

Workshop on Nonlinear Partial Differential Equations X

Nov. 20-Nov.22, 2020

1. Workshop Information

Announcement:

In order to enhance the communications among the mathematicians on the subject of partial differential equations, geometric analysis and related topics, we plan to hold “mini-workshop on nonlinear partial differential equations” on Nov. 20-Nov. 22, 2020. We will invite some experts to share ideas and results on recent research, and discuss current challenging issues.

Organizing Committee:

Congming Li, Shanghai Jiao Tong University

Mijia Lai, Shanghai Jiao Tong University

Yuanyuan Lian, Shanghai Jiao Tong University

Leyun Wu, Shanghai Jiao Tong University

Chunqin Zhou, Shanghai Jiao Tong University

Venues:

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2. Schedule

Nov. 21, Saturday	
Forenoon: On-line	
Zoom ID: 9604720712, PIN: 20201121	
8: 50-9: 00	Opening ceremony
Chair: Yuhua Sun	
9: 00-10: 00	Speaker: Wenxiong Chen Title: Asymptotic method of moving planes for fractional parabolic equations
10: 00-10: 10	Tea break
10: 10-11: 10	Speaker: Hao Fang Title: Boundary compactness for conic sigma_2 Yamabe problem
11: 20-13: 20	Lunch
Afternoon: Off-line	
Room 901, No. 6 Building, Science Buildings	
Chair: Genggeng Huang	
13: 30-14: 20	Speaker: Kai Zhang Title: Boundary Lipschitz regularity and the Hopf lemma for fully nonlinear elliptic equations
14:30-15:20	Speaker: Jian Lu Title: Non-uniqueness of solutions to a class of Monge-Ampere type equations
15: 30-15: 50	Tea break
Chair: Jian Lu	
15: 50-16: 40	Speaker: Jun Wang Title: Existence, bifurcation, orbital stability and Liouville theorems results for elliptic system with quadratic nonlinearity

16: 50-17: 40	Speaker: Zhijie Chen Title: Spectrum of the Lamé operator and application to the mean field equation
18:00	Banquet

3. Titles and Abstracts

Asymptotic method of moving planes for fractional parabolic equations

Speaker: Wenxiong Chen (Yeshiva University)

In this talk, we will consider nonlinear parabolic fractional equations

$$\frac{\partial u}{\partial t} + (-\Delta)^s u = f(t, u(x, t)).$$

We develop a systematical approach in applying an asymptotic method of moving planes to investigate qualitative properties of positive solutions for fractional parabolic equations. To this end, we derive a series of needed key ingredients such as narrow region principles, and various asymptotic maximum and strong maximum principles for antisymmetric functions in both bounded and unbounded domains. Then we illustrate how these new methods can be employed to obtain asymptotic radial symmetry and monotonicity of positive solutions in a unit ball and on the whole space. Namely, we show that no matter what the initial data are, the solutions will eventually approach to radially symmetric functions.

We hope that the ideas and methods introduced here can be conveniently applied to study a variety of nonlocal parabolic problems with more general operators and more general nonlinearities.

Spectrum of the Lamé operator and application to the mean field equation

Speaker: Zhijie Chen (Tsinghua University)

In this talk, I will introduce some recent results on the spectrum of the classical Lamé operator. Some applications to the mean field equation with singularities on flat tori will also be given.

Boundary compactness for conic σ_2 Yamabe problem

Speaker: Hao Fang (The University of Iowa)

In this talk, we discuss the boundary compactness for the constant σ_2 metric on conic 4-spheres. The Yamabe problem for conic 2-spheres has been studied by Troyanov, Luo-Tian, Chen-Li and its corresponding moduli space is well defined. In a previous work with M. Lai, we have established its boundary compactness. In a similar setting, we discuss the σ_2 Yamabe problem for conic 4-spheres where the moduli space has more delicate non-linear behavior. In a joint work with W. Wei, we establish the boundary compactness using a delicate version

of the isoperimetric inequality.

Non-uniqueness of solutions to a class of Monge-Ampere type equations

Speaker: Jian Lu (South China Normal University)

We consider a class of Monge-Ampere type equations defined on the unit sphere in the Euclidean space. These equations arise from the modern Brunn-Minkowski theory about convex geometry, and they may be degenerate or singular in different situations. We will mainly talk about some recent progress about the non-uniqueness of solutions to these equations. This is based on a joint work with Qi-Rui Li and Jiakun Liu.

Existence, bifurcation, orbital stability and Liouville theorems results for elliptic system with quadratic nonlinearity

Speaker: Jun Wang (Jiangsu University)

In this talk we first introduce the recent results on the existence, bifurcation and orbital stability for elliptic system with quadratic nonlinearities. On the other hand, we give the Liouville type results, universal estimates and periodic solutions for the nonhomogeneous parabolic system with quadratic nonlinearities. This work is jointed with Aleks Jevnikar, Junping Shi and Wen Yang.

Boundary Lipschitz regularity and the Hopf lemma for fully nonlinear elliptic equations

Speaker: Kai Zhang (Northwestern Polytechnical University)

In this talk, we study the boundary regularity for viscosity solutions of fully nonlinear elliptic equations. We use a unified, simple method to prove that if the domain Ω satisfies the exterior $C^{1,\alpha}$ condition at $x_0 \in \partial\Omega$, the solution is Lipschitz continuous at x_0 ; if Ω satisfies the interior $C^{1,\alpha}$ condition at x_0 , the Hopf lemma holds at x_0 . Moreover, the $C^{1,\alpha}$ conditions are optimal. The key idea is that the curved boundaries are regarded as perturbations of a hyperplane.

4. List of Participants

Name	Affiliation
陈文雄	Yeshiva University
陈志杰	清华大学
方浩	The University of Iowa
黄耿耿	复旦大学
鲁建	华南师范大学
吕英姝	复旦大学
孙玉华	南开大学
王俊	江苏大学
王小龙	东华理工大学
张凯	西北工业大学

张涛	烟台大学
周长亮	东华理工大学
来米加	上海交通大学
李从明	上海交通大学
李振杰	上海交通大学
廉媛媛	上海交通大学
王芳	上海交通大学
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周春琴	上海交通大学
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