Workshop on Nonlinear Dispersive Equations

Fudan University

This workshop will be participated by domestic and international experts and scholars specialized in nonlinear dispersive equations. The focuses of it include basic theory research and the latest research and development in the mentioned field. As a platform of achievements sharing and demonstrating for experts and scholars in dispersive equations and related problems, the workshop is expected to simultaneously promote international academic exchange and cooperation.

Conference Agenda

Registration: 26th August, 2023

Conference: 2201, Guanghua Tower East Main Building, 27th August, 2023

Zoom Link: https://zoom.us/j/94229762416?pwd=SHpzNHppWURXcWtqZ0tUSm1WM0dDZz09

Conference Schedule

Time	Speaker	Title	Chair
Beijing Time: 8:30-8:40; Tokyo Time: 9:30-9:40;	Opening		
8:40-9:20; 9:40-10:20;	Nakao Hayashi	Asymptotics of solutions to the fractional nonlinear Schrödinger equations (Zoom)	Yi Zhou
9:25-10:05; 10:25-11:05;	Hiroyuki Takamura	The generalized combined effect for one dimensional wave equations (Zoom)	
10:10-10:30; 11:10-11:30;	Tea Break		
10:30-11:10; 11:30-12:10;	Yifei Wu	Scattering for the mass-subcritical nonlinear Schrodinger equations	Yi Zhou
11:15-11:55; 12:15-12:55;	Guixiang Xu	Minimal mass blow-up solutions for the mass critical NLS with the Delta potential in one dimension	
Lunch Break			
14:00-14:40; 15:00-15:40;	Chengbo Wang	Wave equations on hyperbolic spaces	Ning-An Lai
14:45-15:25; 15:45-16:25;	Sanghyuk Lee	Bounds on the Hermite spectral projection	
15:30-15:50; 16:30-16:50;	Tea Break		
15:50-16:30; 16:50-17:30;	Alessandro Palmieri	A Nakao-type weakly coupled system with nonlinearities of derivative-type	Ning-An Lai
16:35-17:15; 17:35-18:15;	Shijie Dong	Global behavior for 2D Dirac-Klein-Gordon equations	

Speaker： Nakao Hayashi (Tohoku University)
Title： Asymptotics of solutions to the fractional nonlinear Schrödinger equations
Abstract： We study the large time asymptotic behavior of small solutions to the Cauchy problem for the fractional nonlinear Schrödinger equations of order alpha with a defocusing nonlinearity of order alpha+1. When alpha>2, then solutions decay in time faster than the those of the linear problem. This phenomena does not occur when alpha =2 which is the well-known cubic nonlinear Schrödinger equation.

Speaker： Hiroyuki Takamura (Tohoku University)
Title： The generalized combined effect for one dimensional wave equations
Abstract： We are interested in the so-called “combined effect” of two different kinds of nonlinear terms for semilinear wave equations in one space dimension. Recently, the first result with the same formulation as in the higher dimensional case has been obtained if and only if the total integral of the initial speed is zero, namely Huygens’ principle holds. In this talk, I would like to introduce you an extended result on the nonlinear term to the general form including the product type. Such model equations are extremely meaningful only in one space dimension because the most cases in higher dimensions possess the global-in-time existence of a classical solution in the general theory for nonlinear wave equations. It is also remarkable that our results on the lifespan estimates are partially better than those of the general theory. This fact tells us that there is a possibility to improve the general theory.

Speaker： Yifei Wu (Tianjin University)
Title： Scattering for the mass-subcritical nonlinear Schrodinger equations
Abstract： In the previous work, we consider the global well-posedness for the mass sub-critical nonlinear Schrodinger equations for rough data (in the critical Sobolev space). In this talk, we further consider the scattering of defocusing mass sub-critical nonlinear Schrodinger equations, both in deterministic setting and in probabilistic setting.

Speaker： Guixiang Xu (Beijing Normal University)
Title： Minimal mass blow-up solutions for the mass critical NLS with the Delta potential in one dimension
Abstract： Local well-posedness theory together with sharp Gagliardo-Nirenberg inequality and the conservation laws of mass and energy implies that the solution with mass less than $\|Q\|_{2}$ is global existence in $H^1(\R)$, where Q is the ground state of the L^2-critical NLS without the delta potential.

We are interested in the dynamics of the solution with threshold mass $\|u_0\|_{2}=\|Q\|_{2}$ in $H^1(\R)$. First, for the case $\mu=0$, such blow-up solution exists due to the pseudo-conformal symmetry of the equation, and is unique up to the symmetries of the equation in $H^1(\R)$ by F. Merle and recently in

$L^2(\R)$ by B. Dodson. Second, for the case $\mu<0$, simple variational argument with the conservation laws of mass and energy implies that radial solutions with threshold mass exist globally in $H^1(\R)$. Last, for the case $\mu>0$, we show the existence of radial threshold solutions with blow-up speed determined by the sign (i.e. $\mu>0$) of the delta potential perturbation since the refined blow-up profile to the rescaled equation is stable in a precise sense. The key ingredients here including the Energy-Morawetz argument and compactness method as well as the modulation analysis, which are close to Raphael-Szeftel's argument for inhomogeneous case. This is a joint work with Xingdong Tang (UIST, Nanjing).

Speaker： Chengbo Wang (Zhejiang University)
Title： Wave equations on hyperbolic spaces
Abstract： In this talk, I will discuss our results for linear and nonlinear wave equations on hyperbolic spaces. In particular, we will discuss the dispersive estimates, Strichartz estimates, and their applications in the analogs of the Strauss conjecture.

It is based on my joint works with Yannick Sire, Christopher D. Sogge, Junyong Zhang, as well as Xiaoran Zhang.

Speaker： Sanghyuk Lee (Seoul National University)
Title： Bounds on the Hermite spectral projection
Abstract： In this talk we are concerned with L^2-L^q bounds on the Hermite spectral projection operator Π_λ in $\mathbb R^d$. For $d\ge 2$, the optimal L^2-L^{q} bound on Π_λ has been known except for the endpoint case $q=2(d+3)/(d+1)$. However, the endpoint L^2-$L^{2(d+3)/(d+1)}$ bound has been left unsettled for a long time. We prove this missing endpoint case for every $d\ge 3$. Our result is based on a new phenomenon: improvement of bounds due to asymmetric localization near the sphere.

Speaker： Alessandro Palmieri (University of Bari)
Title： A Nakao-type weakly coupled system with nonlinearities of derivative-type
Abstract： In this talk, we consider a semilinear weakly coupled system of a wave equation and a damped Klein-Gordon equation with derivative-type nonlinearities. We investigate the blow-up in finite time of local in time classical solutions, by showing the blow-up on a certain characteristic line with an iteration argument. Our approach is inspired by the blow-up technique introduced by Prof. Zhou for the semilinear wave equation $u_{tt} - \Delta u = |u_t|^p$.Based on a joint project with Prof. Hiroyuki Takamura.

Speaker： Shijie Dong (Southern University of Science and Technology)

Title： Global behavior for 2D Dirac-Klein-Gordon equations

Abstract： We consider two-dimensional Dirac-Klein-Gordon equations, which are a basic model in particle physics. We investigate the global behavior of small data solutions to the systems in the case of a massive scalar field and a massless Dirac field. More precisely, we prove sharp time decay and linear scattering for the solutions to the equations. This talk is based on joint works with Kuijie Li, Yue Ma, Zoe Wyatt, and Xu Yuan.