FUNCTIONAL ANALYSIS AND OPERATOR THEORY SESSION (FRI 9/1/26)

ROOM S110 (12.45-15.35)

Santeri Miihkinen (University of Reading)

***Generalisation of the infinite Hilbert matrix on spaces of analytic functions* (12.45-13.05)**

Abstract: The (finite) Hilbert matrix is arguably one of the single most well-known matrices in mathematics. The infinite Hilbert matrix $\mathcal{H}$ was introduced by David Hilbert around 120 years ago in connection with his double series theorem. It can be interpreted as a linear operator on spaces of analytic functions by its action on their Taylor coefficients and admits an integral representation

$$\mathcal{H}(f)(z) = \int_0^1 \frac{1}{1+(t-1)z} f\left(\frac{t}{1+(t-1)z}\right) dt, \tag{1}$$

where $z \in \mathbb{C}$, $|z| < 1$, and the function f typically belongs to some Banach space of analytic functions on the unit disc of the complex plane. The boundedness and compactness properties of the Hilbert matrix operator $\mathcal{H}$ have been investigated extensively on various analytic function spaces and there exist different generalisations of the operator $\mathcal{H}$.

In this talk, we consider a generalised Hilbert matrix operator $\mathcal{H}_\mu$, where the Lebesgue measure dt in (1) is replaced by a probability Borel measure $d\mu$ on $[0, 1[$. We will see how the boundedness and compactness properties of $\mathcal{H}_\mu$ defined on the Bergman spaces can be described in terms of the measure $d\mu$. This talk is based on a joint work with Carlo Bellavita and others [1].

[1] C. Bellavita, V. Daskalogiannis, S. Miihkinen, D. Norrbo, G. Stylogiannis and J. A. Virtanen. *Generalized Hilbert matrix operators acting on Bergman spaces*. J. Funct. Anal., 288(9), 2025. https://doi.org/10.1016/j.jfa.2025.110856

David Norrbo (Åbo Akademi University)

***Exchanging essential norm and integration* (13.15-13.35)**

Let X be a Banach space and let $\{S_t : t \in]0, 1[\}$ be a family of bounded operators on X. Assume the integral operator

$$\int_0^1 S_t \, dt \colon f \mapsto \int_0^1 S_t f \, dt$$

is well defined. What type of families $\{S_t\}$ satisfies

$$\Big\| \int_0^1 S_t \, dt \Big\|_e = \int_0^1 \|S_t\|_e \, dt?$$

In this talk, we will give a sufficient function-theoretic condition for the equality above to hold when $\{S_t\}$ is a family of weighted composition operators acting on the reflexive Bergman spaces $A^p, p > 1$. This talk is based on [1]

[1] D. Norrbo Essential norm and integration of a family of weighted composition operators. arXiv:2505.21268 [math.FA], `http://arxiv.org/abs/2505.21268`.

Atte Pennanen (UEF)

***Berezin transform and Carleson measures* (13.45-14.05)**

For a radial weight ω, let B_ω denote the Berezin transform induced by the weight ω. In the unweighted case, it is known that in some ways the Berezin transform can be seen as an analogue of the Poisson transform for the Bergman space A^p. We show an interesting connection between the Carleson measures of the weighted Bergman space A^p_ω and the boundedness of B_ω in the case of when ω is doubling. We also note how the situation is related to the connection between the Carleson measures of the Hardy space H^p and the boundedness of the Poisson transform. Presentation is based on ongoing joint work with Bo He, Zengjian Lou, Jouni Rättyä and Fanglei Wu.

Antti Perälä (Umeå University)
Two-weight fractional derivatives **(14.15-14.35)**

The concept of a fractional derivative has a long history that can be traced back to the 18th century. For the purposes of this talk, the starting point is the 1932 work of Hardy and Littlewood, which was further developed by Zhu. Motivated by these ideas, we discuss a fractional derivative that is generated by two radial weights on the disk. Such derivatives can be of any positive real order, but also finer than this. We present some recent results demonstrating how these fractional derivatives can be used in analysis – and how they indeed possess properties similar to those of the classical derivatives.

Henrik Wirzenius (Czech Academy of Sciences)
Nilpotent quotient algebras of strictly singular by compact operators on Banach spaces **(14.45-15.05)**

The Banach algebra $\mathcal{A}$ is called n-nilpotent if the product of n number of elements in $\mathcal{A}$ is zero. If $\mathcal{A}$ is n-nilpotent but not $(n-1)$-nilpotent, then n is the index of nilpotency of $\mathcal{A}$.

Let $\mathcal{S}(X)$ and $\mathcal{K}(X)$ denote the closed operator ideals of strictly singular operators and compact operators on a given Banach space X, respectively. I will describe recent joint work with Niels Laustsen (Lancaster), where we determine the index of nilpotency of the quotient algebra $\mathcal{S}(X)/\mathcal{K}(X)$ for a direct sum X of finitely many Banach spaces chosen from the following three families: (i) the Baernstein spaces B_p for $1 < p < \infty$; (ii) the p-convexified Schreier spaces S_p for $1 \leq p < \infty$; (iii) the sequence spaces ℓ_p for $1 \leq p < \infty$ (and c_0).

Zhan Zhang (University of Helsinki)
Berezin transform of Toeplitz operators on the weighted Bergman space **(15.15-15.35)**

In this paper, we obtain some reproducing kernel estimates and some Carleson properties that play an important role. With these tools, we completely characterized cases of the bounded and compact Toeplitz operators on the weighted Bergman spaces with Bekollé-Bonami weights in terms of Berezin transforms.