Rice University
Mathematics Department

Analysis Seminar

Tuesdays 4-5pm, Herman Brown Hall 227

Fall 2025

Date	Speaker	Title
08/26		
09/02		
09/09		
09/16	Sven Sandfelt (University of Chicago)	The Greenfield-Wallach conjecture on nilmanifolds
09/23		
09/30		
10/07	Kurt Vinhage (Utah)	
10/14	Juliet Aygun (Cornell) (midterm recess)	
10/21	Camilo Arosemena (Rice University)	
10/28	Arian Nadjimzadah (UCLA)	
11/04	Jon DeWitt (Penn State, to be confirmed)	
11/11	(interview season)	
11/18	(interview season)	
11/25	(interview season)	
12/02	Ronnie Pavlov (University of Denver)	

Spring 2025

Date	Speaker	Title
01/14		
01/21		
01/28	(keep free)	
02/04	Alex Cohen (MIT)	Lower Bounds for Incidences
02/11		
02/18	Wenyu Pan (Toronto)	Selberg, Ihara and Berkovich
02/25	Anton Gorodetski (UC Irvine)	On Rotation Numbers of One-Parameter Families of Cocycles
03/04	Long Li (Rice)	Almost Periodicity in Time of the Solutions to the Cubic Defocusing Nonlinear Schrödinger Equation
03/11		
03/18	(spring break)	
03/25	Hermann Schulz-Baldes (Erlangen)	Local Perturbations of Toeplitz Matrices
04/01	Wencai Liu (Texas A&M)	Rare Flat Bands for Z^d-Periodic Graph Operators
04/08	Milivoje Lukic (Rice)	Universality Limits for Orthogonal Polynomials
04/15	Wilhelm Schlag (Yale)	Stability Analysis of Topological Solitons and Applications of the Distorted Fourier Transform (via Zoom)
04/22		

Fall 2024

Date	Speaker	Title
08/27	(classes cancelled university-wide)	
09/03	Ping Zhong (University of Houston)	Brown measure of a sum of two free random variables and deformed random matrices
09/10		
09/17	Tal Malinovitch (Rice)	Twisted bilayer graphene in commensurate angles
09/24	Alberto Takase (Rice)	An application of the Combes-Thomas estimate for continuous multidimensional quasiperiodic Schrödinger operators
10/01		
10/08		
10/15	(midterm recess)	
10/22	Jake Fillman (Texas A&M)	Opening spectral gaps for ergodic operators
10/29	Giorgio Young (Michigan)	Rational solutions to the mKdV equation
11/05	(election day, no classes)	
11/12	(interview season)	
11/19	(interview season)	
11/26	(interview season)	
12/03	(interview season)	

Spring 2024

Date	Speaker	Title
01/09	Mitchell Luskin (University of Minnesota)	Math and Physics at the Moiré Scale
01/16	Rose Eliott Smith (University of Chicago)	Uniformly Expanding Random Walks on Manifolds
01/17	Fei Xu (Jilin University); this talk will be on Zoom at 8:30pm	On the Nonlinear Schrödinger Equation with Quasi-periodic Initial Data
01/23	Alexander Ortiz (MIT)	A Sharp Mizohata-Takeuchi-type Estimate for the Cone in R^3
01/30	Wendy Wang (Tsinghua U)	Centralizer Rigidity on Semisimple Lie Group
02/20	Nataliya Goncharuk (Texas A&M University)	Renormalization Operators and Arnold Tongues
03/05	Shiwen Zhang (University of Massachusetts Lowell)	Approximate Eigenvalues via the Landscape Function in Disordered Media
03/12	(spring break)	
03/26	Ilya Kachkovskiy (MSU)	Ballistic Transport for Discrete One-Dimensional Quasiperiodic Operators
04/02	Christopher Cedzich (Heinrich-Heine-Universität Düsseldorf)	Characteristics of the Unitary Almost Mathieu Operator

Fall 2023

Date	Speaker	Title
08/22	Tal Malinovitch (Rice)	Scattering For Schrödinger Operators In The Presence Of Anisotropic Potentials
09/19	Srivatsav Kunnawalkam Elayavalli (UCSD)	Property (T) implies strongly 1-bounded entropy
09/26	Olivine Silier (UC Berkeley)	A Proto Inverse Szemer\'edi-Trotter Theorem
10/03	Josh Zahl (UBC)	Sticky Kakeya Sets, and the Sticky Kakeya Conjecture
10/10	(Midterm recess)	
10/17	Alberto Takase (Rice)	Spectral Estimates of Dynamically-Defined and Amenable Operator Families
10/24	Shukun Wu (Indiana University)	The SL_2 Kakeya Problem
10/31	Adam Black (Yale)	Pointwise Dispersive Estimates for the Schrödinger Equation With a Coulombic Potential
11/21	(Thanksgiving week)	
11/28	Hong Wang (NYU)	

Abstracts

08/22 Tal Malinovitch (Rice)
Scattering For Schrödinger Operators In The Presence Of Anisotropic Potentials

In this talk, I will discuss the long-time behavior of solutions to the Schrödinger equation with potentials that decay fast enough along a collection of rays in \mathbb{R}^d. This generalizes the classical setting of short-range scattering in which the potential is assumed to decay along \emph{all} rays. We show that any state decomposes into a piece that "forgets" the potential, an asymptotically free piece, and a piece that may interact with the potential for long times. We show that both states are characterized by their long-term dynamic, specifically by being approximately localized in phase space asymptotically in time. We also show that in certain cases these characterizations can be purely spatial.

