ORAM 12 Talk Abstracts

Plenary Talks

On certain function spaces in harmonic analysis

Galia Dafni
Concordia University

We consider some function spaces which are closely related to the real Hardy spaces H^p, $0 < p \leq 1$, and BMO, including VMO, nonhomogeneous h^p and bmo, and versions defined on domains, and discuss results involving the boundedness of operators and extension domains.

The relativistic Euler equations with a physical vacuum boundary

Marcelo Disconzi
Vanderbilt University

We consider the relativistic Euler equations with a physical vacuum boundary and an equation of state $p(\varrho) = \varrho^\gamma$, $\gamma > 1$. We establish the following results. (i) local well-posedness in the Hadamard sense, i.e., local existence, uniqueness, and continuous dependence on the data; (ii) low regularity solutions: our uniqueness result holds at the level of Lipschitz velocity and density, while our rough solutions, obtained as unique limits of smooth solutions, have regularity only a half derivative above scaling; (iii) stability: our uniqueness in fact follows from a more general result, namely, we show that a certain nonlinear functional that tracks the distance between two solutions (in part by measuring the distance between their respective boundaries) is propagated by the flow; (iv) we establish sharp, essentially scale invariant energy estimates for solutions; (v) we establish a sharp continuation criterion, at the level of scaling, showing that solutions can be continued as long as the velocity is in $L^1_t Lip_x$ and a suitable weighted version of the density is at the same regularity level. This is joint work with Mihaela Ifrim and Daniel Tataru.

Dispersive estimates for Dirac operators

Burak Erdogan
University of Illinois at Urbana Champaign

We will review recent results on dispersive decay estimates for the Dirac operators in $\mathbb{R}^n$ with a decaying self-adjoint potential. These include $L^1 \to L^\infty$ and Strichartz estimates. We will also discuss the classification of threshold resonances and their effects on dispersive estimates and the limiting absorption principle for Dirac operators. The talk is based on joint works with M. Goldberg (U. Cincinnati), W. Green (Rose-Hulman), and E. Toprak (Yale).

Equality in the spacetime positive mass theorem

Lan-Hsuan Huang
University of Connecticut

The equality case of the spacetime positive mass theorem says that an asymptotically flat initial data set with the dominant energy condition and the null ADM energy-momentum must isometrically embed into Minkowski space. Previous proofs either used spinor methods, relied on the Jang equation, or assumed three spatial dimensions. We provide a new variational proof. This talk is based on joint work with Dan Lee.

Harmonic maps with free boundary and beyond

Yannick Sire
Johns Hopkins University

I will introduce a new heat flow for harmonic maps with free boundary. After giving some motivations to study such maps in relation with extremal metrics in spectral geometry, I will construct weak solutions for the flow and derive their partial regularity. The introduction of this new flow is motivated by the so-called half-harmonic maps introduced by Da Lio and Riviere, which provide a new approach to the old topic of harmonic maps with free boundary. I will also state some open problems and possible generalizations.

Contributed Talks

Existence of isoperimetric sets on non-negatively curved 2-dimensional metric spaces

Gioacchino Antonelli
Courant Institute (New York University)

An Alexandrov space with non-negative curvature is a complete and boundedly compact metric space in which geodesic triangles are thicker than comparison triangles on the Euclidean plane $\mathbb{R}^2$.

In this talk I will show that on 2-dimensional Alexandrov spaces with non-negative curvature the isoperimetric problem admits a solution for every volume. The proof uses a direct variational argument, and the challenging case is the one in which the space is non-compact. In the non-compact case the strategy is to couple a concentration-compactness argument together with a refined analysis of the geometry at infinity of the space.

This is based on a recent work with M. Pozzetta.

On finite configurations in the spectra of singular measures

Rami Ayoush
University of Warsaw

During the talk I will discuss applications of elementary additive combinatorics to dimensional estimates of PDE- and Fourier-constrained measures. My main tool will be a simple certainty principle of the following form: a set $S \subset \mathbb{R}^N$ contains a given finite linear pattern, provided that S is a spectrum of a sufficiently singular measure. This approach is inspired by results of Chang, Laba and Pramanik, concerning fractal analogs of Roth-Szemeredi theorem.

Fourier transform restriction phenomena and applications to control of dispersive equations

Roberto Capistrano-Filho
Virginia Tech and Federal University of Pernambuco

J. Bourgain discovered a subtle smoothing property of solutions of the KdV equation posed on a periodic domain. Since this celebrated article, the smoothing properties for dispersive systems are now well known. In this talk, we will see that in the last 10 years, the Bourgain spaces are fundamental to addressing the global control problems in periodic frameworks. Precisely, we will show that propagation of compactness and regularity have been observed thanks to these spaces in various control problems for dispersive systems.

