OPERATOR THEORY AND APPLICATIONS (S23)

BAS LEMMENS (KENT), ANA LOUREIRO (KENT), MARCO MARLETTA (CARDIFF), IAN WOOD (KENT)

Monday 14:00-16:00 (SIBSR6) chair: TBD

14:00-14:25 Luis Manuel Tovar
Conjugate Complex Harmonic Functions (bicomplex case)
14:30-14:55 Kanat Tulenov
L^p-L^q *boundedness of Fourier multipliers on quantum Euclidean spaces*
15:00-15:25 Dimitri Bytchenkoff
Kernel theorems for operators on co-orbit spaces associated with localised frames
15:30-15:55 Peter Balazs
Representation of Operators Using Fusion Frames

Monday 16:30-18:30 (SIBSR6) chair: TBD

16:30-16:55 Jan Stochel
Similarity to conditionally positive definite unilateral weighted shifts
17:00-17:25 Zenon Jan Jabłoński
Bishop-type theorems for non-subnormal operators
17:30-17:55 Lav Kumar Singh
Geometry of Banach algebra A *and the bidual of* $L^1(G, A)$

Thursday 16:30-18:30 (SIBSR3) chair: TBD

16:30-16:55 Arvish Dabra
Arens regularity of $A_\Phi(G)$
17:00-17:25 Satyabrata Majee
On Decomposition for Pairs of Twisted Contractions
17:30-17:55 Andrew Pritchard
The Asymptotic Behaviour of the Cesàro Operator

Friday 14:00-16:00 (SIBSR3) chair: TBD

14:00-14:25 K.J. Vaishakh
TBC
14:30-14:55 A. Anju
TBC

Abstracts.

Peter Balazs, Acoustics Research Institute of the Austrian Academy of Sciences

Representation of Operators Using Fusion Frames

Abstract. To solve operator equations numerically matrix representations are needed, employing bases or more recently frames. This is done, e.g. in computational acoustics, by using the so called Galerkin approach. For finding the numerical solution of operator equations a decomposition in subspaces is needed in many applications. To combine those two approaches, it is necessary to extend the known methods of matrix representation to the utilization of fusion frames.

In this talk, we start with a motivation from computational acoustics (and domain decomposition). We give a short introduction to frames and fusion frame, that can be considered as a frame-like family of subspaces. We present the representation of operators on a Hilbert space $\mathcal{H}$ with fusion frames. Taking the particular property of the duality of fusion frames into account, we also define a matrix representation in an alternate way, the later being more efficient and well behaved in respect to inversion. We will show how this can be used for the solution of operator equations and link our approach to the well-known additive Schwarz algorithm.

This talk is based on the paper [1] - joint work with Mitra Shamsabadi, Ali Akbar Arefijamaal and Gilles Chardon.

References

[1] P. Balazs, M. Shamsabadi, A. A. Arefijamaal, G. Chardon, Representation of Operators Using Fusion Frames, *Applied and Computational Harmonic Analysis* **68**, (2019), 101596

Dimitri Bytchenkoff, Acoustics Research Institute of the Austrian Academy of Sciences and Faculty of Mathematics of the University of Vienna

Kernel theorems for operators on co-orbit spaces associated with localised frames

Abstract. Kernel theorems provide a convenient representation of bounded linear operators on function spaces as an integral operator. In this speech I shall talk about kernel theorems for bounded linear operators acting on co-orbit spaces associated with localised frames. Two of our main results consist in characterising the spaces of the operators whose integral kernels belong to the co-orbit spaces of either test functions or distributions associated with the tensor product of the localised frames.

References

[1] D. Bytchenkoff, M. Speckbacher and P. Balazs, Kernel theorems for operators on co-orbit spaces associated with localised frames,, *arXiv:2402.18367*.

I would like to thank Hans Georg Feichtinger, Karlheinz Gröchenig and Patrik Wahlberg for fruitful discussions and the Austrian Science Fund (FWF) for its fundings 10.55776/P34624 and 10.55776/Y1199 of this project.

Arvish Dabra, Indian Institute of Technology Delhi

Arens regularity of $A_\Phi(G)$

Abstract. For a locally compact group G, the L^p-analogue $(1 < p < \infty)$ of the Fourier algebra $A(G)$ is called the Figà-Talamanca Herz algebra and is denoted by $A_p(G)$. It is well known that Orlicz spaces L^Φ are the natural generalisation of the classical L^p-spaces. Let $A_\Phi(G)$ denote the Orlicz version of the Figà-Talamanca Herz algebra of G associated with a Young function Φ. As Arens regularity is an important tool to study groups with the help of certain Banach algebras related to it, we show that if $A_\Phi(G)$ is Arens regular, then G is discrete. This generalises the result by Forrest about the Arens regularity of the $A_p(G)$ algebras. We also show that $A_\Phi(G)$ is finite-dimensional if and only if G is finite. Further, for amenable groups, we show that $A_\Phi(G)$ is reflexive if and only if G is finite, under the assumption that the associated Young function Φ satisfies the MA-condition.

This is a joint work with Dr. N. Shravan Kumar.

References

[1] Dabra, A., Kumar, N.S. Arens regularity of $A_\Phi(G)$. Banach J. Math. Anal. 18, 41 (2024). https://doi.org/10.1007/s43037-024-00345-x.

Zenon Jan Jabłoński, Uniwersytet Jagielloński

Bishop-type theorems for non-subnormal operators

Abstract. The celebrated Bishop theorem states that an operator is subnormal if and only if it is the strong limit of a net (or a sequence) of normal operators. Since, by the Agler-Stankus theorem, 2-isometries behave in the sense similarly to subnormal operators (the role of normal extensions for 2-isometries is played by Brownian unitaries), we pose two problems: first, whether the set of all 2-isometries is equal to the strong closure of the set of all Brownian unitaries; second, whether the set of all 2-isometries is strongly closed. In this talk, we give partial solutions to both problems. The talk is based on a joint article [1] with I. B. Jung and J. Stochel.

