Toeplitz operators and Carleson measures in strongly pseudoconvex domains

Marco Abate
(University of Pisa)

We study mapping properties of Toeplitz operators associated to a finite positive Borel measure on a bounded strongly pseudoconvex domain. In particular, we give sharp conditions on the measure ensuring that the associated Toeplitz operator maps the Bergman space A^p into $A^r(D)$ with $r > p$, generalizing and making more precise results by Čučković and McNeal. To do so, we give a geometric characterization of Carleson measures and of vanishing Carleson measures of weighted Bergman spaces in terms of the intrinsic Kobayashi geometry of the domain, generalizing to this setting results obtained by Kaptanoğlu for the unit ball. Joint work with J. Raissy and A. Saracco.

Weighted pluripotential theory

Muhammed Ali Alan
(Syracuse University)

We will give a short survey of weighted pluripotential theory and talk about some recent results.

Stein manifolds M for which $O(M) \approx O(\mathbb{C}^d)$ as Fréchet spaces

Aydın Aytuna
(Sabancı University)

In the first part of this expository talk, we will give some background knowledge in the Fréchet spaces of analytic functions. In the second part, we will focus on to Stein manifolds for which $O(M) \approx O(\mathbb{C}^d)$.

Random iteration in P^k

Turgay Bayraktar
(Johns Hopkins University)

I will discuss some ergodic properties of random holomorphic endomorphisms of complex projective space. By a "random holomorphic endomorphism" we mean a random variable which takes values in the set of holomorphic endomorphisms of fixed algebraic degree with probability one. The focus will be on dynamical properties of compositions of sequences of identically distributed independent random holomorphic maps. For such sequences, one can construct invariant positive closed bidegree $(p;p)$ currents which describe asymptotic distribution of pre-images of subvarieties of codimension p: Under a natural assumption on the distribution of the sequence, we show that these currents have Hölder continuous quasi-potentials. This in turn implies exponential decay of correlation and Central Limit Theorem for d.s.h and Hölder continuous observables.

Model subspaces and their applications

Stephan Ramon Garcia
(Pomona College)

The invariant subspaces of the backward shift operator are of central importance in function-related operator theory. We discuss some of the classical function theoretic properties of these subspaces along with several newer results. If time permits, we conclude with a few words about matrix inner functions and the emerging theory of truncated Toeplitz operators.

Subclasses of Hardy spaces in the plane

Nihat Gökhan Göğüş
(Sabancı University)

We look at the structure of certain weighted Hardy type classes of analytic functions in planar domains. One of these classes is Poletsky-Stessin-Hardy spaces. Connections with other classical spaces will be discussed. This is partly joined work with M. A. Alan.

Aspects of operator theory on weighted symmetric Fock spaces

Turgay Kaptanoğlu
(Bilkent University)

We obtain all Dirichlet spaces $\mathcal{F}_q$, $q \in \mathbb{R}$, of holomorphic functions on the unit ball of $\mathbb{C}^N$ as weighted symmetric Fock spaces over $\mathbb{C}^N$. These are reproducing kernel Hilbert spaces with kernels $K_q(z,w) = (1 - \langle z, w \rangle)^{(-1+N+q)}$ for $q > -(1+N)$ and hypergeometric functions for $q \leq -(1+N)$. The space $\mathcal{F}_{-N}$ is the Drury-Arveson space. We discuss certain aspects of operator theory on these spaces related to shift operators. We use more function theory and reduce many proofs to checking results on diagonal operators on the $\mathcal{F}_q$. We obtain von Neumann inequalities for row contractions on any Hilbert space with respect to shift operators on each $\mathcal{F}_q$. We determine the joint commutants of the shift operators. We prove that the C^*-algebras generated by the shift operators on the $\mathcal{F}_q$ fit in exact sequences that lie in the same Ext class. Radial differential operators are prominent throughout.

Dynamics of linear operators on holomorphic function spaces

Özgür Martin
(Miami University)

We will talk about several results on the dynamic behavior of linear operators on holomorphic function spaces.

