TSSRK Fest

Indian Statistical Institute
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Titles and Abstracts

Javid Ali. Aligarh Muslim University.
Title: *Convergence of iterative schemes for nonlinear mappings in uniformly convex Banach spaces.*
Abstract: In this talk, we discuss a new class of nonlinear mappings, i.e. generalized non-expansive mappings. Then we present some weak and strong convergence theorems for two iterative schemes for generalized non-expansive mappings defined on a uniformly convex Banach spaces. Our results improve and extend the relevant previous results from the literature.
Keywords: Fixed point, hybrid mapping, Ishikawa Iterative scheme, weak and strong convergence and proximinal set.

Abdullah Bin Abu Baker. IIIT Allahabad.
Title: *Algebraic reflexivity of the set of isometries of order n.*
Abstract: We prove that if the group of isometries on $C_0(\Omega, X)$ is algebraically reflexive, then the set of isometries of order n on $C_0(\Omega, X)$ is also algebraically reflexive. Here, Ω is a first countable compact Hausdorff space, and X is a Banach space having the strong Banach-Stone property. As a corollary to this, we establish the algebraic reflexivity of the set of generalized bi-circular projections on $C_0(\Omega, X)$. This answers a question raised by Dutta and Rao.

B V Rajarama Bhat. ISI Bangalore.
Title: *Hilbert C^*-modules and Bures distance for completely positive maps.*
Abstract: D. Kretschmann, D. Schlingemann and R. F. Werner extended the notion of Bures distances from states to completely positive maps. They also explored applications of the notion in quantum information. We present a Hilbert C*-module version of this theory. We show that we do get a metric when the completely positive maps under consideration map to a von Neumann algebra and not in general. We provide several examples and counter examples. We also have a new method of computing Bures distance. This is based on joint works with Mithun Mukherjee and K. Sumesh.

Tirthankar Bhattacharyya. IISc, Bangalore.
Title: *Interpolating Sequences*
Abstract: A sequence $\{z_n\}$ from a set X (for this discussion X is the open unit disk or the bidisk or the symmetrized bidisk) is called an interpolating sequence if given any bounded sequence of numbers $\{w_n\}$ in the complex plane, there is a bounded holomorphic function f on X such that $f(z_i) = w_i$ for all i. We discuss characterizations of interpolating sequences.

Gilles Godefroy. Institut de Mathematiques de Jussieu.
Title: *Proximinality in Banach spaces: old and new results.*
Abstract: Compact subsets of infinite-dimensional Banach spaces are somehow very small. One of the consequences of this simple but fundamental fact is that continuous functions on closed subsets usually do not attain their bounds, even when they are very regular. TSSRK Rao, and other members of the Indian school of functional analysis, contributed to the understanding of this challenging theory and the relevant concepts of norm-attainment and proximinality. We will survey some of their results, and spell out natural open problems in this field of research.

V. Indumathi. Pondicherry University.
Title: *Some recent trends in best approximation from convex sets.*
Abstract: The notion of Ball proximinality, introduced by Pradipta Bandyopadhyay, Bor Luh-Lin and T.S.S.R.K. Rao in 2007, has led to a smooth transition from linear to convex approximation in a natural fashion. We discuss some recent concepts and problems that have emerged from the notion of Ball proximinality.

C R Jayanarayanan. IIT Kanpur.
Title: *Strong proximinality and continuity of metric projection in L_1-predual spaces.*
Abstract: In this talk, we discuss the strong proximinality of the closed unit ball of subspaces of L_1-predual spaces. We also discuss the continuity of metric projection in L_1-predual spaces.

S. H. Kulkarni. IIT Madras.
Title: *Operators that attain reduced minimum modulus.*
Abstract: Let H_1, H_2 be complex Hilbert spaces and T be a densely defined closed linear operator from its domain $D(T)$, a dense subspace of H_1, into H_2. Let $N(T)$ denote the null space of T and $R(T)$ denote the range of T.