References

[1] Z. J. Jabłońki, I. B. Jung, J. Stochel, Bishop-type theorems for non-subnormal operators, submitted.

Satyabrata Majee, Indian Institute of Technology Roorkee

On Decomposition for Pairs of Twisted Contractions

Abstract. In this talk, we present Wold-type decomposition for various pairs of twisted contractions on Hilbert spaces. As a consequence, we obtain a new and simple proof of Słoćinski's theorem for pairs of doubly commuting isometries and generalized that result for pairs of doubly twisted isometries. We also achieve an explicit decomposition for pairs of twisted contractions such that the c.n.u. parts of the contractions are in C_{00}. It is also shown that for a twisted pair (T, V^*) of operators with T as a contraction and V as an isometry, there exists a unique (upto unitary equivalence) pair of doubly twisted isometries on the minimal isometric dilation space of T. As an application, we provide a new proof for pairs of twisted operators consisting of an isometry and a co-isometry are doubly twisted. This is a joint work with Amit Maji.

References

[1] Satyabrata Majee, Amit Maji, On Decomposition for Pairs of Twisted Contractions, *Complex Analysis and Operator Theory* 18, no. 3 (2024): 52.

Andrew Pritchard, Newcastle University

The Asymptotic Behaviour of the Cesàro Operator

Abstract. The (discrete) Cesàro operator T is defined for complex sequences as $Tx = (\phi_k(x))_{k\geq 0}$, where

$$\phi_k(x) = \frac{1}{k+1}\sum_{m=0}^{k} x_m.$$

In a 2010 paper, Adell and Lekuona proved that for sequences $x \in c_0$ satisfying certain additional conditions, it holds that $\|T^n x\| = O(n^{-1/2})$ as $n \to \infty$. Their approach was based on a probabilistic interpretation of the powers of the Cesàro operator.

In this talk, we present an operator-theoretic proof of this result as well as analogous results for the continuous Cesàro operator on certain function spaces. Our approach is based on a quantified version of the Katznelson-Tzafriri theorem.

This is joint work with David Seifert.

References

[1] J. A. Adell, A. Lekuona, Rates of convergence for the iterates of Cesàro operators, *Proc. Amer. Math. Soc.* **138**(3), (2010), 1011–1021.
[2] A. K. J. Pritchard, D. Seifert, The asymptotic behaviour of the Cesàro operator, https://doi.org/10.48550/arXiv.2404.17289

Lav Kumar Singh

Geometry of Banach algebra A and the bidual of $L^1(G, A)$

Abstract. We shall start with the definition of two Arens product defined on the second conjugate algebra $\mathcal{A}^{**}$ of a Banach algebra $\mathcal{A}$. Few fundamental properties of these two products and some examples of Arens regular/irregular Banach algebras will be presented. Further, we will discuss about the topological center of the second dual of generalized group algebra $L^1(G, \mathcal{A})$, where G is any locally compact group and $\mathcal{A}$ is a Banach algebra. We will see that the topological center of $L^1(G, \mathcal{A})^{**}$ holds permanance property with respect to unitization of $\mathcal{A}$ and is a Banach $L^1(G)$-module in case G is abelian. Using these facts, we shall establish the result that the topological center of $L^1(G, \mathcal{A})^{**}$ is $L^1(G, \mathcal{A})$ itself when G is a compact abelian group and underlying Banach space of $\mathcal{A}$ is reflexive. Finally, we shall see a nice consequene of Cohen's factorization theorem regarding the elements in topological center of $L^1(G, \mathcal{A})^{**}$.

Jan Stochel, Jagiellonian University

Similarity to conditionally positive definite unilateral weighted shifts

Abstract. I will discuss the question of similarity of subnormal and CPD unilateral weighted shifts, where CPD is an abbreviation for "conditionally positive definite". These classes of operators emerged from the consideration of positive definite and conditionally positive definite functions on the discrete additive semigroup $(\mathbb{Z}_+, +)$, where $\mathbb{Z}_+$ is the set of all nonnegative integers. I will give several necessary conditions for similarity, which led us to distinguish CPD unilateral weighted shifts of types I, II and III. I will show that non-subnormal unilateral weighted shifts of types I and II are never similar to subnormal operators. This is a kind of dichotomy that excludes the case in which a non-subnormal CPD unilateral weighted shift is similar to a subnormal operator. We also give sufficient conditions for the similarity of CPD unilateral weighted shifts (necessarily of type III) to subnormal operators.

My talk is based on the content of the paper [3].

References

[1] J. B. Conway, *The theory of subnormal operators*, Mathematical Surveys and Monographs, **36**, American Mathematical Society, Providence, RI, 1991.

[2] Z. J. Jabłoński, I. B. Jung and J. Stochel, Conditional positive definiteness in operator theory, *Dissertationes Math.* **578**, (2022), pp. 64.

[3] Z. J. Jabłoński, I. B. Jung and J. Stochel, Similarity to conditionally positive definite unilateral weighted shifts, in progress.

Luis Manuel Tovar, Instituto Politecnico Nacional (MEXICO)

Conjugate Complex Harmonic Functions (bicomplex case)

Abstract. Abstract This paper presents several properties and relations that satisfy the components of a bicomplex holomorphic function. It also exhibits several analogies and differences with the case of analytic functions.

Kanat Tulenov, Ghent University

L^p -L^q boundedness of Fourier multipliers on quantum Euclidean spaces

Abstract. In this paper, we study Fourier multipliers on quantum Euclidean spaces and obtain results on their L^p -L^q boundedness.