On extensions of pluricomplex Green functions on Reinhardt domains

Zeynep Sıdıka Özal
(Syracuse University)

On Reinhardt domains containing the origin, the pluricomplex Green function with logarithmic pole at 0 is polyradial. This property of the function can be used to find it using an associated convex function in logarithmic coordinates. We first discuss a special class of convex functions and then prove extension properties of pluricomplex Green functions on Reinhardt domains using its relation with the associated convex functions.

Invariant metrics and distances – a survey

Peter Pflug
(University of Oldenburg)

After recalling various notions from the theory of invariant functions (metrics) we will discuss the relation of two results due to Lempert, namely the equality of the Carathéodory pseudodistance and the Lempert function on convex, respectively, strongly linearly convex domains. After an excursion to the μ-synthesis problem we discuss new concrete domains, namely, the symmetrized bidisc and the tetrablock.

Hardy and Bergman spaces on hyperconvex domains

Evgeny Poletsky
(Syracuse University)

Hardy and Bergman spaces, $H^p_u(D)$ and $A^p_{u,\alpha}(D)$ respectively, on a hyperconvex domain $D \subset \mathbb{C}^n$ were introduced by Michael Stessin and the speaker to generalize the notion of the classical spaces to hyperconvex domains D and then study the composition operators generated by the holomorphic mappings between such domains. These spaces are parameterized by plurisubharmonic exhaustion functions u on D and in the case of strictly pseudoconvex domains they all are the subsets of classical Hardy and Bergman spaces $H^p(D)$ and $A^p_\alpha(D)$.

On this domains we defined the Nevanlinna counting function and established its connection with the norms of functions in Hardy and Bergman spaces. After that it became possible to obtain in several dimensions results similar to results in the one-dimensional case. However, only basic facts about these spaces, mostly in particular cases, were proved in this paper.

Recently, N. Gogus and M. Alan, S. Sahin and K. R. Shrestra started detailed studies of these space. In particular, they came with examples of exhausting functions u on the unit disk $\mathbb{D}$ such that the spaces $H^p_u(\mathbb{D})$ are strictly less than $H^p(\mathbb{D})$.

In the first lecture we will discuss the basic definitions and properties of Hardy and Bergman spaces on a hyperconvex domains. It will be explained that on a strongly pseudoconvex domain D the intersection of all Hardy spaces $H^p_u(D)$ is the space $H^\infty(D)$ of bounded holomorphic functions on D.

The second lecture will be devoted to the problem of boundary values. Even for smooth domains, where holomorphic and plurisubharmonic functions from Hardy spaces have radial limit values almost everywhere with respect to the surface area, it is not clear whether we can use these boundary values to restore functions.

In the third lecture we will mostly discuss open problems..

TBA

Marek Ptak
(University of Agriculture)

Let H be a complex Hilbert space and let $L(H)$ denote the algebra of all bounded linear operators on H. Let us consider W a unital subalgebra of $L(H)$ closed in WOT topology. Denote by $\operatorname{Lat} W$ the set of all closed subspaces invariant for operators from W, and by $\operatorname{Alg} W$ denote the algebra containing all operators $T \in L(H)$ leaving invariant all subspaces from $\operatorname{Lat} W$. We have always $W \subset \operatorname{Alg} W \subset L(H)$. An algebra, following D. Sarason, is called reflexive if $W = \operatorname{Alg} W$. In other words an algebra W is reflexive if it has so many invariant subspaces that they determine the algebra itself. On the contrary an algebra W is called transitive if $\operatorname{Lat} W = \{H, \{0\}\}$, i.e., $\operatorname{Alg} W = L(H)$.

If fact there is no need to have the algebra structure for reflexivity and transitivity. More suitable setting for this notions are not algebras, but subspaces of operators. It was observed by V. Schulman and D. Larson. Moreover, there are weaker, having the same origin properties: k–reflexivity and k–hyperreflexivity.

