Short talks. Book of abstracts

Alexis, Michel (University of Bonn, Germany):
The $SU(2n)$-valued nonlinear Fourier transform: representing matrix-valued functions in a quantum computer.

Abstract: Motivated by the recent connection between Quantum Signal Processing and the $SU(2)$-valued nonlinear Fourier transform, we define an $SU(2n)$-valued nonlinear Fourier transform. In particular, we define the nonlinear Fourier transform as a map from square summable sequences into $SU(2n)$-valued functions $\begin{pmatrix} A & B \\ C & D \end{pmatrix}$ on $\mathbb{T}$. Furthermore, we show that the inverse transform is well-defined on the set of $SU(2n)$-valued functions $\begin{pmatrix} A & B \\ C & D \end{pmatrix}$ for which A^* and D are both outer functions in $H^2(\mathbb{D})$. Our proof takes the form of an algorithm, with applications to phase factor finding for Generalized Quantum Signal Processing in $SU(2^m)$.

Ballesta Yagüe, Fernando (Universidad Complutense de Madrid, Spain):
The Neumann problem in graph Lipschitz domains in the plane with A_∞-measures on the boundary.

Abstract: Weighted theory can be used to solve boundary value problems for the Laplacian in graph Lipschitz domains in the plane with data in several function spaces. This technique, originally introduced by Carlos Kenig, has recently been further developed in several papers by María Jesús Carro and Virginia Naibo, among other authors. Here, we extend some of their results about the Neumann problem, considering A_∞-measures on the boundary instead of arc-length measure.

This is joint work with María Jesús Carro.

Basak, Riju (National Taiwan Normal University, Taiwan):
On the Fourier transform of measures in Besov spaces.

Abstract: The Fourier transform of the characteristic function χ_E of a bounded set E with certain boundary conditions enjoys nice decay estimates and has significant applications in harmonic analysis and geometric measure theory. Depending on the assumption on the boundary, the Fourier transform of χ_E belongs to certain L^p spaces, and at the endpoint, it belongs to weak L^p spaces.

In this talk, we will discuss a generalization of the classical results of Herz regarding convex sets and the recent result of Ko and Lee concerning bounded sets with Lipschitz boundaries. Specifically, we will show that when a finite Radon measure μ belongs to a Besov space of negative order, the Fourier transform of Riesz potentials of μ belongs to weak L^p spaces at the endpoint. We also talk about the optimality of our results. This is a collaboration with D. Spector and D. Stolyarov.

Cairo, Hannah (UC Berkeley, USA):
A counterexample to the Mizohata-Takeuchi Conjecture.

Abstract: We derive a family of L^p estimates of the X-Ray transform of positive measures in $\mathbb{R}^d$, which we use to construct a log R-loss counterexample to the Mizohata-Takeuchi conjecture for every C^2 hypersurface in $\mathbb{R}^d$ that does not lie in a hyperplane. In particular, multilinear restriction estimates at the endpoint cannot be sharpened directly by the Mizohata-Takeuchi conjecture.

Cano Mármol, Antonio Ismael (Baylor University, United States):
Fourier and Schur multipliers on noncommutative Hardy spaces.

Abstract: The noncommutative Hardy space H^1 of functions with values in a given von Neumann algebra $\mathcal{M}$ represents a suitable model in which a singular theory for matrix-valued Hardy spaces can be developed. The construction of this space relies on noncommutative analogues of objects and results that are present in the classical theory, namely: the Littlewood-Paley g-function, the Fefferman-Stein duality, and atomic decompositions.

In this talk, we will be interested in several results in matrix-valued Calderón-Zygmund theory that follow from these characterizations. In particular, we will discuss how this theory provides a refinement of a celebrated endpoint estimate for Schur multipliers whose symbol satisfy a Hörmander-Mikhlin condition, recently introduced by Conde-Alonso, González-Pérez, Parcet and Tablate.

This talk is based on joint work with Tao Mei.

Canto, Javier (University of the Basque Country – UPV/EHU):
Fractional dispersion properties of the Helmholtz equation.

Abstract: In this talk, we will explore the fractional dispersion of solutions to the Helmholtz equation. We are interested in the case where the scattering data is the Dirac comb, that is, a sum of Dirac deltas at the integers. This poses a challenge because of the rigid structure of the Helmholtz equation.

Somehow surprisingly, the interactions between the Dirac deltas at different frequencies modifies significantly the dispersion in the low-regularity range $b \in (0,1)$, creating a fluctuating term that has very interesting properties: it is a sum of Dirac deltas at each rational point, with height depending on the parity of the denominator. As a limiting case, we recover the Talbot effect that has been observed under similar condition in the Schrödinger equation.

This is based on joint work with Nico M. Schiavone (UPM) and Luis Vega (UPV/EHU, BCAM).

Casey, Emily (University of Washington, United States of America):
Rectifiability and anisotropic singular integral operators .

Abstract: Since the work of Mattila and Preiss in 1995, it has been known that for a Radon measure with reasonable density assumptions, the almost everywhere existence of principal values of the Riesz transform is equivalent to the measure being rectifiable. In forthcoming work with M. Goering, T. Toro, and B. Wilson, we extend the result of Mattila and Preiss to a class of anisotropic Riesz kernels. In this talk, we will discuss the motivation for this work as well as the geometric ideas behind the proof of rectifiability from the almost everywhere existence of principal values.

Cejas, María Eugenia (Universidad Nacional de La Plata, Argentina)
Solutions of the divergence equation in Hardy and lipschitz spaces.

Abstract: Given a bounded domain Ω and f of zero integral, the existence of a vector fields $\mathbf{u}$ vanishing on $\partial\Omega$ and satisfying $\operatorname{div}\mathbf{u} = f$ has been widely studied because of its connection with many important problems. It is known that for $f \in L^p(\Omega)$, $1 < p < \infty$, there exists a solution $\mathbf{u} \in W_0^{1,p}(\Omega)$, and also that an analogous result is not true for $p = 1$ or $p = \infty$. The goal of this talk is to prove results for Hardy spaces when $\frac{n}{n+1} < p \leq 1$, and in the other limiting case, for bounded mean oscillation and Lipschitz spaces. This a joint work with Ricardo Durán.

Cho, Chuhee (Seoul National University, Republic of Korea):
Endpoint estimates for maximal operators associated to the wave equation.

Abstract: We consider the H^s–L^q maximal estimates associated to the wave operator

$$e^{it\sqrt{-\Delta}}f(x) = \frac{1}{(2\pi)^d}\int_{\mathbb{R}^d} e^{i(x\cdot\xi + t|\xi|)}\widehat{f}(\xi)d\xi.$$

Rogers–Villarroya proved H^s–L^q estimates for the maximal operator $f \mapsto \sup_t |e^{it\sqrt{-\Delta}}f|$ up to the critical Sobolev exponents $s_c(q,d)$. We obtain the endpoint $H^{s_c(q,d)}$–L^q bounded on the maximal operator $f \mapsto \sup_t |e^{it\sqrt{-\Delta}}f|$. We also prove that several different forms of the maximal estimates considered by Rogers–Villarroya are basically equivalent to each other. This talk is based on joint work with Sanghyuk Lee and Wenjuan Li.