Recall that $C(T) := D(T) \cap N(T)^{\perp}$ is called the *carrier space of* T and the *reduced minimum modulus* $\gamma(T)$ of T is defined as:

$$\gamma(T) := \inf\{\|T(x)\| : x \in C(T), \|x\| = 1\}$$

Further, we say that T *attains its reduced minimum modulus* if there exists $x_0 \in C(T)$ such that $\|x_0\| = 1$ and $\|T(x_0)\| = \gamma(T)$. In this talk, we discuss some properties of operators that attain reduced minimum modulus. One of the main results is the following.
Theorem: Let H_1, H_2 be complex Hilbert spaces and T be a densely defined closed linear operator from its domain $D(T)$, a dense subspace of H_1, into H_2. Then T attains its reduced minimum modulus if and only if its Moore-Penrose inverse $T^{\dagger}$ is bounded and attains its norm, that is, there exists $y_0 \in H_2$ such that $\|y_0\| = 1$ and $\|T^{\dagger}\| = \|T^{\dagger}(y_0)\|$

Romesh Kumar. University of Jammu.
Title: *Composition Operators between Orlicz Spaces.*
Abstract: Let Ω_1 and Ω_2 be two non–empty sets and let $V(\Omega_1, \mathbf{C})$ and $V(\Omega_2, \mathbf{C})$ be two topological vector spaces of complex valued functions on Ω_1 and Ω_2, respectively, under pointwise vector space operations, where $\mathbf{C}$ denotes the field of all complex numbers. Suppose $T : \Omega_2 \mapsto \Omega_1$ is a mapping such that $f \circ T \in V(\Omega_2, \mathbf{C})$, whenever $f \in V(\Omega_1, \mathbf{C})$. Define a composition transformation $C_T : V(\Omega_1, \mathbf{C}) \mapsto V(\Omega_2, \mathbf{C})$ as

$$C_T f = f \circ T, \; f \in V(\Omega_1, \mathbf{C}).$$

If C_T is continuous, then C_T is called a composition operator induced by T.

In this talk, I will discuss bounded composition operators between two weighted Orlicz spaces. This talk is based on my joint work with Yunan Cui, Henryk Hudzik, Rajeev Kumar, Heera Saini and Lech Maligranda.

S. Lalithambigai. Madurai Kamaraj University.
Title: *Ball Proximinal Banach Spaces.*
Abstract: The notion of ball proximinality and the strong ball proximinality were recently introduced by P. Bandyopadhyay et al. In this talk, we first show that * subalgebras $\mathcal{A}$ of $C(Q)$ are, in fact, strongly ball proximinal (and hence ball proximinal). Further, we show that the metric projection from $C(Q)$ onto the closed unit ball of $\mathcal{A}$ is Hausdorff metric continuous and hence has a continuous selection. In particular this would imply that $C(Q)$ is strongly ball proximinal in its bidual and the metric projection from $(C(Q))^{**}$ onto $(C(Q))_1$ is Hausdorff metric continuous. Next we prove that an equable subspace Y of a Banach space X is strongly ball proximinal and the metric projection from X, onto the closed unit ball of Y, is Hausdorff metric continuous and hence has a continuous selection. Finally we show that spaces with strong $1\frac{1}{2}$-ball property are ball proximinal.

Gadadhar Misra. IISc.
Title: *The role of curvature in Operator theory.*

Lajos Molnar. Bolyai Institute, University of Szeged.
Title: *Transformations on positive matrices and operators.*
Abstract: So-called preserver problems have attracted considerable interest in linear algebra and functional analysis over the past decades. In the beginning, the attention was paid to descriptions of linear maps on linear spaces of matrices or operators that preserve certain numerical quantities, operations, relations, etc among the elements of the underlying spaces. This has been changed recently and now research focuses mainly on descriptions of transformations which are not necessarily linear, they may even be defined on non-linear structures.

In this talk we deal with preservers on positive (semidefinite or definite) matrices. We present structural results concerning transformations on their sets which are

- preservers of algebraic, especially multiplicative structures (isomorphisms);
- preservers of geometrical structures (isometries, generalized isometries);
- preservers of relations, in particular orderds.

