Last name	First name	Institution	Title of proposed presentation	Abstract
Balogh	Andras	The University of Texas-Rio Grande Valley	A Fourth Order Runge-Kutta Method for the Higgs Boson Equation in de Sitter Spacetime Using Graphics Processing Unit	The Higgs boson is an important concept in modern day particle physics. The equation for the Higgs real-valued scalar field in the de Sitter spacetime is a time-dependent, nonlinear wave equation in three space dimensions. We use an explicit fourth order RUnge-Kutta scheme implemented on graphics processing units (GPUs) to address two important and open questions about the Cauchy problem's solutions for the Higgs boson equation: 1) conditions for the creation, growth, and interaction of the zeros of global solutions in the interior of their supports (also known as bubbles), and 2) conditions for the global existence and blowup of solutions.
Blecher	David	University of Houston	Quantum cardinals	This is joint work with Nik Weaver. We discuss some aspects of quantum measure theory, and prove some theorems about quantum cardinals. Some of the proofs make use of Farah and Weaver's theory of quantum filters to investigate states on von Neumann algebras which are not normal but have other natural continuity properties which have been studied in the context of axiomatic von Neumann algebra quantum mechanics.
Bucaj	Valmir	Rice University	On the Kunz-Souillard approach to localization for the discrete one dimensional generalized Anderson model	We prove dynamical and spectral localization at all energies for the discrete {\it generalized Anderson model} via the Kunz-Souillard approach to localization. This is an extension of the original Kunz-Souillard approach to localization for Schr\"odinger operators, to the case where a single random variable determines the potential on a block of an arbitrary, but fixed, size α. For this model, we also prove positivity of the Lyapunov exponents at all energies. In fact, we prove a stronger statemen where we also allow finitely supported distributions. We also show that for any size α {\it generalized Anderson model}, there exists some finitely supported distribution ν for which the Lyapunov exponent will vanish for at least one energy. Moreover, restricting to the special case $\alpha=1$, we describe a pleasant consequence of this modified technique to the original Kunz-Souillard approach to localization. In particular, we demonstrate that actually the single operator T_1 is a strict contraction in $L^2(\mathbb{R})$, whereas before it was only shown that the second iterate of T_1 is a strict contraction.
Do	Tam	Rice University	Finite Time Blow-up and Global Regularity for Model Equations in Fluids	In recent years, a number of 1D model PDEs have been proposed to study singularity formation in fluid equations such as the 3D Euler equations. We will review recent results for these equations. In particular, we will show finite time blow-up for a system derived from restricting 3D Euler dynamics to the boundary. This is a joint work with A.Kiselev (Rice) and X. Xu (Carnegie Melon).
Dragovic	Vladimir	UT Dallas	Discriminant Separability and Integrability	We will present the classification of discriminantly separable polynomials in three variables and of degree two in each variable. We will discuss connections between such polynomials and some well-known continuous and discrete integrable systems. Some of the results are obtained jointly with Katarina Kukic.

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Feng	Baofeng	The University of Texas Rio Grande Valley	The complex short pulse equation and the complex sine-Gordon equation	In this talk, I am going to show a reciprocal (hodograph) link between the complex short pulse equation, a recently proposed model for ultra-short pulse in nonlinear optics, and the complex sine-Gordon equation which belongs to the negative flow of the AKNS hierarchy. We will firstly give a geometric interpretation of these two equations, then we will provide their multi-soliton solutions based on a reduction of the KP hierarchy.
Fleeman	Matthew	Baylor University	Approximating z-bar in the Bergman Space and Bergman Analytic Content	In this talk we will classify the best approximation to z-bar in the Bergman space in terms of the solution to a Dirichlet problem, and look at several examples where the best approximation to z-bar is either a monomial or a rational function. We also examine the related problem of finding the Bergman analytic content of a domain, which is given by the distance of z-bar from the Bergman Space over a domain Ω. We give an explicit formula for Bergman analytic content when Ω is a quadrature domain with polynomial map, as well as show that the Bergman analytic content of a simply connected domain is equivalent to the square root of the torsional rigidity from classical elasticity theory. We also discuss a physical interpretation for Bergman analytic content when Ω is multiply connected. This talk is on joint work with Dmitry Khavinson and Erik Lundberg.