Choudhary, Surjeet Singh (Indian Institute of Science Education and Research Mohali, India):
Bilinear Bochner-Riesz means for convex domains in the plane.

Abstract: For $\alpha \geq 0$, the bilinear Bochner-Riesz operator of order α in $\mathbb{R}^n$ is defined as

$$\mathcal{B}_R^\alpha(f,g)(x) = \int_{\mathbb{R}^n \times \mathbb{R}^n} \left(1 - \frac{|\xi|^2 + |\eta|^2}{R^2}\right)_+^\alpha \hat{f}(\xi)\hat{g}(\eta) e^{2\pi i x\cdot(\xi+\eta)} d\xi d\eta.$$

For $\alpha > n - \frac{1}{2}$, $\mathcal{B}_R^\alpha$ maps $L^{p_1}(\mathbb{R}^n) \times L^{p_2}(\mathbb{R}^n)$ into $L^p(\mathbb{R}^n)$ whenever $p_1, p_2 \geq 1$ and $\frac{1}{p} = \frac{1}{p_1} + \frac{1}{p_2}$. Thus, $\alpha = n - \frac{1}{2}$ is commonly referred to as the critical index for the bilinear Bochner-Riesz operator. Recently, there have been some results on L^p-boundedness of the bilinear Bochner-Riesz operator $\mathcal{B}_R^\alpha$ when $\alpha \leq n - \frac{1}{2}$.

In this talk, we extend the bilinear Bochner-Riesz operator to convex domains in the plane and discuss some L^p-boundedness results.

Claros, Alejandro (BCAM - Basque Center for Applied Mathematics, Spain):
Weighted Poincaré-Sobolev inequalities via fractional integration.

Abstract: In this talk, we will discuss weighted Poincaré-Sobolev type inequalities with an explicit analysis of the dependence on the A_p constants of the involved weights. We obtain inequalities of the form

$$\left(\frac{1}{w(B)}\int_B |f(x) - f_B|^q w(x)dx\right)^{\frac{1}{q}} \leq C_w r(B) \left(\frac{1}{w(B)}\int_B |\nabla f(x)|^p w(x)dx\right)^{\frac{1}{p}},$$

with quantitative estimates for the exponent q and the constant C_w, where $f_B = \frac{1}{|B|}\int_B f$ is the average of f over a ball B, $r(B)$ is the radius of B and $1 \leq p \leq q < \infty$. We prove these estimates as a consequence of the study of weighted local bounds for the fractional integral operator I_α, and the classical subrepresentation formula

$$|f(x) - f_B| \leq c_n I_1(|\nabla f|\chi_B)(x).$$

We also show that the dependence of C_w on the A_p constant is sharp. We answer positively to a conjecture proposed by C. Pérez and E. Rela [Trans. Amer. Math. Soc. 372 (2019)] related to the sharp exponent in the A_1 constant in the (p^*, p) Poincaré-Sobolev inequality with A_1 weights. Our method allows us to prove Poincaré-Sobolev inequalities for high-order derivatives and fractional Poincaré-Sobolev inequalities with the BBM extra gain factor $(1-\delta)^{\frac{1}{p}}$.

Craig, Sam (University of Wisconsin - Madison, USA):
Failure of restricted weak-type endpoint restriction estimates for quadratic manifolds.

Abstract: It is well-known that the Fourier extension operator for the paraboloid in $\mathbb{R}^d$ cannot be restricted weak-type bounded at the restriction endpoint $p = 2d/(d-1)$, since such an estimate would imply bounds for the Kakeya maximal function which contradict the existence of measure zero Kakeya sets. We generalize this approach to prove that the Fourier extension operator for an n-dimensional quadratic manifold $\mathcal{M} \subset \mathbb{R}^d$ cannot be restricted weak-type bounded at the restriction endpoint $p = 2d/n$. The key step in this proof is constructing a set $K \subset \mathbb{R}^d$ containing a translate of every plane normal to $\mathcal{M}$ which can be covered by $o(\delta^{-d})$ many δ-balls, or more generally, proving that for an n-dimensional subset $\mathcal{N}$ of the Grassmanian of $d-n$ planes in $\mathbb{R}^d$, we can find a set $K \subset \mathbb{R}^d$ containing a translate of every plane in $\mathcal{N}$ such that K has measure zero. We will call such a set an $\mathcal{N}$-Kakeya set. Once we have constructed such a set, we follow standard arguments to prove necessary conditions on the boundedness of an associated Kakeya maximal function, which in turn rule out endpoint restricted weak-type bounds for the Fourier extension operator associated with $\mathcal{M}$.

We construct measure zero $\mathcal{N}$-Kakeya sets by iteratively constructing a sequence of $\mathcal{N}$-Kakeya sets in $[-1,1]^d$ which are narrow in a increasing subset of $[-1,1]^d$. By quantifying the narrowness and some bookkeeping, we conclude that the final set can be covered by $O\left(\delta^{-d}\left(\frac{\log\log(1/\delta)}{\log(1/\delta)}\right)^{n/(d-n)}\right)$ many δ-balls. This approach differs from the Perron tree construction because the narrowing procedure follows from replacing tubes with narrower cones, rather than translating tubes to have greater overlap, which has the advantage of requiring less structure in the direction set than the Perron tree construction at the cost of a slightly larger cover than the Perron tree construction.

Dąbrowski, Damian (University of Jyväskylä, Finland):
Favard length and quantitative rectifiability.

Abstract: Favard length of a planar set is the average length of its orthogonal projections. The Besicovitch projection theorem, which is one of the cornerstones of geometric measure theory, states the following: if a set E of finite length has positive Favard length, then there exists a rectifiable curve intersecting E in a set of positive length. In this talk I will discuss my recent quantification of this classical result, and its application to Vitushkin's conjecture.

Dalmasso, Estefanía Dafne (IMAL-CONICET-UNL, Argentina):
Weighted L^p estimates for Schrödinger-Calderón-Zygmund operators with exponential decay.

Abstract: In this talk, we will present some weighted boundedness results for a class of singular integral operators with exponentially decaying kernels. First, we will state an extrapolation theorem on weighted L^p spaces and characterize the classes of weights through an appropriate maximal operator. As a consequence, we will obtain the boundedness of several operators associated with the generalized Schrödinger operator $-\Delta + \mu$, where μ is a nonnegative Radon measure in $\mathbb{R}^d$ and $d \geq 3$, that fall within our framework.

This is a joint work with Gabriela R. Lezama and Marisa Toschi (IMAL-CONICET-UNL, Argentina).

Duncan, Jennifer (Universidad Autónoma de Madrid, Spain):
Localised Multilinear Restriction Estimates and the Helical Maximal Function.