Interrelations between the results will be discussed and a few applications (e.g., ones related to physics) will be given. We might make comments on infinite dimensional generalizations in the setting of operator algebras.

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M. Nadkarni. Bombay University.
Title: *Some notes on flat polynomials.*
Abstract: A sequence of polynomials on the circle group is said to be flat if it converges in absolute value to the constant function 1 in some suitable norm. I will discuss some basic facts about such polynomials, mention some unsolved problems, and give some necessary conditions for a sequence of polynomials on the circle group to be flat.

Tanmoy Paul. IIT Hyderabad.
Title: *Some approximation results in the spaces of Bochner integrable functions.*
Abstract: It is well known that for a separable proximinal subspace Y of X, $L_p(\Omega; Y)$ is proximinal in $L_p(\Omega; X)$. In this talk I will discuss some strengthening of proximinality properties in same set up.

Ashoke Roy. ISI Kolkata.
Title: *Density of norm-attaining operators in a class of Banach spaces*
Abstract: Let $A(K)$ be the space of continuous affine functions on a Choquet simplex K and X a uniformly convex Banach space. Let

$$NA(A(K), X) = \{T \in B(A(K), X) : \exists a \in A(K), ||a|| = 1, ||Ta|| = ||T||\},$$

the so-called norm -attaining operators in $B(A(K), X)$. We will sketch a proof of the density of $NA(A(K), X)$ in $B(A(K), X)$ and, possibly, indicate an extension of this result.

Thomas Schlumprecht. Texas A&M University.
Title: *The algebra of bounded linear operators on $\ell_p \oplus \ell_q$, $1 < p < q < \infty$ has infinitely many closed subideals.*
Abstract: For a Banach space X we consider $\mathcal{L}(X)$, the algebra of linear bounded operators on X. A closed subideal of $\mathcal{L}(X)$, is a subideal which is closed in the operator norm. For very few Banach spaces X the structure of the closed subideals of $\mathcal{L}(X)$ is well understood. For example it is known for a long time that the only non trivial closed subideals of $\mathcal{L}(\ell_p)$ (other than the zero ideal and the entire algebra) is the ideal of compact operators. In his book "Operator Ideals" Albrecht Pietsch asked about the structure of the closed subideals of $\mathcal{L}(\ell_p \oplus \ell_q)$, the space of operators on the complemented sum of ℓ_p and ℓ_q, where $1 \leq p < q \leq \infty$. In particular he asked if there are infinitely many closed subideals. This question was recently solved affirmatively for the reflexive range $1 < p < q < \infty$, in a joint work by the author in collaboration with András Zsak.

Ajit Iqbal Singh. INSA Emeritus Scientist.
Title: *Algebra, Analysis and Geometry of Quantum Entanglement.*
Abstract: Quantum entanglement is considered to be a critical resource for information processing tasks such as quantum teleportation, dense-coding and distributed quantum systems. We will present its different aspects via polynomials, geometric configurations and Functional analytic tools.

Kalyan B Sinha. JNCASR Bangalore.
Title: *Weyl Commutation Rules for a Hyperbolic Plane*
Abstract: The talk will consist of a set of preliminary observations on extending the Weyl CCR for Euclidean system to a hyperbolic 2- manifold in the UHP model of Poincare . This is the first step towards constructing a non-commutative hyperbolic 4-manifold .

V.S. Sunder. IMSc.
Title: *My take on the spectral theorem.*
Abstract: The spectral theorem is a statement about a pair of functional calculii for a normal operator on a separable Hilbert space:

1. the continuous functional calculus which is an isometric unital *-homomorphism $C(\Sigma) \ni f \mapsto f(T) \in B(H)$ - with $\Sigma = \sigma(T)$; and

2. the measurable functional calculus which is an isometric unital *-homomorphism $L^\infty(\Sigma, \mu) \ni f \mapsto f(T) \in B(H)$ for a suitable probability measure μ defined on $\mathcal{B}_\Sigma$ with the property that a (uniformly norm-) bounded sequence $\{f_n : n \in \mathbb{N}\} \subset L^\infty(\Sigma, \mu)$ converges in μ-measure to an f if and only if $f_n(T)x \to f(T)x \ \forall x \in H$.

