

“偏微分方程与几何分析” 青年学者线上研讨会

程序册



哈尔滨工业大学数学研究院

2022年8月10日-11日

“偏微分方程与几何分析”青年学者线上研讨会

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邀请专家:

曹 杨 (大连理工大学)	郭千桥 (西北工业大学)
黄耿耿 (复旦大学)	蒋飞达 (东南大学)
李春和 (电子科技大学)	李志夙 (西北大学)
钮维生 (安徽大学)	盛 利 (四川大学)
孙玉华 (南开大学)	陶雪妍 (中国海洋大学)
滕凯民 (太原理工大学)	王 芳 (上海交通大学)
王克磊 (武汉大学)	王良伟 (重庆三峡学院)
徐 强 (兰州大学)	姚锋平 (上海大学)
张彬林 (山东科技大学)	张 凯 (上海交通大学)
张世金 (北京航空航天大学)	张永胜 (同济大学)

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会议日程

2022年8月10日，周三上午

时间	报告信息	主持人
08:50-09:00	欢迎致辞（许全华）	张超
09:00-09:35	On positive solutions of biharmonic elliptic inequalities on Riemannian manifolds 孙玉华 南开大学	张超
09:40-10:15	Refined blow up analysis for critical nonlinear heat equation 王克磊 武汉大学	
10:20-10:55	Quantitative estimates for stochastic elliptic systems on bounded Lipschitz domains 徐强 兰州大学	姚锋平
11:00-11:35	Compactness and stable regularity in multiscale homogenization 钮维生 安徽大学	

2022年8月10日，周三下午

时间	报告信息	主持人
14:00-14:35	A semilinear pseudo-parabolic equation with initial data non-rarefied at ∞ 曹杨 大连理工大学	郭千桥
14:40-15:15	Complicated asymptotic behavior of solutions for the Fourth-order Parabolic Equation 王良伟 重庆三峡学院	
15:20-15:55	Well-posedness results on an oncolytic virotherapy model 陶雪妍 中国海洋大学	
16:00-16:35	Existence results for Kirchhoff-type problems via Morse theory 张彬林 山东科技大学	滕凯民
16:40-17:15	Boundary regularity for elliptic equations 张凯 上海交通大学	

2022年8月11日，周四上午

时间	报告信息	主持人
09:00-09:35	Instability of Type (II) Lawson-Osserman Cones 张永胜 同济大学	王克磊
09:40-10:15	Estimates of the second derivative and gradient of the solutions of generalized p-harmonic equation on Riemannian manifolds 张世金 北京航空航天大学	
10:20-10:55	On the relative volume of conformally compact Einstein manifolds 王芳 上海交通大学	张世金
11:00-11:35	Extremal Metrics on Toric Manifolds and Homogeneous Toric Bundles 盛利 四川大学	

2022年8月11日，周四下午

时间	报告信息	主持人
14:00-14:35	On the Neumann Problem for Monge-Ampere type equations 蒋飞达 东南大学	矫贺明
14:40-15:15	Global Harnack inequalities of elliptic equations in general domains 李志夙 西北大学	
15:20-15:55	The isometric deformation in rotationally symmetric warped product spaces 李春和 电子科技大学	隋哲楠
16:00-16:35	Uniqueness of the non-trivial solutions of some degenerate Monge-Ampere equation 黄耿耿 复旦大学	

报告题目与摘要

A semilinear pseudo-parabolic equation with initial data non-rarefied at ∞

曹杨 大连理工大学

Abstract. In this talk we introduce the Cauchy problem for a semilinear pseudo-parabolic equation with initial data non-rarefied at ∞ . Our interest lies in the discussion of the effect of the non-rarefied factors on the blow-up phenomenon and the life span of the solution.

Uniqueness of the non-trivial solutions of some degenerate Monge-Ampere equation

黄耿耿 复旦大学

Abstract. In this talk, we talk about the uniqueness of the non-trivial solutions of some degenerate Monge-Ampere equations.

$$\begin{cases} \det D^2 u = f(-u), & \text{in } \Omega \\ u = 0, & \text{on } \partial\Omega \end{cases}$$

Under suitable conditions on $f(t)$, we can show u is symmetric as Ω is symmetric. Then we can show the non-trivial solution u is unique by showing the non-degeneracy of the linearized equation for some special $f(t)$. This is a joint work with Cheng Tingzhi.