The recent reflexivity, transitivity and hyperreflexivity results for subspaces and algebras of Toeplitz operators will be presented. We start with the classical result about reflexivity and hyperreflexivity of analytic Toeplitz operators on the Hardy space on the unit disc. The space of all Toeplitz operators is transitive but 2–reflexive. We will study the dichotomic behavior of subspaces of Toeplitz operators on the Hardy space. A linear space of Toeplitz operators which is closed in the ultraweak operator topology is either transitive or reflexive. No intermediate behavior is possible. This result can be extended to the Toeplitz operators on the Hardy space on the upper half–plane and simply connected domains on $\mathbb{C}$. The Toeplitz operators on the multi connected domains will be also considered.

Essential normality of submodules of the Drury-Arveson space

Mohan Ravichandran
(Bilgi University)

The reproducing kernel Hilbert space on the unit ball in $\mathbb{C}^d$ given by the kernel $K(z,w) = \dfrac{1}{1- < z,w >}$ is now termed the Druty-Arveson space in the operator theoretic community and has extremely interesting universal properties. For instance, the "shift" operators given by the co-ordinate multplications are a universal model for commuting row contractions, which in turn yields a von Neumann inequality for commuting row contractions.

The following question asked by Arveson in 2003 has attracted a great deal of interest recently.

Question. Let I be a homogeneous ideal in the polynomial algebra $\mathcal{A} = \mathbb{C}[z_1, \cdots, z_n]$ and let $M = [I]$ be the associated closed subspace in the Drury-Arveson space H^2_d. Let $S_1, \cdots, S_n$ be the shift operators on H^2_d. Are the cross commutators $[S_i, S_j^*]$ compact?

The problem rose out of Arverson's attempts to define a Fredholm index for tuples of operators and from his investigation of extremality properties of the Drury-Arveson space.

Ron Douglas observed that analogous essential normality problems can also be asked for Bergman spaces associated to strongly pseudoconvex domains and such a theorem would have significant implications in complex geometry.

The talk will be substantially a report of other people's work - I'll mention work done by William Arveson, Ron Douglas, Kunyu Guo, Kai Wang, Orr Shalit, Ken Davidson and Matthew Kennedy. I will also present some results of mine on the C^* algebras that the compressed shift operators generate.

Poletsky-Stessin Hardy spaces on domains bounded by an analytic Jordan curve in $\mathbb{C}$

Sibel Şahin
(Sabancı University)

In this talk we will examine Poletsky-Stessin Hardy spaces that are generated by continuous, subharmonic exhaustion functions on a domain $\Omega \subset \mathbb{C}$, that is bounded by an analytic Jordan curve. Different from Poletsky & Stessin's work these exhaustion functions are not necessarily harmonic outside of a compact set but have finite Monge-Ampère mass. We have showed that functions belonging to Poletsky-Stessin Hardy spaces have a factorization analogous to classical Hardy spaces and the algebra $A(\Omega)$ is dense in these spaces as in the classical case ; however, contrary to the classical Hardy spaces, composition operators with analytic symbols on these Poletsky-Stessin Hardy spaces need not always be bounded.

Operator theory from several complex variables perspective

Sönmez Şahutoğlu
(University of Toledo)

The first talk will cover the set-up of the $\overline{\partial}$-Neumann problem. In the second and third talks we will conver some recent results about compactness of Hankel operators on the Bergman space and forms on pseudoconvex domains and their relations to the $\overline{\partial}$-Neumann problem. This is joint work with Mehmet Çelik and Željko Čučković.

Extension of plurisubharmonic functions with logarithmic growth

Özcan Yazıcı
(Syracuse University)

Suppose that X is an algebraic subvariety of $\mathbb{C}^n$ and $\overline{X}$ is its closure in $\mathbb{P}^n$. Coman-Guedj-Zeriahi proved that if the germs $(\overline{X}, a)$ are irreducible for all points $a \in \overline{X} \setminus X$ then every plurisubharmonic function with logarithmic growth on X is the restriction of a globally defined plurisubharmonic function with logarithmic growth. In this talk we will discuss the converse problem: If the germ $(\overline{X}, a)$ is reducible for some $a \in \overline{X} \setminus X$ then is there a plurisubharmonic function with logarithmic growth on X which does not extend to a globally defined plurisubharmonic function with logarithmic growth?

TBA

Vyacheslav Zaharyuta
(Sabancı University)

To be announced.