Analysis of the Transmission Eigenvalue Problem with Two Conductivity Parameters

Rafael Ceja Ayala
Purdue University

In this talk, we show the existence and discreetness of the transmission eigenvalue problem with two conductivity parameters. In previous studies, this problem was analyzed with one conductive boundary parameter, while in this study we consider the case of two parameters. The underlying physical model is given by the scattering of a plane wave for an isotropic scatterer. We will study the dependance on the physical parameters and the monotonicity of the first transmission eigenvalue with respect to the parameters. Lastly, we will consider the limiting procedure as the second boundary parameter vanishes and present numerical results.

Asymptotic Mean-Value Formulas for Nonlinear Equations

Fernando Charro
Wayne State University

In recent years there has been an increasing interest in whether a mean-value property, known to characterize harmonic functions, can be extended in some weak form to solutions of nonlinear equations. This question has been partially motivated by the surprising connection between Random Tug-of-War games and the normalized p-Laplacian discovered some years ago by Peres et al., where a nonlinear asymptotic mean-value property for solutions of a PDE is related to a dynamic programming principle for an appropriate game. In this talk we discuss asymptotic mean-value formulas for a class of nonlinear second-order equations that includes the classical Monge-Ampre and k-Hessian equations among other examples.

Infinite Speed of Propagation of Fractional Dispersive Waves

Brian Choi
Southern Methodist University

This talk addresses the time evolution of the support of solutions to fractional dispersive equations. It is shown by complex-analytic arguments that all non-trivial dispersive waves, whose dispersion relation is defined with minimal hypotheses on its regularity, are compactly supported for at most one time element. Furthermore the method developed here applies to time fractional-order systems given by the Caputo derivative where the generalized space-time fractional Schrödinger equation is considered for concreteness. When the energy operator $i\partial_t$ and the Riesz derivative $(-\Delta)^{\frac{\beta}{2}}$ are fractionalized to the same order, it is shown that the sharp frequency-localized dispersive estimates yield the time decay of solutions that depends on both the spatial dimension and the long-memory effect, portraying a qualitative behavior different from that of the classical Schrödinger time evolution. This is a joint work with a graduate student Steven Walton.

Weighted Bergman kernels and weak-type estimates

Adam Christopherson
The Ohio State University

In this talk, we discuss the weak-type regularity of the Bergman projection on power-generalized Hartogs triangles in $\mathbb{C}^2$ and $\mathbb{C}^3$. In particular, we expand on a result of Huo-Wick for the classical Hartogs triangle by showing that the Bergman projection satisfies a weak-type estimate at the upper endpoint of L^p boundedness. This work is joint with K.D. Koenig.

Projections in the convex hull of isometries on function spaces

Priyadarshi Dey
University of South Florida

An interesting problem in Banach space theory is to study the projections which are in the convex hull of surjective isometries. The study was initiated by Fernanda Botelho for the space of all continuous functions with values in a strictly convex space and it was shown that for a strictly convex Banach space X, a projection which is in the convex hull of 2 surjective isometries is a generalized bi-circular projection. The problem was further studied by various mathematicians for convex hull of three isometries as well. In this talk, a general result will be mentioned along this line. Also, in specific, I will show some applications of the above result for spaces of vector-valued absolutely continuous functions. This is a joint work with Fernanda Botelho & Zachary Easley.

The Parabolic ∞-Laplace Equation in Grushin-Type Spaces

Zachary Forrest
University of South Florida

Let $1 \leq m < n$ and consider the C^2 function $\sigma : \mathbb{R}^m \to \mathbb{R}$ where $\{\sigma = 0\} = Z \times \mathbb{R}^{n-m}$ for a discrete set $Z \subset \mathbb{R}^m$. The vector fields

$$\begin{cases} X_i(p) := \dfrac{\partial}{\partial x_i} & i = 1, 2, \ldots, m \\ \\ X_j(p) := \sigma(p_1, p_2, \ldots, p_m) \dfrac{\partial}{\partial x_j} & j = m+1, m+2, \ldots, n \end{cases}$$

define a class of Grushin-type spaces, a class of sub-Riemannian spaces lacking an algebraic group structure.

