WORKSHOP IN HARMONIC ANALYSIS 2025

Friday, October 3

11:00 a.m. in VV 911:
Welcome

11:05 a.m. in VV 911:
Joris Roos (University of Massachusetts-Lowell)

2:00 p.m. in VV 911:
Shengwen Gan (UW Madison)

3:30-3:55 p.m.:
Colloquium's tea on VV 911

4:00 p.m. in VV B239 (Colloquium):
Hong Wang (Courant Institute and IHES)

Saturday, October 4

All talks in VV B239

9:30 a.m.:
Lars Becker (Princeton University)

11:00 a.m.:
Polona Durcik (Chapman University)

2:00 p.m.:
Manasa Vempati (Lousiana State University)

4:00 p.m.:
Shukun Wu (Indiana University).

List of Titles and Abstracts

Friday talks

Joris Roos
11:00 a.m. in VV 911

Title: A fractal local smoothing problem for the wave equation

Abstract: We will talk about a variant of the well-known local smoothing conjecture with times restricted to a fractal set. The fractal conjecture involves a new dimensional spectrum called the Legendre-Assouad function, which also comes up in the characterization of L^p improving properties of spherical maximal functions. Joint work with David Beltran, Alex Rutar and Andreas Seeger.

Shengwen Gan
2:00 p.m. in VV 911

Title: Sharp local smoothing estimates for curve averages

Abstract: I will talk about the sharp local smoothing estimates for curve averages in all dimensions. As a corollary, we prove the sharp L^p boundedness of the helical maximal operator in $\mathbb{R}^4$, which was previously known for $\mathbb{R}^2$ and $\mathbb{R}^3$. There are new ingredients in the proof: Fourier decay estimates and wave envelope estimates for nondegenerate curves in $\mathbb{R}^n$. This is joint work with Dominique Maldague and Changkeun Oh.

Hong Wang
Departmental Colloquium
4:00 p.m. in VV B239

Title: Restriction theory and projection theorems

Abstract: Restriction theory studies functions whose Fourier transforms are supported on some curved manifold in $\mathbb{R}^n$ (for example, solutions to the linear Schrodinger equation or to the wave equation). Projection theorems study the Hausdorff dimension of fractal sets under orthogonal projections from $\mathbb{R}^n$ to its subspaces. We will survey some recent works in both fields and discuss their interactions.

Saturday talks

Lars Becker
9:30 a.m. in VV B239

Title: On trilinear singular integral forms

Abstract: Which trilinear singular integral forms satisfy L^p estimates? Classical singular integral theory, more modern time-frequency analysis and the theory of the twisted paraproduct can be used to answer this question in many special cases. In this talk we discuss a classification of all trilinear singular integral forms, showing in particular which forms exactly the previous sentence applies to and what is left to be done. This is based on joint work with Polona Durcik and Fred Yu-Hsiang Lin.

Polona Durcik
11:00 a.m. in VV B239

Title: Bounds for a class of trilinear singular integrals

Abstract: We discuss bounds for a particular class of trilinear singular integral forms that arises as a natural case in the classification of trilinear singular Brascamp-Lieb integrals obtained in a joint work with L. Becker and F. Lin.

Manasa Vempati
2:30 p.m. in VV B239

Title: Weighted inequalities for singular integrals

Abstract: Weighted inequalities for singular integral operators are central in the study of non-homogeneous harmonic analysis. Two weight inequalities for singular integral operators, in-particular attracted attention as they can be essential in the perturbation theory of unitary matrices, spectral theory of Jacobi matrices and PDE's. In this talk, I will discuss several results concerning the two weight inequalities for various Calderón-Zygmund operators in both Euclidean setting and in the more generic setting of spaces of homogeneous type in the sense of Coifman and Weiss. We will also discuss the existence of similar analogues for multilinear Calderón-Zygmund operators.

Shukun Wu
4:00 p.m. in VV B239

Title: Weighted L^2 estimates and applications to L^p problems

Abstract: We will discuss some weighted L^2 estimates in the plane and their applications to a couple of L^p problems. These include the almost everywhere convergence of the planar Bochner-Riesz means, decay of circular L^p-means of Fourier transform of fractal measures, estimates for the maximal Schrödinger operator and the maximal extension operator, and an L^p analogue of the Mizohata–Takeuchi conjecture.