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Abstracts

Session 30

Operator Theory and Spaces of Analytic Functions

Organizers:

José Bonet (Universidad Politécnica de Valencia)
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Cora Sadosky (Howard University)

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Gleason's problem and tangential homogeneous interpolation for hyperholomorphic quaternionic functions

Daniel Alpay* (Ben-Gurion University of the Negev)

Michael Shapiro (IPN, Ciudad de México)

We study a version of Gleason's problem in the setting of functions of class C^1 in the unit ball of $\mathbb{C}^2$. We use the setting of hyperholomorphic functions to define and solve the problem. Finally, we briefly discuss a tangential interpolation problem for hyperholomorphic functions.

The Schur-class of analytical functions: multivariable generalizations

Joseph A. Ball (Virginia Tech)

The classical Schur class consists of holomorphic functions mapping the unit disk to the closed unit disk. Such functions (or, more generally, such functions with operator rather than scalar values) arise as the transfer function for a conservative (or unitary) discrete-time input-state-output linear system, as the scattering function for a discrete-time Lax – Phillips scattering system, and as the characteristic function for a completely nonunitary contraction operator in the Sz.-Nagy – Foiaş model theory. We discuss some multivariable generalizations of these ideas which have been the topic of intensive research of late.

Projective description of weighted (LF)-spaces of holomorphic functions on the disc

Klaus D. Bierstedt* (Universität G. Paderborn)

José Bonet (Universidad Politécnica de Valencia)

The topology of certain weighted inductive limits of Fréchet spaces of holomorphic functions on the unit disc can be described by means of weighted sup-seminorms in case the weights are radial and satisfy certain natural assumptions due to W. Lusky; in the sense of A.L. Shields, D.L. Williams, the weights have to be *normal*. It turns out that no assumption on the (double) sequence of normal weights is necessary for the topological projective description in the case of o-growth conditions. For O-growth conditions, we give a necessary and sufficient condition (in terms of associated weights) for projective description in the case of (LB)-spaces and normal weights. This last result is related to a theorem of P. Mattila, E. Saksman, and J. Taskinen.

Semigroups of composition operators on the disk algebra

Manuel D. Contreras* (Universidad de Sevilla)

Santiago Díaz-Madrigal (Universidad de Sevilla)

In this talk we give a characterization of semigroups of composition operators which are strongly continuous on the disk algebra. We see that the situation is different from Hardy and Bergman spaces. We also present the relationship between starlike domains (in the complex plane) with a locally connected boundary and these semigroups in the disk algebra.

Weighted composition operators on the Bergman space

Željko Čučković* (University of Toledo)

Ruhan Zhao (University of Virginia)

Bounded, compact and Schatten class weighted composition operators on the Bergman space are characterized by using a generalized Berezin transform. We also give an estimate of the essential norms of these operators. Most of our results remain true for the Hardy space and weighted Bergman spaces.

Multivariate operator theory and complex geometry

Ronald G. Douglas* (Texas A & M University)

Gadadhar Misra (Indian Statistical Institute, Bangalore)

In the study of multivariate operator theory (or more than one operator) on Hilbert space, a module approach has been shown to be useful in bringing to bear concepts and techniques from complex and algebraic geometry. In this talk, I will demonstate instances of such applications to the study of the quotient modules determined by submodules consisting of the functions that vanish to some fixed order in the normal direction. Emphasis will be placed on concrete examples involving the bidisk and gaining a conceptual understanding of how one can characterize such modules and how they illustrate the general case. In this situation, there is a holomorphic hermitian bundle over the manifold points of the hypersurface defined by the quotient module and the curvature of this bundle, especially the longitudinal and transverse parts of it relative to the hypersurface, is used to describe the module along with other spectral invariants related to the second fundamental form.

On the properties of generalized Toeplitz-type operators

László Kérchy (University of Szeged)

Let μ be the normalized Lebesgue measure on the unit circle $\mathbb{T} = \{z \in \mathbb{C} : |z| = 1\}$, and let us consider the Hardy space H^2 of functions $f \in L^2(\mu)$ with zero Fourier coefficients of negative indexes. Denoting by S the simple unilateral shift on H^2 (that is $Sf(z) = zf(z)$), the classical Toeplitz operators can be characterized as the solutions of the operator equation $S^*XS = X$.

Following that pattern, for a given contraction T acting on a Hilbert space $\mathcal{H}$, an operator X on $\mathcal{H}$ is called T-Toeplitz if $T^*XT = X$. Such generalized Toeplitz-type operators were investigated by R.G. Douglas, B. Sz.-Nagy – C. Foiaş, V. Pták – P. Vrbová, G. Cassier – T. Fack, C.H. Mancera – P.J. Paúl, and others. We extend this research to the case when T is an arbitrary operator with regular norm-sequence $\{\|T^n\|\}_{n=1}^{\infty}$. (This set of operators is a very wide extension of the class of power-bounded operators with spectral radius one.) It turns out that a satisfactory symbolic calculus can be given in this general setting as well. Spectral properties are examined, and invariant subspace theorems concerning T are derived from the study of T-Toeplitz operators.

A nice theorem due to E.A. Azoff and M. Ptak claims that every intransitive, weak-$*$ closed subspace of classical Toeplitz operators is reflexive. We examine to what extent this dichotomy property can be transferred to subspaces of generalized Toeplitz-type operators.

Generalizations of Koplienko-Neidhardt trace formula

Stefania A. M. Marcantognini* (Instituto Venezolano de Invetigaciones Científicas)

María Dolores Morán (Universidad Central De Venezuela)

We present a trace formula for a contractive Hilbert-Schmidt perturbation of a unitary operator from which we deduce a similar formula for contractive Hilbert-Schmidt perturbation of a contractive (no longer unitary) operator. We also discuss the dissipative case. The results generalize those given by L.S. Koplienko and H. Neidhradt.

Operator theory on varieties in the bidisk

Jim Agler (University of California at San Diego)

John McCarthy* (Washington University)

Function and operator theory on varieties in the bidisk is a natural area to study. It comes up in interpolation, model theory, and as a generalization (and sometimes simplification) of function theory on multiply connected planar domains. I shall discuss some results in this area.

Noncommutative function theory, tensor algebras, and interpolation

Paul S. Muhly* (University of Iowa)

Baruch Solel (Technion, Haifa)

We discuss interpolation problems in the tensor algebra $H^\infty(E)$ over a W^*-correspondence E. The key is to exhibit $H^\infty(E)$ as a noncommutative function algebra over the (open) unit ball in the correspondence F which is dual to E.

Hypercyclic commutators of generalized backward shifts

Félix Martínez-Giménez (Universidad Politécnica de Valencia)

Alfredo Peris* (Universidad Politécnica de Valencia)

We show that certain commutators of generalized backward shift operators are hypercyclic. As an application we characterize the hypercyclic differential operators on Hilbert spaces consisting of entire functions of slow growth in the sense of Chan and Shapiro. This solves an open problem explicitely formulated by them.

A skew normal dilation on the numerical range of an operator

Mihai Putinar (University of California, Santa Barbara)

By using the Poincaré-Neumann operator we prove that, for an arbitrary linear bounded operator on a Hilbert space, there exists a skew normal dilation with spectrum contained in the closed numerical range.