This talk concerns the existence-uniqueness of viscosity solutions to the Cauchy problem

$$\begin{cases} w_t + \mathfrak{D}\, w = 0 \text{ in } \Omega_T \\ \qquad\quad w = g \text{ on } \partial_{\mathrm{par}}\Omega_T, \end{cases}$$

where $\mathfrak{D}$ represents either the ∞- or the $\infty(\cdot)$-Laplacian.

Lipschitz Free Spaces over Unions of Metric Spaces

Chris Gartland
Texas A&M

The Lipschitz free space $\mathcal{F}(X)$ over a metric space X is a canonical Banach space containing a copy of X isometrically. Naturally, a principal theme is to investigate the relationship between geometric properties of X and linear-geometric properties of $\mathcal{F}(X)$. A well-studied problem within this theme is classify those X for which $\mathcal{F}(X)$ is isomorphic to L^1. In this talk, we'll discuss our recent result that $\mathcal{F}(X \cup Y)$ is isomorphic to L^1 whenever X, Y are subsets of some ambient metric space with finite Nagata dimension and both $\mathcal{F}(X)$ and $\mathcal{F}(Y)$ are isomorphic to L^1. Based on joint work with David Freeman.

Fractional Leibniz Rules in the Setting of quasi-Banach Function Spaces

Elizabeth Hale
Kansas State University

Fractional Leibniz rules are reminiscent of the product rule learned in calculus classes, offering estimates in the Lebesgue norm for fractional derivatives of a product of functions in terms of the Lebesgue norms of each function and its fractional derivative. We prove such estimates for Coifman-Meyer multiplier operators in the setting of Triebel-Lizorkin and Besov spaces based on quasi-Banach function spaces. As corollaries, we obtain results in weighted mixed Lebesgue spaces and Morrey spaces, as well as the class of rearrangement invariant quasi-Banach function spaces, of which weighted Lebesgue spaces, Lorentz spaces, and Orlicz spaces are specific examples.

Recovering initial temperature of a two-dimensional body from finite time observations

Ramesh Karki
Indiana University East

We have studied an inverse problem of recovering an initial temperature profile of a thin uniform two-dimensional square plate from finite time observations made at a suitably chosen fixed location of the plate. This generalizes the outcome of our previous work related to a one-dimensional case.

Obstacle problems with double boundary condition for least gradient functions in metric measure spaces

Josh Kline
University of Cincinnati

In this talk we discuss the following generalization of the least gradient problem: minimize the BV-energy in a domain Ω of all functions which are bounded between two obstacle functions in Ω and whose trace lies between two prescribed functions on $\partial\Omega$. In the metric setting, we construct solutions to this problem for continuous obstacle and boundary functions when the domain is uniform and satisfies a certain positive mean curvature condition.

Two Weight Bump Conditions for Compactness of Commutators

Adam Mair
University of Alabama (Tuscaloosa)

We prove certain two weight bump conditions are sufficient for the compactness of the commutator $[b, T]$ where $b \in CMO$ and T is a Caldern- Zygmund operator. This is the first result for compactness in the two weight setting without additional assumptions on the individual weights. If time allows we may discuss generalizations, including iterated commutators and fractional integral operators.

Constant gap length trees in products of thick Cantor sets

Alex McDonald
The Ohio State University

Many questions of interest in geometric measure theory ask whether a sufficiently 'large' fractal must contain patterns of a given type. For example, there is a large body of work concerning patterns in sets with sufficiently large Hausdorff dimension. Recently, there has been progress on patterns in sets whose size is measured by a notion of 'thickness' instead of Hausdorff dimension. We show that distance-t-graphs with a tree structure appear in such sets for an interval worth of distances t. Joint work with Krystal Taylor.

Co-Dimension One Stable Blowup for the Quadratic Wave Equation Beyond the Light Cone

Michael McNulty
Michigan State University

Nonlinear wave equations of power-type have been recognized to serve as important toy models for geometric partial differential equations such as the hyperbolic Yang-Mills and wave maps equations. For energy supercritical problems, unstable self-similar solutions are believed to play a crucial role in describing the threshold for singularity formation. In this talk, we will discuss the stability of an explicit, genuinely unstable self-similar solution of the energy supercritical quadratic wave equation. This solution becomes singular at a single point and remains smooth everywhere else. By using a well-adapted system of coordinates, we are able to investigate its stability arbitrarily close to the Cauchy horizon of the singularity. We will emphasize, in particular, the interplay between geometric and evolutionary aspects of a novel method for investigating unstable self-similar solutions of nonlinear wave equations.