Gerbuz	Vitalii	Rice University	Transport exponents for initial states with large support	The transport properties of the 1-dimensional quantum particle are described through the exponential rates of the wavepacket propagation, which are called transport exponents. We will discuss upper and lower bounds on transport exponents of initially delocalized states in general setting and in applications. Concrete models include quiasiperiodic Schrodinger operators, random polymer model and some substitutional sequences.
Gilula	Maxim	Michigan State University	The Newton polyhedron and multilinear oscillatory integral estimates	I will discuss a recent collaboration with Philip T. Gressman and Lechao Xiao. We proved sharp local $L^2(\mathbb{R}^d)$ multilinear estimates fo oscillatory integrals with analytic phases satisfying a nondegeneracy condition similar to one originally considered by Varchenko. This result is closely related to the celebrated papers of Varchenko and of Phong-Stein-Sturm, but the techniques are all real analytic.
Gu	Pengfei	University of Texas-Rio Grande Valley	Lie symmetry to second-order nonlinear differential equations and its first integrals	There are many well-known techniques for obtaining exact solutions of differential equations, but most of them are merely special cases of a few powerful symmetry methods. In this talk we focus our attention on a second-order nonlinear ordinary differential equation of special forms with arbitrary parameters, which is a combination of Lienard-type equation and equation with quadratic friction. With the help of Lie Symmetry methods, we identify several integrable cases of this equation. And for each case, we use the Lie Symmetry method to derive the associated determining system, and apply it further to find infinitesimal generators under given parametric conditions. After reducing them to canonical variables, we obtain an equivalent autonomous equation. Further, through the inverse transformations we identify the explicit first integrals form for each case.

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Mavi	Rajinder	Michigan State University	Anderson localization in a disordered polaron	Anderson localization in most one particle models has been well studied mathematically and many aspects of the localized phase is well understood. Lately there has been a movement to communicate this understanding to multi-particle models and many body models. We will discuss a phase of Anderson localization in a Fock space representation of a polaron, a type of many body model which does not conserve particle number. Polarons are physical quasiparticles modeling the interaction of a particle, in this case an electron on a graph, with fixed atoms, at the nodes of the graph, which are modeled by harmonic oscillators. In the present model the interaction of the harmonic oscillators are mediated through the movement of the electron. The disorder is modeled by the usual Anderson type potential acting on the electron. We will apply the Aizenman - Molchanov technique to this model to demonstrate decay of fractional moments.
Morales-Almazan	Pedro	The University of Texas at Austin	Zeta function for perturbed surfaces of revolution	Here we explore the Zeta function arising from a small perturbation on a surface of revolution and the effect of this on the functional determinant an in the change of the Casimir energy associated with this configuration.
Simanek	Brian	Baylor University	Universality Results for Polynomial Reproducing Kernels	Given a positive, finite, and compactly supported measure on the complex plane with infinitely many points in its support, let K_n(x,y) denote the reproducing kernel for polynomials of degree at most n in the space L^2 (\mu). We are interested in understanding the behavior of scaled limits of these reproducing kernels as n tends to infinity. Such asymptotics are known to exist for a wide variety of measures and in many cases the limit is stable under certain perturbations of the measure. We will discuss new results that demonstrate the existence of these scaled limits for new classes of measures, including measures on the unit circle that have a Fisher-Hartwig type singularity and area type measures on a certain disconnected polynomial lemniscate.
TIAN	JING	University of South Florida	CHAOTIC VIBRATION OF TWO-DIMENSIONAL NON-STRICTLY HYPERBOLIC EQUATION	Joint work with Goong Chen and Liangliang Li We give a rigorous proof for the chaotic vibration phenomenon of the 2D non-strictly hyperbolic equation. After introducing two linear operators, the initial system of the 2D non-strictly hyperbolic equation is converted into a system of two coupled first order equations. By using the method of characteristics, we have found the explicit solution formulas of the new system. We have also found a regime of the parameters when the chaotic vibration phenomenon occurs by applying the period-doubling bifurcation theorem. Numerical simulations are presented to validate the theoretical results.