Abstract: A fundamental result in modern fourier analysis is the celebrated Bennett–Carbery–Tao multilinear restriction estimate: given an ensemble $(S_1, \ldots, S_n)$ of compact transversal hypersurfaces in $\mathbb{R}^n$, let E_j denote the fourier extension operator associated with S_j for each $1 \leq j \leq n$. Then, for all $\varepsilon, R > 0$,

$$\Big\| \prod_{j=1}^{n} E_j f_j \Big\|_{L^{\frac{2}{n-1}}(B_R)} \lesssim_\varepsilon R^\varepsilon \prod_{j=1}^{n} \|f_j\|_{L^2}.$$

This inequality has found use in a number of important contexts, examples including the linear restriction problem, decoupling theory, and the theory of maximal functions, to name a few. In recent years, certain localised variants of multilinear restriction estimates have been found to greatly extend the utility of this framework. In this talk, I will describe the localised multilinear restriction estimate and discuss the main aspects of its proof, in particular how the underlying geometry is captured by a certain generalised notion of a Brascamp–Lieb inequality. I will then illustrate how these localised multilinear restriction estimates may be applied in conjunction with other tools from harmonic analysis in order to establish the complete range (up to endpoints) of off-diagonal estimates for the local helical maximal function in $\mathbb{R}^3$, which we define as, given a curve $\gamma : [-1, 1] \to \mathbb{R}^3$,

$$M_\gamma f(x) := \sup_{t \in [1,2]} \left| \int_{\mathbb{R}} f(x - t\gamma(s))\chi(s) ds\mathbb{R} \right|,$$

where $\chi \in C_0^\infty(\mathbb{R})$ is a bump function supported on $[-1, 1]$, and we assume that γ has non-vanishing torsion. This is joint work with David Beltrán and Jonathan Hickman.

Dziubański, Jacek (University of Wrocław, Poland):
Dimension-free and potential-free estimates for Riesz transforms associated with Schrödinger operators.

Abstract: Let $L = -\Delta + V(x)$ be a Schrödinger operator on $\mathbb{R}^d$, where $V(x) \geq 0$, $V \in L^1_{\mathrm{loc}}(\mathbb{R}^d)$. We give a short proof of dimension free $L^p(\mathbb{R}^d)$ estimates, $1 < p \leq 2$, for the vector of the Riesz transforms

$$\Big(\frac{\partial}{\partial x_1} L^{-1/2}, \frac{\partial}{\partial x_2} L^{-1/2}, \ldots, \frac{\partial}{\partial x_d} L^{-1/2}\Big).$$

The constant in the estimates does not depend on the potential V. We simultaneously provide a short proof of the weak type $(1, 1)$ estimates for $\frac{\partial}{\partial x_j} L^{-1/2}$.

Eceizabarrena, Daniel (BCAM - Basque Center for Applied Mathematics, Spain):
Periodic counterexamples to Carleson's convergence problem for higher order symbols.

Abstract: For the free Schrödinger equation $i\partial_t u+\Delta u = 0$, what is the minimum Sobolev regularity needed for the initial data such that the solution converges to such data a.e. when $t \to 0$? We know since 2019 that the correct exponent in $\mathbb{R}^n$ is $n/(2(n+1))$.

However, we do not know if changing the dispersion relation of the equation alters this result. For example, for the fractional equation $i\partial_t u+(-\Delta)^\alpha u = 0$ with Fourier symbol $|\xi|^{2\alpha}$ with $\alpha > 1$ the exponent $n/(2(n+1))$ is sufficient regardless of α, but necessary exponents are only known for polynomial symbols $\alpha \in \mathbb{N}$ and they depend on α. In contrast, I will show that in the periodic case the exponent $n/(2(n+1))$ is actually necessary when $\alpha \in \mathbb{N}$, that is, for the power-Schrödinger equation $i\partial_t u + (-\Delta)^k u = 0$ for $k \in \mathbb{N}$, independently of k.

Fleschler, Ian (Princeton University, USA):
Higher Multiplicity Allard Boundary Regularity.

Abstract: In the context of area minimizing currents, Allard Boundary Regularity asserts that an oriented surface with boundary that minimizes area cannot have boundary singularities of minimum density. More precisely, near a point of minimum density, the surface must coincide with a classical smooth minimal surface, attaching smoothly to the boundary.

In this short talk, I will present recent results extending Allard Boundary Regularity to the setting of higher boundary multiplicity, still within the framework of area minimizing currents. Part of this work is joint with Reinaldo Resende.

Fraccaroli, Marco (BCAM - Basque Center for Applied Mathematics, Spain):
The time-frequency analysis of the uniform bounds for Hilbert forms.

Abstract: Forms associated with the superposition of bilinear Hilbert transforms (BHTs) appear in many contexts in analysis, for example in the study of Cauchy intergrals on Lipschitz curves. This leads to the first Calderón commutator, which can be expressed as a superposition of BHTs parametrized by $\alpha \in [0, 1]$.

Although estimates for the commutator were recovered via other arguments, the question of estimates for such BHTs remained unsolved. The existence of bounds was addressed in the seminal papers of Lacey and Thiele, later improved to results uniform in α. We will explore the problem of uniform estimates with a special focus on the higher dimensional generalizations of BHTs, when α is a matrix, describing a result in the quasi-conformal case. This includes uniform bounds for two-dimensional bilinear Beurling transforms.

In particular, we will discuss the main tool in the time-frequency analysis of such bilinear operators, the phase plane projection. This "projection" operator concerns the appropriate simultaneous localization of both a function and its Fourier transform to specific regions of the time-frequency support.

This talk is based on joint work with Olli Saari and Christoph Thiele.

Fraser, Robert (Wichita State University, United States of America):
Oscillatory integrals arising from algebraic number fields.

Abstract: We describe a family of real oscillatory integrals whose phases arise from polynomials over algebraic number fields. We apply this oscillatory integral estimate to a version of Tarry's problem for number fields.

Galanos, Yannis (University of Edinburgh, Scotland):
Kakeya-Brascamp-Lieb Inequalities in the Heisenberg Group.

Abstract: Recent work on the Kakeya problem in the first Heisenberg group has revealed connections with restricted projection theory and Wolff's circular maximal function. I will present a bilinear variant of the three-dimensional Heisenberg Kakeya estimate and demonstrate how it can be reduced to geometric incidence estimates in the plane. I will also discuss some higher-dimensional conjectures and explain the limitations of current techniques in proving these.

Hejna, Agnieszka (Rutgers University, USA and University of Wrocław, Poland):
Dunkl translations of smooth enough functions: positive nad negative results.

Abstract: In 1989, Charles F. Dunkl defined new commuting differential-difference operators

$$T_\xi f(\mathbf{x}) = \partial_\xi f(\mathbf{x}) + \sum_{\alpha \in R} \frac{k(\alpha)}{2} \langle \alpha, \xi \rangle \frac{f(\mathbf{x}) - f(\sigma_\alpha(\mathbf{x}))}{\langle \alpha, \mathbf{x} \rangle}$$

associated with a finite reflection group G which is related to a root system R on a Euclidean space $\mathbb{R}^N$. They can be treated as perturbations of the classical directional derivatives ∂_ξ by difference operators. They have applications in mathematical physics. In the Dunkl analysis framework, we have the Dunkl transform $\mathcal{F}$, which plays the roles of the Fourier transform. Using the Fourier–Dunkl transform and the Dunkl kernel $E(\mathbf{x}, \mathbf{y})$ (the counterpart of the exponential function) one can define the analog of ordinary translation of the function in argument by $\tau_{\mathbf{x}} f(-\mathbf{y}) = \mathcal{F}^{-1}(E(i\mathbf{x}, \cdot)\mathcal{F}f(\cdot))(-\mathbf{y})$.