Regularity and asymptotic properties of nonlocal stochastic evolution equations arising in chemical and biomedical models

Oleksandr Misiats
Virginia Commonwealth University

This talk is devoted to the influence of stochastic perturbations on the long time behavior of nonlocal evolution equations, such as the bidomain model of heart tissue, and the aggregation-diffusion equation (Keller-Segel model). The nonlocal character of these equations can be present either in the differential operator (bidomain) or in the reaction term (Keller-Segel). Using the fundamental concepts in the area of stochastic analysis, semigroup theory and PDEs, in my talk, I will address the effects of noise on the existence of global vs. local solutions (Keller-Segel), their regularity, as well as the existence of invariant measures (for the bidomain model), which is the key step in establishing the qualitative behavior of the underlying physical system.

Regularity of Solutions for Nonlocal Diffusion Equations on Periodic Distributions

Ilyas Mustapha
Kansas State University

We study the regularity of solutions to the nonlocal diffusion equation given by

$$\begin{cases} u_t(x,t) = L^{\delta,\beta}u(x,t), \ x \in T^n, \ t > 0, \\ u(x,0) = f(x), \end{cases}$$

over the space of periodic distributions $H^s(T^n)$ with $s \in \mathbb{R}$. Here, T^n denotes the periodic torus in $\mathbb{R}^n$ and $L^{\delta,\beta}$ is a nonlocal Laplace operator. We present results on the spatial regularity of solutions in terms of regularity of the initial data.

Rational homotopy group and its fractional estimate

Woongbae Park
University of Pittsburgh

In this talk, I introduce generalized topological degree called rational homotopy group and provide its integral representation formula. From this, we can get analytic estimate of the degree so the notion of degree can extend to (fractional) Sobolev maps.

Bose-Einstein condensation for particles with repulsive short-range pair-interactions in a Poisson random external potential in $\mathbb{R}^d$

Maximilian Pechmann
University of Tennessee, Knoxville

We study Bose gases in d dimensions, $d \geq 2$, with short-range repulsive pair-interactions, at positive temperature, in the canonical ensemble and in the thermodynamic limit. We assume the presence of hard Poissonian obstacles and focus on the non-percolation regime. For sufficiently strong interparticle-interactions, we show that almost surely there cannot be Bose–Einstein condensation into a sufficiently localized, normalized one-particle state. The results apply to the canonical eigenstates of the underlying one-particle Hamiltonian.

Matrix Weights and Convolution Operators in Variable Lebesgue Spaces

Michael Penrod
University of Alabama

The theory of matrix $\mathcal{A}_p$ weights has attracted considerable attention, beginning with the work of Nazarov, Treil, and Volberg in the 1990s. In this talk, we describe our work to extend this theory to the variable Lebesgue spaces. Generalizing matrix $\mathcal{A}_p$ to the variable exponent setting plays a crucial role.

David Cruz-Uribe, Kabe Moen, and Scott Rodney proved that given a matrix weight $W \in \mathcal{A}_p$ and a nice function $\phi \in C_c^\infty(\Omega)$, the convolution operator $\mathbf{f} \mapsto \phi * \mathbf{f}$ is bounded and approximate identities defined using ϕ converge. We extend the convergence of this convolution operator to matrix weighted variable Lebesgue spaces. As an application of our work, we prove a version of the classical $H = W$ theorem for matrix weighted, variable exponent Sobolev spaces.

Global regularity issue of the two-and-a-half dimensional Hall-magnetohydrodynamics system

Mohammad Mahabubur Rahman
Texas Tech University

Whether or not the solution to the $2\frac{1}{2}$-dimensional Hall-magnetohydrodynamics system starting from any smooth initial data preserves its regularity for all time remains a challenging open problem. Although the research direction on component reduction of regularity criteria for Navier-Stokes equations and magnetohydrodynamics system has caught much attention recently, the Hall term has presented many difficulties. In this manuscript we discover a certain cancellation within the Hall term and obtain various new regularity criteria: first, in terms of a gradient of only the third component of the magnetic field; second, in terms of only the third component of the current density; third, in terms of only the third component of the velocity field; fourth, in terms of only the first and second components of the velocity field. As another consequence of the cancellation that we discovered, we are able to prove the global well-posedness of the $2\frac{1}{2}$-dimensional Hallmagnetohydrodynamics system with hyper-diffusion only for the magnetic field in the horizontal direction; we also obtained an analogous result in the 3-dimensional case via the discovery of additional cancellations. These results extend and improve various previous works. This is the joint work with Prof. Kazuo Yamazaki.

