非线性偏微分方程研讨会

程序册

哈尔滨工业大学数学研究院

2020 年 1 月 14 日-1 月 16 日

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会议地点：哈尔滨工业大学明德楼 B 区 201 学术报告厅

邀请报告专家：

丁彦恒	（中科院数学与系统科学研究院）
郭斌	（吉林大学）
郭青	（中央民族大学）
韩丕功	（中科院数学与系统科学研究院）
Panu Lahti	（University of Augsburg）
李风泉	（大连理工大学）
李玉祥	（东南大学）
王玉兰	（西华大学）
杨健夫	（江西师范大学）
周蜀林	（北京大学）

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会 议 日 程

1 月 15 日 上午

09:00-09:10	欢迎致辞（尹智）

主持人：王明新		
09:10-10:00	丁彦恒	变分理论与交叉科学
10:00-10:20	合影、茶歇	
10:20-11:10	Panu Lahti	A new Federer-type characterization of sets of finite perimeter
11:10-12:00	杨健夫	Normalized solutions and mass concentration for supercritical NLS
12:00	午餐	

1 月 15 日 下午

自由活动

1 月 16 日　上午

主持人：张超		
08:30-09:20	周蜀林	Entropy and Renormalized Solutions for Quasilinear Elliptic/Parabolic Equations and Fractional Parabolic Equations with L1 Data
09:20-10:10	李玉祥	Type-II gradient blow-up for 1-d KPZ equations
10:10-10:20		茶歇
10:20-11:10	王玉兰	Some recent results in the analysis of chemotaxis-fluid interaction
11:10-12:00	郭青	Variational and reduction methods in the study of dynamics of NLS
12:00		午餐

1 月 16 日　下午

主持人：王国栋		
14:30-15:20	韩丕功	Semilinear elliptic equations with critical growth and Hardy potential
15:20-16:10	李风泉	Symmetry and monotonicity results for nonlinear fractional p-Laplacian equations
16:10-16:30		茶歇
16:30-17:20	郭斌	Lifespan and asymptotic behavior of solutions to a damped wave equation with superlinear sources
17:20		晚餐

报告题目与摘要

变分理论与交叉科学

丁彦恒　　　中科院数学与系统科学研究院

Abstract. 抽象半线性问题的变分框架；借以研究 Hamilton 系统的同宿轨、Schrödinger 方程、反应扩散系统的全局解、Dirac 方程等；进而谈一些变分方法在交叉科学研究中的作用。

Lifespan and asymptotic behavior of solutions to a damped wave equation with superlinear sources

郭斌　　　吉林大学

Abstract. This talk deals with a class of damped wave equations

$$u_{tt} - \Delta u - \omega \Delta u_t + \mu u_t = |u|^{p-2} u$$

in a bounded domain. We mainly discuss asymptotic behavior and the lower and upper of blow up times. These results answer some open problems of [F. Gazzola, M. Squassina, Ann. I. H. Poincaré, 23 (2006): 185-207.]

Variational and Reduction Methods in the Study of Dynamics of NLS

郭青　　　中央民族大学

Abstract. It is well known that nonlinear Schrodinger equation and its stationary derivation have pretty much relationship in many respects such as the formation of their solutions, the variational characterizations, and even the corresponding resolution methods. In this subject, we will talk about the robust techniques in the study of the long time behaviors and the dynamics of NLS especially developed in the past thirty years. Several of our recent works on these two techniques will be introduced.

Semilinear elliptic equations with critical growth and Hardy potential

韩丕功　　　中科院数学与系统科学研究院

Abstract. Semilinear elliptic equations arise from many mathematical models in physics, chemistry and biology or other branches of mathematics (such as Yamabe

problem and isoperimetric inequality in geometry, Hardy Littlewood Sobolev inequality in Harmonic analysis). In this talk, I will introduce a series of results on the existence, multiplicity and singularity of solutions to elliptic equations with critical growth and Hardy potential.

A new Federer-type characterization of sets of finite perimeter

Panu Lahti   University of Augsburg

Abstract. Federer's characterization, which is a key result in the theory of functions of bounded variation (BV functions), states that a set is of finite perimeter (i.e. the set's characteristic function is a BV function) if and only if the n−1-dimensional Hausdorff measure of the set's measure-theoretic boundary is finite. The measure-theoretic boundary consists of those points where both the set and its complement have positive upper density. I discuss recent work in which I show that the characterization remains true if the measure-theoretic boundary is replaced by a smaller boundary consisting of those points where the lower densities of both the set and its complement are at least a given positive constant.

Symmetry and monotonicity results for nonlinear fractional p-Laplacian equations

李风泉   大连理工大学

Abstract.   In this talk, I will discuss the qualitative properties of solutions to Hardy type problems and Hénon type problems involving the fractional p-Laplacian. First, the symmetry and monotonicity results are proved by the method of moving planes. Finally, as p=2, by a comparison with the first eigenfunction associated with the fractional Laplacian, we obtain a nonexistence result for a Hénon type problem on unbounded domain. This work is joined with Cai Miaomiao.

Type-II gradient blow-up for 1-d KPZ equations

李玉祥   东南大学

Abstract.   In this talk, we consider the Kardar-Parisi-Zhang (KPZ) equation. In certain physical models, for instance of ballistic deposition processes, the evolution of the profile of a growing interface can be described by KPZ equation. Using the asymptotic matching method, we construct a type-II blow-up solution.

Some recent results in the analysis of chemotaxis-fluid interaction

王玉兰　　西华大学

Abstract. The phenomenon of biased movement along a chemical signal gradient is known as chemotaxis and can be observed for a wide array of aerobic bacteria such as Bacillus subtilis. When bacteria of the species Bacillus subtilis are suspended in water, it can be observed experimentally that spatial patterns may spontaneously emerge from initially almost homogeneous distributions of bacteria. A coupled chemotaxis-fluid system was proposed as the theoretical description of such a process.

The interplay of the chemotaxis- and (Navier)-Stokes equations present in the model poses some interesting mathematical problems. We will talk about some recent results on the chemotaxis-(Navier-)Stokes systems in the bounded domains.

Normalized solutions and mass concentration for supercritical NLS

杨健夫　　江西师范大学

Abstract.　In this talk, we deal with the existence and concentration of normalized solutions to the supercritical nonlinear Schrödinger equation

$$\begin{cases} -\Delta u + V(x)u = \mu_q u + a|u|^q u & \text{in} \quad \mathbb{R}^2, \\ \int_{\mathbb{R}^2} |u|^2 \, dx = 1, \end{cases}$$

where μ_q is the Lagrange multiplier. We show that for q>2 close to 2, the problem admits two solutions: one is the local minimal solution u_q and another one is the mountain pass solution v_q. Furthermore, we study the limiting behavior of u_q and v_q when $q \to 2_+$. Particularly, we describe precisely the blow-up formation of the excited state v_q.

Entropy and Renormalized Solutions for Quasilinear Elliptic/Parabolic Equations and Fractional Parabolic Equations with L^1 Data

周蜀林　　北京大学

Abstract.　In this talk I will survey our work for elliptic/parabolic p(x)-Laplace equations, non-uniformly elliptic/parabolic equations and parabolic fractional p-Laplace equations with L^1 data under the frameworks of entropy solutions and renormalized solutions. Prof. Chao Zhang in Harbin Institute of Technology was the main co-worker, and Prof. Yongyong Cai in Beijing Computational Science Research Center and Prof. Kaimin Teng in Taiyuan University of Technology were the contributors.

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