In this talk, I will briefly introduce some of the main ideas in scattering theory, state some of the results, sketch some of the main ideas in the proof, and briefly discuss some examples of these

interacting states for different systems. This is joint work with Adam Black.

09/19 Srivatsav Kunnawalkam Elayavalli (UCSD)
Property (T) implies strongly 1-bounded entropy

I will describe a recent result of mine with Hayes and Jekel, where we answer definitively a question of Jung and Shlyakhtenko from 2007 by showing that Voiculescu's entropy is strongly 1-boudned in the sense of Jung for non-commutative distributions that generate a property (T) von Neumann algebra. I will also discuss several new insights about free entropy and Property (T) that arise from this work.

Spring 2023

Date	Speaker	Title
01/24	Ashley Ran Zhang (Wisconsin)	Convergence of non-linear Fourier transform via spectral problems for canonical systems
01/31	Ao Cai (PUC Rio de Janeiro)	An Abstract LDT Theorem for Strongly Mixing Markov Systems
02/07	Xingya Wang (Rice University)	1-Dim Half-line Schrödinger Operators with H^{-1} Potentials
02/14		
02/21	Anton Gorodetski (UC Irvine)	Furstenberg Theorem and its Generalizations
02/28	Mehrdad Kalantar (University of Houston)	On type I hyperbolic locally compact groups
03/07		
03/14	No meeting (spring break)	
03/23 3pm in HBH 453	Benjamin Dodson (Johns Hopkins University)	Rigidity for solutions to the mass-critical NLS in one dimension
03/28		
04/04	Mishko Mitkovski (Clemson)	Uncertainty, sampling, stabilization, and control
04/11	Grigorii Monakov (UC Irvine)	On regularity of stationary measures for random dynamical systems
04/18	Íris Emilsdottir (Rice University)	The Schwartzman group of an affine transformation

Abstracts

01/24 Ashley Ran Zhang (Wisconsin)
Convergence of non-linear Fourier transform via spectral problems for canonical systems

This talk will be about connections between spectral problems for canonical systems and non-linear Fourier transforms (NLFTs). Non-linear Fourier transform is closely connected to Dirac systems, which form a subclass of canonical systems of differential equations. This connection allows one to find analogs of results on inverse spectral problems for canonical systems in the area of NLFT. In particular, NLFTs of discrete sequences, discussed in the lecture notes by Tao and Thiele, are related to spectral problems for periodic measures and the theory of orthogonal polynomials.

I will start the talk with the basics of non-linear Fourier transforms, then connect NLFTs to canonical systems. Then I will present an explicit algorithm for inverse spectral problems developed by Makarov and Poltoratski for locally-finite periodic spectral measures, as well as an extension of their work to certain classes of non-periodic spectral measures. Finally I will return to NLFT and translate the results for inverse spectral problems to results for NLFT.

02/07 Xingya Wang (Rice)
1-Dim Half-line Schrödinger Operators with H^{-1} Potentials

In this talk, I will share some spectral results of Schrödinger operators with locally H^{-1} potentials. In the first part, we will recover some general spectral theoretical results in the current setting, including a Last-Simon-type criteria for the presence and absence of the absolutely continuous spectrum on the open half-line. In the second part, we will focus on potentials which are decaying in a locally H^{-1} sense and present an analogue of short-range decay in the distributional setting. We will also look at a class of Pearson-type distributional potentials and establish a spectral transition result between short-range and long-range decay.

02/21 Anton Gorodetski (UC Irvine)
Furstenberg Theorem and its Generalizations

Let us consider the growth rate of the norm of a power of a 2x2 matrix. Asymptotically it will either grow exponentially fast (hyperbolic case), or polynomially, or will not grow at all (elliptic case). What if one takes two matrices and starts to multiply them in a random order? Is the growth rate of the norm of such random products going to be well defined, and what one can say about it? It turns out that even if both of the matrices are elliptic, the random products most likely will grow exponentially fast, unless in an extremely degenerate case (e.g. when both matrices are rotations). Formal statement about positivity of an exponential growth rate (Lyapunov exponent) in this setting is a famous Furstenberg Theorem on random matrix products. In a series of works with Victor Kleptsyn we obtained a few generalizations of this result. For example, even if each matrix in a random product is chosen with respect to its own distribution, one can still ensure that the norms of the random product will grow exponentially fast, with a well define non-random pattern of growth, which can be considered as a non-stationary version of Lyapunov exponent. As an application, we consider discrete Schrodinger operators with non-stationary random potentials and prove Anderson Localization for that model.

02/28 Mehrdad Kalantar (University of Houston)
On type I hyperbolic locally compact groups

The notion of type I, hailing from the very origins of operator algebras and representation theory, can be seen as a rigorous way to define the class of groups for which unitary representations can be classified in any meaningful manner. By a celebrated result of Thoma, a discrete group is type I if and only if it is virtually abelian. In the non-discrete case, the current state of the art is not nearly as complete. What is completely lacking, in contrast to Thoma's theorem, is a definite structural consequence of type I. This talk is around the following conjecture: Every second countable locally compact group of type I admits a cocompact amenable subgroup. We motivate the conjecture, provide some supporting evidence for it, and prove it for type I hyperbolic locally compact groups admitting a cocompact lattice.

This is joint work with Pierre-Emmanuel Caprace and Nicolas Monod.

04/03 Mishko Mitkovski (Clemson)
Uncertainty, sampling, stabilization, and control

I will present several new manifestations of the harmonic analysis uncertainty principle, and the corresponding sampling results. Our results were inspired by control and stabilization problems for some classes of PDE's. I will try to explain these connections and present some applications.