Dunkl translations possess many properties similar to classical translations; however, it turns out that they also exhibit several fundamentally different properties. In my talk, I will discuss a theorem stating that the Dunkl translation $\tau_{\mathbf{x}}\varphi$ of a nonnegative function φ can be a function taking negative values. This is something that cannot occur in the classical case and seems to be one of the major difficulties in one of the most well-known open problems in Dunkl theory: the boundedness of Dunkl translation operators on L^p.

Moreover, it turns out that pointwise estimates for $\tau_{\mathbf{x}}\varphi(-\mathbf{y})$, for sufficiently smooth φ, can be expressed in terms analogous to those in classical harmonic analysis. However, they require an appropriate consideration of the symmetries associated with the root system. I will demonstrate this with examples of upper and lower bounds for the Dunkl heat kernel, which are expressed in a similar form but incorporate two metrics: the Euclidean metric and the orbit metric, as well as other symmetries.

Hernández García, Joan (Universitat Autònoma de Barcelona, Spain):
On properties of the 1/2*-symmetric caloric capacity in the plane.*

Abstract: In this talk we will introduce the so-called 1/2-symmetric caloric capacity, associated simultaneously with the 1/2-heat equation and its conjugate, those defined via the operators $(-\Delta_x)^{1/2} \pm \partial_t$. We will present some of its most important features such as its semi-additivity in $\mathbb{R}^2$ together with examples that illustrate its non-isotropic behavior. The proofs of the previous results are inspired by Tolsa's and Volberg's arguments when studying Cauchy and vector Riesz kernels respectively, once adapted to a non anti-symmetric setting by means of general Tb-like-theorems. Moreover, we will give an explicit formula for the 1/2-symmetric caloric capacity of a rectangle, which differs substantially to that of other well-known capacities, such as analytic capacity.

References:

[1] Tolsa, X. (2014). *Analytic Capacity, the Cauchy Transform, and Non-homogeneous Calderón-Zygmund Theory.* Birkhäuser, Cham.

[2] Volberg, A. (2003). *Calderón-Zygmund Capacities and Operators on Nonhomogeneous Spaces.* Volume 100, CBMS Regional Conference Series in Mathematics. Providence, Rhode Island: American Mathematical Society.

Hidalgo-Palencia, Pablo (ICMAT, Spain):
Parabolic Dirichlet problem with Lp data and variable coefficients.

Abstract: It is a very recent result of Bortz, Hofmann, Martell and Nyström (in combination with earlier works of Hofmann, Lewis and Murray) that the Dirichlet problem for the heat equation is well-posed in Lp in domains whose boundary is a (parabolic) Lipschitz graph, with the additional property that the graph has a half-time derivative in BMO. They show that this condition, although possibly artificial at first glance, is actually optimal.

In this talk, we show an extension of this result beyond the heat equation. Concretely, we are able to prove that, for a family of coefficients satisfying a Carleson measure condition "of L1 type", it is necessary that half-time derivatives are in BMO in order to obtain well-posedness of the Dirichlet problem.

This is joint work with Simon Bortz, Sandra Ferris and Steve Hofmann.

Hou, Hedong (Université Paris-Saclay):
Well-posedness for non-autonomous parabolic Cauchy problems with rough coefficients.

Abstract: In this talk, I will present well-posedness of non-autonomous parabolic Cauchy problems of divergence type, with uniformly elliptic, bounded measurable, complex-valued coefficients. A key distinction from the existing literature is that we impose no regularity assumptions on the coefficients. Our approach is based on the theory of tent spaces, introduced by (Fefferman–Stein, 1972) and (Coifman–Meyer–Stein, 1985), using conical square functions to construct weak solutions. The initial data are tempered distributions in homogeneous Hardy–Sobolev spaces, while source terms belong to specific scales of weighted tent spaces as well. Notably, some results are even new for the heat equation. These results are based on a series of joint work with Pascal Auscher.

Huang, Kaiyi (University of Wisconsin-Madison, USA):
New results in multilinear Radon-like transforms.

Abstract: We study a broad class of multilinear Radon-like transforms with mixed co-ranks. In the direct-sum Finner case, we characterized the admissible exponents for L^p-boundedness of the operators.

Jaehyeon, Ryu (Ewha Womans University, South Korea):
Perturbed Nevo–Thangavelu maximal functions on step two groups.

Abstract: Let G be a step two nilpotent Lie group, identified via the exponential map with the Lie-algebra $\mathfrak{g} = \mathfrak{g}_1 \oplus \mathfrak{g}_2$, where $\mathfrak{g}_2$ is contained in the center. We study L^p-boundedness behavior of maximal functions associated with spheres in a d-dimensional linear subspace H, dilated by the natural parabolic dilations. The case where $H = \mathfrak{g}_1$ is well understood. We consider the case of a tilted plane $H \neq \mathfrak{g}_1$ which is not invariant under the automorphic dilations. While in the case of Métivier groups it is known that the L^p-boundedness results are stable under a small tilt, we show that this is generally not the case for other step two groups. We provide various positive and negative results depending on the geometry of H in relation to the group law. This talk is based on ongoing joint work with Andreas Seeger.

Korobenko, Luda (Reed College, USA):
Φ-admissible weights and degenerate elliptic equations.

Abstract: The notion of a p-admissible weight was first introduced by Fabes, Kenig, and Serapioni in 1982, and it captures the main properties of a weight needed for implementation of Moser's iterative scheme. As a result one obtains regularity of weak solutions to degenerate elliptic equations, where the degeneracy is controlled by such a weight. One of the main defining properties of p-admissible weights is a $(p\sigma, p)$ Sobolev inequality with $\sigma > 1$, which in particular implies that these weights are doubling. In this talk I will introduce a generalization of 2-admissible weights, the class of Φ-admissible weights. A weight is Φ-admissible if a $(\Phi, 2)$ weighted Orlicz-Sobolev inequality holds. Such a weight might not be 2-admissible, and even non-doubling, therefore classical iterative schemes of Moser and DeGiorgi become unavailable. However, a modified DeGiorgi iteration can be performed and meaningful regularity theory developed for degeneracies controlled by certain Φ-admissible weights, thus making it an interesting class to explore and investigate further.

Li, Wenjuan (Northwestern Polytechnical University, China):
Boundedness for maximal operators over homogeneous hypersurfaces in $\mathbb{R}^3$.

Abstract: In this article, we study maximal functions related to hypersurfaces with vanishing Gaussian curvature in $\mathbb{R}^3$. We characterize the $L^p \to L^q$ boundedness of local maximal operators along homogeneous hypersurfaces. As a corollary, weighted L^p-estimates are obtained for the corresponding global operators.

Lorist, Emiel (Delft University of Technology, The Netherlands):
Quantifying the overlap of a collection of sets.