On Uniqueness for Half-Wave Maps in Dimension $d \geq 3$

Silvino Reyes Farina
University of Pittsburgh

Half-wave maps appear in the physics literature as the continuum limit of Calagero-Moser spin systems. In this talk, we discuss uniqueness for solutions of the half-wave equation in dimension $d \geq 3$ in the natural energy class obtained by extending an argument by Shatah and Struwe. In the proof, we differentiate in time to arrive at a wave-type equation, and then use a Grnwall inequality argument to obtain uniqueness. We rely on geometric properties combined with fractional Leibniz rules and related commutator estimates. Joint work with E. Eyeson and A. Schikorra.

Large Scale Estimate for Dirichlet Problems on a Bounded Perforated Domain

Robert Righi
University of Kentucky

The goal of this presentation is to obtain a large scale estimate for the Dirichlet problem for Laplace's equation in a bounded domain $\Omega_{\epsilon,\eta}$ perforated quasi-periodically with small holes in $\mathbb{R}^d$, where the minimal distance between holes is of order ϵ and η represents the ratio between the size of the holes and ϵ. The result relies on establishing convergences rates as $\epsilon \to 0$ to an intermediate solution given by a Schrödinger equation. This, combined with regularity estimates on our intermediate solution, will allow us to make use of a real-variable method for establishing L^p estimates.

Monotonicity in measure spaces and Hardy inequalities

Alejandro Santacruz Hidalgo
University of Western Ontario

We consider a measure space together with a totally ordered subset of its sigma algebra called an ordered core. Recently, this construction was used in the context of Hardy inequalities, giving a uniform treatment of many different types of Hardy operators. We will begin by introducing a definition of monotone functions compatible with the ordered core. We will find explicit connections between a measure space equipped with an ordered core and an induced measure over the half-line. As an application of this framework we will show a weight characterization for two-weight Hardy inequalities which hold on general metric measure spaces. This talk is based on joint work with Gord Sinnamon.

Toward a C^m Whitney Extension Theorem for Horizontal Curves in Free Step 2 Carnot Groups

Hyogo Shibahara
University of Cincinnati

Pinamonti, Speight, and Zimmerman established a C^m Whitney Extension Theorem for horizontal curves in the Heisenberg groups. In this talk, we will discuss this in the setting of step 2 free Carnot groups, G_r. First we give an example in G_3 which suggests that a simple generalization of the necessary and sufficient condition from the Heisenberg groups does not work. This motivates us to find a suitable condition to establish a C^m Whitney Extension Theorem in the setting of step 2 free Carnot groups. We report a C^m Whitney Extension Theorem for horizontal curves in G_3.

Fredholm determinants, Evans functions and Maslov indices

Alim Sukhtayev
Miami University

The Evans function is a well known tool for locating spectra of differential operators in one spatial dimension. We construct a multidimensional analogue as the modified Fredholm determinant of a ratio of Dirichlet-to-Robin operators on the boundary. This gives a tool for studying the eigenvalue counting functions of second-order elliptic operators that need not be self-adjoint. In the self-adjoint case we relate our construction to the Maslov index, another well known tool in the spectral theory of differential operators.

Multiplier weak type inequalities for maximal operators and singular integrals

Brandon Sweeting
The University of Alabama

We discuss a kind of weak type inequality for the Hardy-Littlewood maximal operator and Caldern-Zygmund singular integral operators that was first studied by Muckenhoupt and Wheeden and later by Sawyer. This formulation treats the weight for the image space as a multiplier, rather than a measure, leading to fundamentally different behavior. In this talk, I will discuss quantitative estimates obtained for A_p weights, $p > 1$, that generalize those results obtained by Cruz-Uribe, Isralowitz, Moen, Pott and Rivera-Ros for $p = 1$. I will also discuss an endpoint result for the Riesz potentials.

The First Beurling and Malliavin Theorem Revisited.

Ioann Vasilyev
Universit Paris Saclay

The First Beurling and Malliavin Theorem is a classical result in Harmonic Analysis. This theorem has attracted the attention of several recognized mathematicians including J.-P. Kahane, Y. Kaznelson, L. de Branges, P. Koosis, V. Havin, F. Nazarov, N. Makarov, A. Poltoratski, etc. This result provides limits of applicability of the following naive formulation of the Uncertainty Principle in Harmonic Analysis: 'A nonzero function and its Fourier image cannot be too small simultaneously'. In my talk, I will discuss recent generalizations of this theorem. If time permits, then I will also talk about possible analogues of this result in several dimensions.