VandenBoom	Tom	Rice University	Reflectionless Jacobi operators from a dynamical perspective	We present a dynamical interpretation of some results of Sodin and Yuditskii pertaining to reflectionless Jacobi operators with homogeneous spectrum.

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Weyand	Tracy	Baylor University	The Relation Between Spectral Zeta Functions of Discrete and Quantum Graphs	The spectral zeta function is a generalization of the Riemann zeta function where eigenvalues take on the role of the integers. Here we are interested in the spectrum of an operator acting on functions whose domain is a graph. We write the spectral zeta function of a quantum (metric) graph in terms of the spectral zeta function of a corresponding discrete (combinatorial) graph. This extends a previous result relating eigenvalues the Laplace operator on discrete graphs to eigenvalues of the Laplace operator on equilateral quantum graphs. Since the spectral zeta function is relatively easy to compute for finite discrete graphs (where the spectrum is the set of eigenvalues of a matrix), we demonstrate the usefulness of this relation by calculating the spectral determinant and vacuum energy for a particular graph. This is based on joint work with Jon Harrison.
Xiao	Lechao	University of Pennsylvania	Some sharp $L^\infty\times L^\infty \times L^infty$ estimates	Joint work with P.T. Gressman The goal of this talk is to present some recent progress (joint with P.T. Gressman) in the $L^\infty\times L^\infty \times L^infty$-estimates for the following trilinear oscillatory integral form □□ $ \int_{\mathbb R}\int_{\mathbb R} e^{i\lambda S(x,y)} \phi (x,y)f(x) g(y)h (x+y) dx dy $ Sharp bilinear estimates will also be discussed here.
Yang	Kai	University of Iowa	Symplectic non-squeezing of mass subcritical Hartree equations	We prove the symplectic non-squeezing properties of all mass sub-critical Hartree equations with dimension higher than one. The result is achieved by elaborating and generalizing some of the techniques in [3, 4] by Killip, Visan, and Zhang. Two major ingredients are the weak well-posedness for a sequence of changing equations and approximation to an infinite dimensional problem by finite dimensional problem.
Yin	Rong	University of Texas-Rio Grande Valley	The Distribution of Solution of a kind of Free Boundary Problem	In this talk, we consider a free boundary problem of parabolic equations. We will show that, when the coefficient of diffusion term is large enough, the problem has a global solution, while, if it is small enough, the solution exists only in finite time.
Yoon	Jasang	UT Rio Grande Valley	Toral and spherical Aluthge transforms of operators	In this talk, we introduce two natural notions of Aluthge transforms (toral and spherical) for 2-variable weighted shifts and study their basic properties. Next, we introduce the class of spherically quasinormal 2-variable weighted shifts, which are the fixed points for the spherical Aluthg transform. Finally, we briefly discuss the relation between spherically quasinormal and spherically isometric 2-variable weighted shifts. This is a joint work with Professor Curto.

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Zhang	Zhenghe	Rice University	Uniform Positivity of the Lyapunov Exponent for Monotonic Potentials Generated by the Doubling Map	We consider the 1D discrete Schrodinger operators with potentials generated by the doubling map. We show that if the potentials is C1 with derivative uniformly bounded away from zero, then the Lyapunov exponen is uniformly positive for all energies provided the coupling constant is large This is second example of this kind after the trigonometric polynomials where Herman's trick applies. In particular, it provides an affirmative answ to a problem proposed by David Damanik. Our technique are from dynamical systems which was first introduced by Lai-Sang Young.
Zhao	Junfang	University of Texas-Rio Grande Valley	The existence of positive solutions of a kind of singular fractional differential equation with integral boundary conditions	In this talk, we study a kind of fractional differential equation with integral boundary value conditions, where the nonlinear term is singular and the fractional derivative involved is the Riemann-Liouville type. By using the fixed point theorems on cones, we show the existence of positive solutions.