Abstract: Quantifying the overlap or almost pairwise disjointness among a collection of sets plays an important role in harmonic analysis. Two key notions for quantifying this are sparseness and the so-called Carleson condition. For dyadic cubes, these notions were shown to be equivalent by Verbitsky, drawing on ideas from Dor. More recently, Hänninen generalized this result to general sets in $\mathbb{R}^d$. This equivalence is very useful in harmonic analysis: the Carleson condition is often straightforward to verify, while sparseness proves incredibly useful for obtaining (sharp) estimates.

The remarkably elegant Dor–Hänninen–Verbitsky proof is based on duality and the Hahn–Banach separation theorem and is therefore non-constructive, even for finite collections. In this talk, we will reformulate the equivalence between sparseness and the Carleson condition as a graph theory problem – more specifically, as a max-flow problem on a weighted directed graph. Borrowing some methods from optimization theory, we deduce a constructive proof of the equivalence between the Carleson condition and sparseness.

Madrid Padilla, José Ramón (Virginia Tech, USA):
Isoperimetric inequalities on the hypercube.

Abstract: In this talk, we will discuss some isoperimetric inequalities for subsets of the hypercube refining many previous results.

Merino, Pablo (Basque Center for Applied Mathematics (BCAM), Bilbao, Spain):
A pathological set regarding the propagation of almost sure properties of Gaussian measures.

Abstract: Given the periodic and cubic wave quation in $3d$, we deal with two questions:

- From a deterministic point of view, given $p > 2$ and $\sigma \geq 1$ large enough, what can we say about the propagation of spatial derivative regularity, in terms of $W^{\sigma,p}(\mathbb{T}^3)$, for the linear and the nonlinear flow of the aforementioned equation?
- From a probabilistic point of view, given the loss of derivative regularity that we will encounter for the previous question, can we randomize the initial data in any way such that we do not see such regularity loss in $W^{\sigma,p}(\mathbb{T}^3)$, almost surely with respect certain meaningful measure?

I will talk about a complementary result to the quasi-invariance of Gaussian measures supported on Sobolev spaces under the dynamics of this equation, proved by T. S. Gunaratnam, T. Oh, N. Tzvetkov and H. Weber (2022). Namely, we will discuss about the existence of dense sets of general Sobolev spaces $W^{\sigma,p}(\mathbb{T}^3)$, for large p and σ, for which the deterministic dynamics does not preserve the regularity σ, and which are in sharp contrast with the propagation of almost sure properties of the Gaussian measure along the flow. This is a joint work with Nikolay Tzvetkov.

Minguillón, Javier (Universidad Autónoma de Madrid, Spain):
Almost Everywhere Convergence Along Tangential Curves to the Schrödinger Equation Initial Datum.

Abstract: The study of almost everywhere convergence of solutions to the Schrödinger equation to their initial data has been a major problem in harmonic analysis since Carleson first posed the question in 1980. Carleson proved that for $n = 1$, convergence holds for functions in the Sobolev space $H^s(\mathbb{R}^n)$ with $s \geq \frac{1}{4}$, a condition later shown to be sharp by Dahlberg and Kenig. Over the years, mathematicians like Bourgain, Tao, Vargas and Vega made significant progress. In higher dimensions, Bourgain established the necessity of $s \geq \frac{n}{2(n+1)}$ and Du, Guth, Li and Zhang proved that $s > \frac{n}{2(n+1)}$ was sufficient when $n \geq 2$.

In this talk, we revisit this problem, focusing on convergence along tangential curves. Specifically, we consider the almost everywhere convergence of $e^{it\Delta}f(x + \gamma(t))$ to $f(x)$ as $t \to 0$, where γ is an α-Hölder curve with $\frac{1}{2} \leq \alpha \leq 1$. We present a simplified proof of a result due to Cao and Miao: for $f \in H^s(\mathbb{R}^n)$ with $s > \frac{n}{2(n+1)}$, convergence holds almost everywhere. This result is optimal up to the endpoint and our proof avoids advanced techniques like broad-narrow analysis.

The talk will provide a historical overview, highlight key contributions, and present our streamlined proof, emphasizing its simplicity.

Monti, Matteo (Università degli studi di Bergamo, Italy):
Paley-Wiener spaces of discrete entire functions on $\mathbb{Z}^2$.

Abstract: In this talk I will present a Paley–Wiener type theorem for the class of discrete entire functions on $\mathbb{Z}^2$. Similarly to the continuous case, I will show how a suitable exponential growth condition of a discrete entire function F is interlinked with the support of the Fourier transform of the restriction of F to $\mathbb{Z} \times \{0\}$.

I will then define some reproducing kernel Hilbert spaces PW_α. For such spaces I will provide a sampling result. Namely, I will provide sufficient conditions to reconstruct the function on $\mathbb{Z}^2$ starting only from the sampling of the function on a proper subsets of $\mathbb{Z}$.

This is a joint work with Alessandro Monguzzi.

Mosquera, Carolina (University of Buenos Aires, Argentina):
Self-improving Poincaré-Sobolev type functionals in product spaces.

Abstract: We give a geometric condition which ensures that (q, p)-Poincaré-Sobolev inequalities are implied from generalized (1,1)-Poincaré inequalities related to L^1 norms in the context of product spaces. We provide several (1,1)-Poincaré type inequalities adapted to different geometries and then show that our self-improving method can be applied to obtain special interesting Poincaré-Sobolev estimates.

The results are based on joint work with E. Cejas (UNL, Argentina), C. Pérez (BCAM) and, E. Rela (UBA, Argentina).

Niedorf, Lars (University of Wisconsin-Madison, USA):
Spectral multipliers on two-step stratified Lie groups with degenerate group structure.

Abstract: Let L be a sub-Laplacian on a two-step stratified Lie group G of topological dimension d. We establish new L^p-spectral multiplier estimates under the sharp regularity condition $s > d\,|1/p - 1/2|$, addressing cases where the group structure of G is degenerate. These results extend previously known estimates in the non-degenerate setting. Notably, our results yield the L^p-boundedness of Bochner–Riesz means at the sharp regularity threshold predicted by the Bochner–Riesz conjecture. The proof combines restriction type estimates with a detailed analysis of the sub-Riemannian geometry of G. A key novelty of our approach is the use of a refined spectral decomposition into caps on the unit sphere in the center of the Lie group.

Niksiński, Jakub (University of Wrocław, Poland):
Dimension-free estimates for the discrete maximal functions over balls.