$W^{1,p}$ estimates for Dirichlet Problems in Perforated Domains

Jamison Wallace
University of Kentucky

We consider the Dirichlet problem for Laplace's equation in a domain perforated periodically with small holes. We are primarily concerned with obtaining uniform $W^{1,p}$ estimates for solutions with explicit dependence on both the minimal distance between holes and the ratio of the hole size to minimal distance. We will discuss how these estimates can be obtained using a large-scale Lipschitz estimate for harmonic functions in perforated domains.

Inequalities in homogeneous Triebel-Lizorkin and Besov-Lipschitz spaces

Lifeng Wang
University of Pittsburgh

In this presentation, the speaker will introduce the definition of homogeneous Triebel-Lizorkin and Besov-Lipschitz spaces, the Peetre-Fefferman-Stein maximal function, and the Plancherel-Polya-Nikol'skij inequality. Furthermore, the speaker will also introduce some research results related to homogeneous Triebel-Lizorkin and Besov-Lipschitz quasinorms and the iterated difference of a function, including historical developments by celebrated mathematicians such as H. Triebel, E. M. Stein, and A. Seeger. Some most recent results on this topic are also included. This presentation also introduces relevant corollaries and uses these corollaries to deduce new inequalities.

Uniform quasiconformal groups of nilpotent Lie groups

Xiangdong Xie
Bowling Green State University

A group of quasiconformal maps of a metric space X is called a uniform quasiconformal group if there is some $K \geq 1$ such that each element of the group is K-quasiconformal. Clearly a quasiconformal conjugate of a conformal group is a uniform quasiconformal group. A natural question is when the converse holds. Tukia's theorem says that if a uniform quasiconformal group of $\mathbb{S}^n$ for $n \geq 2$ is big enough, then the converse holds. We present a generalization of Tukia's theorem to uniform quasiconformal groups of two classes of nilpotent Lie groups: Carnot groups and Carnot-by-Carnot groups. This has consequences for the quasiisometric rigidity of solvable Lie groups and finitely generated solvable groups. This talk is based on joint work with Tullia Dymarz and David Fisher.

Regularity of Geodesics in Singular Metric Spaces

Chengcheng Yang
University of Cincinnati

In many singular metric spaces, the regularity of a shortest-length curve is unknown. Algebraic varieties, or more generally semi-algebraic sets defined by finitely many polynomial equalities and inequalities, all locally partition into finitely many analytic submanifolds called strata. Therefore any component of a shortest-length curve which lies completely in one such stratum is a real analytic curve in the stratum. The key question is whether there are only finitely many components.

F. Albrecht and I. D. Berg proved this for geodesics in a closed region of the Euclidean space with an analytic boundary. We then generalize their result in $\mathbb{R}^3$ to a union of two regions with analytic boundary and intersecting transversally. Moreover in the case of semi-algebraic sets, we could prove this for $\mathbb{R}^2$ and we will discuss our current research progress in $\mathbb{R}^3$.

Sharp Holder Regularity for Nirenberg's Complex Frobenius Theorem

Liding Yao
The Ohio State University

Nirenberg's famous complex Frobenius theorem gives necessary and sufficient conditions on a locally integrable structure for when it is equal to the span of some real and complex coordinate vector fields. In the talk I will discuss some differential complexes and how some of the notions make sense in the non-smooth setting. For a $C^{k,s}$ complex Frobenius structure, we show that there is a $C^{k,s}$ coordinate chart such that the structure is spanned by coordinate vector fields which are $C^{k,s-\epsilon}$ for all $\epsilon > 0$. Here the $\epsilon > 0$ loss in the result is optimal.

Monotone rearrangement on VMO

Pavel Zatitskii
University of Cincinnati

Monotone rearrangement is a useful tool in studying extremal problems on various function classes. It is known that rearrangement does not increase the BMO-norm of a function defined on an interval, or the A_p-characteristic of a Muckenhoupt weight on an interval. Moreover, the same is true for more general classes of functions that are defined in terms of averages. The proofs of these facts use the scale invariance of the norm (or characteristic) on such classes.

In the present talk, I will discuss why monotone rearrangement does not increase the Campanato-type norm of a VMO-function defined on an interval. The main difficulty and difference with the known results is that the Campanato-type norm is not scale invariant. The result has immediate applications in Bellman-function analysis on VMO.

The talk is based on recent joint work with Leonid Slavin