(The ranges of these two calculii are, respectively, the C^*- and von Neumann algebras generated by $\{id_H, T\}$.)

We shall also briefly dwell on the version for a family of commuting normal operators, as well as how this version readily yields the traditional 'projection-valued measure' formulation.

This talk is also a bit of a shameless promo for a book I recently wrote on this version.

A. Swaminathan. IIT Roorkee.
Title: *Behaviour of Orthogonal polynomials on the unit circle and real line for certain perturbations of the corresponding chain sequences.*
Abstract: When a nontrivial measure μ on the unit circle satisfies the symmetry $d\mu(e^{i(2\pi-\theta)}) = -d\mu(e^{i\theta})$ then the associated orthogonal polynomials on the unit circle, say Φ_n, are all real. In this talk, recent literature for the relation between the two sequences of para-orthogonal polynomials $\{z\Phi_n(z)+\Phi_n^*(z)\}$ and $\{z\Phi_n(z)-\Phi_n^*(z)\}$, where $\phi_n^*(z) = z^n\overline{\Phi_n(1/\overline{z})}$, $|z| < 1$ for any nontrivial measure in terms of three term recurrence and chain sequences is outlined.

As application, perturbations of two different chain sequences are considered. Using the minimal parameter sequence of the given chain sequence the corresponding polynomials are analyzed. In this analysis continued fractions play an important role. The consequences for the unit circle and real line provided are explored.
References: (1) K. K. Behera, A. Sri Ranga and A. Swaminathan, Orthogonal polynomials associated with complementary chain sequences, to appear in SIGMA - Symmetry, Integrability and Geometry: Methods and Applications, 16 pages.

(2) Kiran Kumar Behera and A. Swaminathan, Orthogonal polynomials on the real line corresponding to a perturbed chain sequence, submitted, 9 pages.

(3) C.F. Bracciali, A. Sri Ranga, A. Swaminathan, Para-orthogonal polynomials on the unit circle satisfying three term recurrence formulas, http://arxiv.org/pdf/1406.0719v1, Applied Num. Mathematics, 109 (2016) 19–40.

(4) T. S. Chihara, The parameters of a chain sequence, Proc. Amer. Math. Soc. 108 (1990), no. 3, 775–780.

(5) L. Garza and F. Marcellán, Szegő transformations and nth order associated polynomials on the unit circle, Comput. Math. Appl. 57 (2009), no. 10, 1659–1671.

(6) M. E. H. Ismail, Classical and quantum orthogonal polynomials in one variable, reprint of the 2005 original, Encyclopedia of Mathematics and its Applications, 98, Cambridge Univ. Press, Cambridge, 2009.

(7) B. Simon, Orthogonal polynomials on the unit circle. Part 1, AMS Colloquium Publications, 54, Part 1, AMS, Providence, RI, 2005.

(8) H. S. Wall, Analytic Theory of Continued Fractions, D. Van Nostrand Company, Inc., New York, NY, 1948.

S. Thangavelu. IISc.
Title: *An extension problem for the CR sublaplacian on the Heisenberg group*
Abstract: In this talk we present some recent results concerning the extension problem for the sublaplacian studied by Frank et al in the spirit of Caffarelli-Silvestre who studied the Euclidean case. Using an intertwining operator we show that the Dirichlet-Neumann map is given by a fractional power of the sublaplacian.

David Yost. Federation University Australia.
Title: *Rao, reducibility, ridges and random encounters.*
Abstract: My random walk through mathematics has taken me from Banach spaces and C^*-algebras through approximation theory to combinatorial geometry. I will try to explain

- how the concepts of M-ideals and reducible convex sets connect these topics;
- how my encounters with TSS Rao have influenced my research;
- why I am now counting faces of convex sets;
- why number theory affects the minimal number of ridges of n-dimensional polytopes with $2n+1$ extreme points.