Abstract: Consider the following discrete averaging operator

$$\mathcal{M}_t f(x) := \frac{1}{|tB(d) \cap \mathbb{Z}^d|} \sum_{y \in tB(d) \cap \mathbb{Z}^d} f(x-y),$$

where $tB(d) = \{x \in \mathbb{R}^d : \sum_{i=1}^d x_i^2 \leq t\}$ and $|\cdot|$ denotes the counting measure. In the 90's Elias Stein conjectured dimension-free l^2 estimates for the related maximal operator, that is

$$\sup_{d \in \mathbb{N}} \Big\| \sup_{t>0} \mathcal{M}_t \Big\|_{\ell^2(\mathbb{Z}^d) \to \ell^2(\mathbb{Z}^d)} < \infty.$$

This conjecture was motivated by the fact that similar result holds for the continous counterpart. There were not any results established towards this conjecture until the breakthrough work of Bourgain, Mirek, Stein and Wróbel in 2019, who showed that

$$\sup_{d \in \mathbb{N}} \Big\| \sup_{t \geq d} \mathcal{M}_t \Big\|_{\ell^2(\mathbb{Z}^d) \to \ell^2(\mathbb{Z}^d)} < \infty, \quad \sup_{d \in \mathbb{N}} \Big\| \sup_{t \in \mathbb{D}} \mathcal{M}_t \Big\|_{\ell^2(\mathbb{Z}^d) \to \ell^2(\mathbb{Z}^d)} < \infty, \quad \text{where } \mathbb{D} = \{2^k : k \in \mathbb{N}_0\}.$$

In a recent joint work with Wróbel we have managed to prove that for any $\varepsilon > 0$ we have

$$\sup_{d \in \mathbb{N}} \Big\| \sup_{0 < t \leq d^{1/2-\varepsilon}} \mathcal{M}_t \Big\|_{\ell^2(\mathbb{Z}^d) \to \ell^2(\mathbb{Z}^d)} < \infty.$$

In this talk, I will address the new difficulties encountered when studying these estimates in the discrete setting. I will then explain why the range $t \leq d^{1/2-\varepsilon}$ was approachable, outline the steps of our proof, and introduce a crucial fact concerning the behavior of lattice points in high-dimensional balls with small radii, which plays a key role in simplifying the problem.

O'Regan, William (University of British Columbia, Canada):
Sum-product phenomena for Ahlfors-regular sets.

Abstract: Sum-product phenomena is the maxim that additive and multiplicative structure find it hard to co-exist. An example of this is the result of Erdős and Szemerédi: There exists $c > 0$ so that for all large enough $A \subset \mathbb{Z}$ we have

$$|A + A| + |AA| > |A|^{1+c}. \tag{1}$$

In other words, finite subsets of $\mathbb{Z}$ cannot closely resemble rings.

Sum-product phenomena is now known to hold in a large variety of settings, in particular, for fractal sets. Loosely stated, if $A \subset \mathbb{R}$ has 'dimension' s, then one of $A + A$ or AA has 'dimension' at least Cs. It has been an open problem over the last few decades to quantify C. If the dimension of A is not too large, it is known due to Ren and Wang that we may take $C = 5/4$.

In this talk we show that we may take $C = 4/3$ if our set is Ahlfors-regular: we have equal Hausdorff and box dimension.

Oliveira, Itamar (University of Birmingham, UK):
A phase-space approach to weighted Fourier extension inequalities.

Abstract: The goal of the talk is to present a certain ray bundle representation of the Fourier extension operator in terms of the Wigner transform to investigate weighted estimates in restriction theory and their connections to time-frequency analysis and geometric combinatorics.

In joint work with Bennett, Gutierrez and Nakamura, we show how Sobolev estimates for the Wigner transform can be converted into certain tomographic bounds for the Fourier extension operator, which implies a variant of the (recently shown by H. Cairo to be false) Mizohata-Takeuchi conjecture. Together with Bez and the previous three authors, we employed of our phase-space approach in the context of Strichartz inequalities for orthonormal systems in the spirit of the work of Frank and Sabin. If time allows, we will make a further connection between our results and Flandrin's conjecture in signal processing through the study of certain singular integral operators similar to those studied by Lacey, Lie, Muscalu, Tao and Thiele.

Olivo, Andrea (Basque Center for Applied Mathematics (BCAM), Bilbao, Spain):
A variant of the isoperimetric inequality.

Abstract: It is well known that the celebrated Gagliardo estimate can be viewed as an extension of the classical isoperimetric inequality although the best constant was not obtained by Gagliardo. In this talk, we will explore some generalizations of this result involving weights, and we will discuss how it can be extended beyond smooth domains.

Pérez García, Jorge (Universidad Autónoma de Madrid, Spain):
Riesz transforms as Schur multipliers.

Abstract: Schur multipliers can be viewed as a flexible generalization of Fourier multipliers, making it natural to explore how classical results for Fourier multipliers extend to this setting. In this talk, we present a result concerning the Schur analogue of Riesz transforms, with applications ranging from new criteria for the S_p-boundedness of Schur multipliers to simplified proofs of some well-known results. This work is joint with Adrián González-Pérez, Javier Parcet, and Éric Ricard.

Plewa, Paweł (Wrocław University of Science and Technology, Poland):
Riesz transforms on solvable extensions of stratified groups.

Abstract: Let $G = N \rtimes R$, where N is a stratified Lie group group and R acts on N via automorphic dilations. Homogeneous left-invariant sub-Laplacians on N and R can be lifted to G, and their sum is a left-invariant sub-Laplacian Δ on G. We prove that the first-order Riesz transforms $X\Delta^{-1/2}$ are bounded on $L^p(G)$ for all $p \in (1, \infty)$, where X is any horizontal left-invariant vector field on G. The proof makes use of an operator-valued spectral multiplier theorem and hinges on estimates for products of modified Bessel functions and their derivatives.
This is a joint work with Alessio Martini from Politecnico di Torino.

Preisner, Marcin (University of Wrocław, Poland):
Hardy spaces meet harmonic weights.

Abstract: Let L be a non-negative self-adjoint operator on a metric measure space (X, d, μ). Denote by T_t the semigroup generated by L. By definition, a function f belongs to the Hardy space H^1_L if the maximal function $\sup_{t>0} |T_t f(x)|$ is integrable.

A classical result for the Laplacian $L = -\Delta$ on $\mathbb{R}^n$ states that a function f belongs to $H^1_{-\Delta}$ if it admits the atomic decomposition $f(x) = \sum_k \lambda_k a_k(x)$, where $\sum_k |\lambda_k| < \infty$ and the functions a_k, so called "atoms", satisfy the following conditions for some balls B_k:

$$\operatorname{supp} a_k \subseteq B_k, \quad \|a_k\|_\infty \leq |B_k|^{-1}, \quad \int a_k = 0.$$

Obviously, for the classical Laplacian $-\Delta$, the only bounded harmonic functions are the constant functions.

In this talk, we consider a differential operator L and its associated harmonic function h. We present results analogous to the classical atomic decomposition theorem, where the atoms satisfy localization, size, and cancellation conditions adapted to h. Additionally, we explore the case when there exist more than one linearly independent bounded harmonic function.

The results presented are based on joint work with Jacek Dziubański, Adam Sikora, and Lixin Yan.

Radillo-Murguia, Blanca (Baylor University, USA):
Directional Maximal Operators and Kakeya-Type Sets

Abstract: We will discuss a recent result that provides a condition on a set of directions $\Omega \subseteq \mathbb{S}^1$ sufficient to show the admissibility of Kakeya-type sets, extending prior work of Bateman and Katz. This condition guarantees that the associated directional maximal operator M_Ω is unbounded on $L^p(\mathbb{R}^2)$ for every $1 \leq p < \infty$. This work is joint with Paul Hagelstein and Alex Stokolos.

Ramos, Antonio Pedro (Scuola Internazionale Superiore di Studi Avanzati, Italy):
Fourier optimization and pair correlation problems in number theory.

