about Rubio de Francia type extrapolation. As applications to both duality and extrapolation, the boundedness of several well known integral operators will be deduced.

Ved Prakash Gupta, Jawaharlal Nehru University, New Delhi

Title: An analogue of Hall's Marriage Theorem for regular subfactors

Abstract: Given a subgroup H of a finite group G, as an application of the well known Hall's Marriage Theorem, it is known that there exists a finite set in G which acts simultaneously as a set of representatives for the left cosets as well as the right cosets of H in G.

Given an inclusion of type II_1 factors $N \subset M$ with finite Jones' index, M can be treated naturally as a left and a right N-module. Pimsner and Popa showed that M is finitely generated as a left (equivalently, right) N-module. However, it has been unknown whether a common finite set can act simultaneously as a left and a right 'Pimsner-Popa basis' for M over N. We answer this question in the affirmative for the so called regular subfactors.

This talk is based on a joint work with Keshab Chandra Bakshi titled "On orthogonal systems, two-sided bases and regular subfactors".

Peter Hislop, University of Kentucky, Lexington

Title: Local eigenvalue statistics for a family of random band matrices

Abstract: Random band matrices are models of disordered systems that interpolate between random Schr\"odinger operators on a lattice and Wigner matrices, such as the Gaussian orthogonal ensemble. For real symmetric random matrices of size N, the width W is taken to scale as N^α, for $\alpha \in [0,1]$. It is conjectured that $\alpha = \frac{1}{2}$ is the critical exponent, with the large N limit exhibiting localization for $0 \leq \alpha < \frac{1}{2}$, and delocalization for $\frac{1}{2} < \alpha \leq 1$. Localization results have been proved for $\alpha < \frac{1}{7}$, and delocalization for $\alpha > \frac{3}{4}$. This talk focuses on the family of random band matrices with fixed band width corresponding to $\alpha = 0$. This family includes random Schr\"odinger operators on Z. New localization estimates for these random band matrices are used to prove the convergence of the density of states function. This result, along with Wegner and Minami estimates, are used to prove that the local eigenvalue statistics is a Poisson point process, as anticipated.