Abstract: We apply Fourier optimization techniques to provide upper and lower bounds for the average value of Montgomery's function $F(\alpha, T)$, introduced to study the pair correlation of the non-trivial zeros of the Riemann zeta function. More generally, we consider analogues of Montgomery's function in the case of arbitrary sequences satisfying some basic assumptions, and connect their estimation to two extremal problems in Fourier analysis, which are promptly studied. This talk concerns work done in collaboration with Emanuel Carneiro, Mithun Kumar Das, Micah Milinovich, and Tolibjon Ismoilov.

Ray, Samya Kumar (Indian Institute of Science Education and Research Thiruvananthapurami):
Non-commutative square function associated to differences of ball averages and martingale.

Abstract: In this talk, we discuss weighted and unweighted weak type and strong type boundedness for certain square function associated to differences of ball averages and martingale in the non-commutative setting. One of the main tools to study this square function is non-commutative Calderón-Zygmund decomposition developed recently by Cadilhac, Conde-Alonso, and Parcet.

Riccardi, Federico (Politecnico di Torino, Italy):
Maximizing the eigenvalues of Toeplitz operators on the Fock space.

Abstract: Toeplitz operators T_F are widely studied operators acting on the Fock space $\mathcal{F}^2(\mathbb{C})$ and are determined by a function $F\colon \mathbb{C} \to \mathbb{C}$, called the *symbol* of the operator. When the symbol is the characteristic function of a set $\Omega \subset \mathbb{C}$ with finite positive measure, the corresponding operator $T_{\chi_\Omega} = T_\Omega$ is compact, positive and self-adjoint, and therefore admits a non-increasing sequence of eigenvalues $\lambda_1(\Omega) \geq \lambda_2(\Omega) \geq \cdots > 0$.

In this talk, we will explore recent results concerning the maximization (in a broad sense) of these eigenvalues. Beginning with the foundational result of Nicola and Tilli, which addresses the maximization of the first eigenvalues, we will present further developments — particularly regarding the Hilbert–Schmidt norm (i.e., a particular series of the eigenvalues) and the sum of the first K eigenvalues for any natural number K, in the case where Ω radial.

Rizzo, Elena (Università degli Studi di Milano, Italy):
Calderón-Zygmund theory and sparse domination of Bergman projectors on radial trees.

Abstract: Let $\mathfrak{X}$ be a tree endowed with the natural Bergman measures on trees, that give rise to Bergman spaces of harmonic functions.

When the tree has bounded geometry, i.e. the number of neighbours of a vertex is uniformly bounded on $\mathfrak{X}$, the resulting space is doubling and the classical Calderón-Zygmund theory can be applied. In this context we prove sparse domination for the Bergman projection, which provides weighted estimates and leads to a sufficient condition on weights that turns out to be a discrete counterpart of the one found by Bekollé and Bonami on the disc.

Then, allowing the tree to have unbounded geometry, but assuming it to be radial, we deal with a nondoubling setting. Nevertheless, a dyadic structure on the tree can be defined and techniques from dyadic analysis, as well as a suitable Calderón-Zygmund decomposition, can be employed to deal with the lack of the doubling property. We obtain endpoint estimates for integral operators and we prove sharper endpoint results and sparse-like bounds for the Bergman projection, that will bring to a stronger condition on weights.

This is joint work with J. Conde Alonso, F. De Mari, M. Monti and M. Vallarino.

Roy, Hrit (University of Edinburgh, United Kingdom):
A Uniform Decoupling Estimate for Convex Curves in the Plane.

Abstract: Decoupling estimates are an important tool in harmonic analysis with far-reaching applications in PDEs and number theory. The main idea is to take a function with frequencies near a curved manifold or a set with special arithmetic structure, and decompose the Fourier support into disjoint boxes to study the cancellation between the different frequency pieces caused by destructive interference.

Using a high/low argument, we prove an $\ell^2 L^6$ decoupling estimate for planar convex curves, extending Bourgain–Demeter's celebrated parabolic decoupling theorem in the plane.

Roychowdhury, Prasun (University of Milano Bicocca, Italy):
Sharp constants in the Adams-Cianchi inequality.

Abstract: The presentation will primarily focus on the derivation of optimal constants for various critical Sobolev embeddings. These fundamental inequalities were initially formulated by David R. Adams, while the determination of optimal constants in the first-order case is attributed to Andrea Cianchi. This is a joint work with Professor Daniel Spector.

Ruohoniemi, Ian (University of Minnesota, USA):
Conditions on Energy for Equispacing of Points on $\mathbb{S}^1$.

Abstract: Within the field of optimal point configurations, it is known that for many common forms of interaction energy, the minimizing configuration for n points on $\mathbb{S}^1$ equally spaces the points around the circle. However, a necessary and sufficient condition on the interaction energy for this property remains unknown. This talk will present known necessary conditions as well as sufficient conditions from Cohn-Kumar and Hardin-Saff. The talk will then discuss more of the conditions on the Fourier coefficients of the interaction energy and expand upon attempts to unify the two known sufficient conditions under one common theory.

Saari, Olli (Universitat Politècnica de Catalunya, Catalonia):
Poincaré inequalities with radial derivatives.

Abstract: Consider the space $\mathbb{R}^n$, $n \geq 2$. Let $p \in [1, \infty)$. The inequality

$$\int_{B(0,1)} |f(x) - f_{B(0,1)}|^p \, dx \leq C \int_{B(0,1)} |g(x)|^p \, dx$$

with $C = C(n, p)$ holds for all smooth functions f when $g = \nabla f$. It does not necessarily hold when $g(x) = (x/|x|) \cdot \nabla f(x)$. A recent result of Cabré shows that it does hold, however, under the additional assumptions $p = 1$ and f be superharmonic. In this talk, I discuss a recent joint work with X. Cabré identifying all the values of p, for which the inequality holds when f is superharmonic.

Saucedo, Miquel (Centre de Recerca Matemàtica, Spain):
Every classical inequality for the Fourier operator is trivial.

Abstract: In this talk we will see that if the Fourier operator is bounded between two classical spaces (for instance, rearrangement invariant spaces), then every operator which maps L^1 and L^2 to L^∞ and L^2, respectively, must also be bounded. We will also discuss why this means that there cannot be any 'interesting' classical Fourier inequalities and give some applications. Joint work with Sergey Tikhonov.

Schiavone, Nico Michele (Universidad Politécnica de Madrid, Spain):
Uniform resolvent estimates for the Heisenberg sublaplacian and applications.

Abstract:

Many physical systems evolve under constrained dynamics, operating within specific geometric frameworks where motion is restricted to predetermined directions in the tangent space. A natural setting to model such systems is provided by non-abelian Carnot (or stratified) groups, with the Heisenberg group $\mathbb{H}^d$ serving as a well-known toy model. Central to the sub-Riemannian structure of $\mathbb{H}^d$ is the sublaplacian $\mathcal{L}$, which serves as the counterpart of the Euclidean Laplacian, though with important differences.

We present global bounds for solutions to both stationary and time-dependent Schrödinger equations associated with the sublaplacian $\mathcal{L}$, as well as its fractional powers $\mathcal{L}^s$ and the conformally invariant fractional power $\mathcal{L}_s$. The key ingredient in our approach is a new abstract uniform weighted resolvent estimate, derived using the method of weakly conjugate operators—a variant of Mourre's commutator method—together with Hardy-type inequalities on the Heisenberg group.

Resolvent estimates and the Helmholtz equation represent some of the strongest connections between Fourier Analysis, Partial Differential Equations, and Spectral Theory. In fact, as an application of our uniform resolvent estimates, we derive Kato-type smoothing effects for the time-dependent Schrödinger equation, and the spectral stability of the sublaplacian perturbed by complex decaying potentials that satisfy a subordination condition.

Joint work with Luca Fanelli, Haruya Mizutani, and Luz Roncal.

Sjögren, Peter (University of Gothenburg, Sweden)
Variational inequalities for the Ornstein–Uhlenbeck semigroup.

Abstract: We study the variation seminorm of order ϱ for a general Ornstein–Uhlenbeck semigroup $(H_t)_{t>0}$, in any finite dimension. This is a way of measuring the speed of the convergence $H_t f \to f$ as $t \to 0$. For $\varrho > 2$ this variation is known to define a bounded operator on ^{p} with respect to the invariant measure, and we prove the corresponding weak type (1,1). But when $\varrho \leq 2$ no strong nor weak ^{p} bounds hold.

Taylor, Mitchell (ETH Zurich, Switzerland):
Stable phase retrieval.

Abstract: The classical phase retrieval problem was originally formulated in an infinite dimensional setting, where one wishes to recover information on a signal from magnitude measurements of the Fourier transform. However, until recently, global stability of the phase retrieval problem was believed to be impossible in infinite dimensions. I will discuss recent work showing that this is not the case, and in fact there is a rich class of infinite dimensional subspaces doing stable phase retrieval.

Ulmer, Martin (Brown University, United States of America):
A new solvability condition for L^p boundary value problems.

Abstract: We are discussing the elliptic operator $L := \operatorname{div}(A\nabla\cdot)$ and wonder which types of matrices A yield solvability of L^p boundary value problems. It is well-known that the DKP or Carleson condition implies solvability for the Dirichlet and the regularity boundary value problem. Equally, if the domain is the upper half space, independence of the transversal direction t gives solvability of these boundary value problems.

On the upper half space $\mathbb{R}^{n+1}_+$, we would like to introduce a different sufficient condition for solvability which is given by

$$\int_0^\infty \|\partial_t A(\cdot,t)\|_{L^\infty} dt < \infty.$$

This $L^1 - L^\infty$ condition implies solvability of the L^p Dirichlet and regularity boundary value problem. If we are in the setting of the upper half plane $\mathbb{R}^2_+$, we obtain a stronger result for the Dirichlet problem by the

same proof strategy: If A satisfies an L^1-Carleson condition on $\partial_t A$, then we obtain $\omega \in A_\infty(\sigma)$ or solvability of the L^p Dirichlet problem.

Uraltsev, Gennady (University of Arkansas, USA):
Probabilistic Well-Posedness for the Cubic NLS Using Directional Norms and Multilinear Expansions.

Abstract: The nonlinear SchrÃ¶dinger equation (NLS) is a case study for dispersive partial differential equation, where different frequencies travel at distinct velocities, and the linearized flow does not present a clear smoothing effect. As an infinite-dimensional Hamiltonian system, the NLS suggests the existence of invariant measures associated with its flow. Constructing such a measure requires establishing probabilistic local well-posedness of NLS in low regularity spaces.

While significant progress has been made for NLS on the torus, beginning with Bourgain's work in the 1990s, analogous results on Euclidean space remain are limited.

In this talk, we prove the probabilistic local well-posedness of the cubic NLS

$$(i\partial_t + \Delta)u = \pm|u|^2 u \text{ on } [0,T) \times \mathbb{R}^d,$$

for unit-scale Wiener randomized initial data in $H^S_x(\mathbb{R}^d)$. For the physically relevant case $d = 3$ we cover the range of regularities $S > 0$.

We introduce a refined decomposition of solutions: an explicit multilinear expansion of high order driven by the random initial data, and a smoother remainder term with deterministically subcritical regularity. The quantitative analysis uses directional smoothing and maximal estimates, that generalize classical multilinear Strichartz estimates.

These methods could have implications for related stochastic dispersive equations as well as to questions related to global-in-time dynamics.

Vedana, Guilherme (Instituto de Matematica Pura e Aplicada, Brazil):
A classification of Fourier Summation formulas.

Abstract: A Fourier Summation pair (FS-pair) is a pair (μ, a), where μ is a tempered measure on $\mathbb{R}$ and $a : \mathbb{R} \to \mathbb{C}$ is a function with countable support, and such that $\int_{\mathbb{R}} \widehat{\varphi}(t) d\mu(t) = \sum_{n\geq 0} a(\lambda_n)\varphi(\lambda_n)$ holds for any test function $\varphi \in C_c^\infty(\mathbb{R})$. Here $\{\lambda_n; n \geq 0\} = \{x \in \mathbb{R}; a(x) \neq 0\}$ is any enumeration of the support of a. We ask the condition that $\sum_{\lambda_n \in [-T,T]} |a(\lambda_n)| < \infty$ for all $T > 0$, so that the above statements are well defined. The basic example is the Poisson summation formula $\sum_{k\in\mathbb{Z}} \varphi(k) = \sum_{m\in\mathbb{Z}} \widehat{\varphi}(m)$, where $a(x) = 1_{\mathbb{Z}}(x)$ is the indicator function of the integers and $\mu = \sum_{k\in\mathbb{Z}} \delta_k$.

FS-pairs appear abundantly in Number Theory, for instance in the study of properties of the Riemann Zeta function, the Guinand-Weil explicitly formula, the Selberg trace formula, sphere packings, Fourier interpolation formulas among other examples. There are also applications to crystallography, in determining the atomic structure of materials called crystals and quasicrystals. This structure, which is represented by a measure μ, and which we want to discover, is reconstructed from the knowledge of $|\widehat{\mu}|^2$, which is obtained from experiments.

In this talk, we present a complete classification of the FS-pairs (μ, a) for which the function a has finite exponential growth, that is, $\sum_{n\geq 0} |a(\lambda_n)|e^{-\alpha|\lambda_n|} < \infty$, for some $\alpha > 0$. We prove that any such pair can be uniquely associated with a holomorphic map $F(z)$ in $\mathbb{C}^+$, the complex upper-half plane, which is both almost periodic and belongs to the Nevanlinna class. This function $F(z)$ encapsulates the information contained in the FS-pair (μ, a) by having the coefficients of its "Fourier series" given by the function $a(\cdot)$ and μ is the measure of its Nevanlinna factorization. The converse is also true: starting from any such function $F(z)$, it is possible to build a FS-pair.

Zhai, Yujia (Harbin Institute of Technology, China):
Multilinear singular integrals under the framework of Brascamp-Lieb.

Abstract: We will introduce the general Brascamp-Lieb framework to categorize and study multilinear singular integrals. While many well-known multilinear singular integral operators are of Hölder type, such as paraproduct and bilinear Hilbert transform, we will focus on the operators with non-Hölder scaling. We will take a glimpse at the analyses trailered to this wide class of operators if time permits.