On the Neumann Problem for Monge-Ampere type equations

蒋飞达 东南大学

Abstract. In this talk, we will study the classical solvability of the Neumann problem for Monge-Ampere type equations in Euclidean space, which has applications in fully nonlinear Yamabe problem with prescribed boundary mean curvature in conformal

geometry. The global second derivative estimates will be mainly discussed under a regularity condition of the matrix function. Both the nondegenerate and the degenerate cases will be covered.

The isometric deformation in rotationally symmetric warped product spaces

李春和 电子科技大学

Abstract. The rigidity in isometric deformation plays a crucial role in the definition of quasi-local mass in mathematical general relativity. An example in \cite{LW} shows the lack of rigidity of convex closed surface embedded in rotationally symmetric warped product spaces. To recover the rigidity, some extra conditions are imposed to be compatible with the isometry of ambient space. In this talk, some recent progress in this direction is reported which is based on joint work with Pengzi Miao(Miami University) and Zhizhang Wang(Fudan University).

Global Harnack inequalities of elliptic equations in general domains

李志夙 西北大学

Abstract. In this talk, we will present our recent global Harnack inequalities of harmonic functions, and of solutions of general linear and nonlinear elliptic equations in general domains (such as balls, convex domains, conical domains, Lipschitz domains, H^{α} domains, etc.), based mainly on the traditional interior Harnack inequalities and some elementary covering arguments and recursion techniques in a unified approach.

Compactness and stable regularity in multiscale homogenization

钮维生 安徽大学

Abstract. We report some quantitative results in the homogenization of second-order elliptic systems with periodic coefficients that oscillate on multiple separated scales. The results include the uniform C^α and Lipschitz estimates we obtained recently. This is based on the joint work with Jinping Zhuge.

Extremal Metrics on Toric Manifolds and Homogeneous Toric Bundles

盛利 四川大学

Abstract. An example of Apostolov et al. indicate that the condition of K-stability may not be correct one for general polarised manifolds. Szekelyhidi modified definition of K-stability by filtration and stated a variant of the Yau-Tian-Donaldson conjecture. We will talk about our proof of this variant of YTD conjecture for toric manifolds and homogeneous toric bundles. This is jointed with Li An-Min and Lian Zhao.

On positive solutions of biharmonic elliptic inequalities on Riemannian manifolds

孙玉华 南开大学

Abstract. We investigate the non-existence and existence of positive solutions to biharmonic elliptic inequalities on manifolds. Using Green function and volume growth conditions, we establish the critical exponent for biharmonic problem. This is based on joint work with Yadong Zheng.

Well-posedness results on an oncolytic virotherapy model

陶雪妍 中国海洋大学

Abstract. Oncolytic virotherapy is a promising therapeutic approach for cancer treatment. This talk begins with an introduction to an oncolytic virotherapy model. After reviewing some well-posedness results on this model, this talk reports a recent co-work, with Shulin Zhou, on global boundedness and asymptotic behavior of classical solutions in two-dimensional domains.

On the relative volume of conformally compact Einstein manifolds

王芳 上海交通大学

Abstract. For a conformally compact Einstein manifold, the Bishop-Gromov comparison theorem tells us that the relative volume is a non-increasing function of the geodesic radius. In this talk, I will show that the fractional Yamabe constant at the conformal infinity provides a lower bound for this function. As an application, this implies a gap phenomenon and the rigidity theorem.

Refined blow up analysis for critical nonlinear heat equation

王克磊 武汉大学

Abstract. In this talk I will discuss the finite time blow up problem for nonlinear heat equation with the critical Sobolev exponent. A possible blow up scheme is by the formation of bubbles, which is a typical energy concentration phenomenon. In order to give a precise description of blow up profiles and blow up rates, we need to perform a refined blow up analysis of this energy concentration phenomenon. I will discuss some tools used in this analysis, including a reverse version of the Lyapunov-Schmidt reduction method and the inner-outer gluing method of Del Pino et. al. (also used in a reverse manner). This is a joint work with Juncheng Wei.

Complicated asymptotic behavior of solutions for the Fourth-order Parabolic Equation

王良伟 重庆三峡学院

Abstract. In this talk, we will report some results about the complicated asymptotic behavior of solutions for the Cauchy problem of the Fourth-order Parabolic Equation.

Quantitative estimates for stochastic elliptic systems on bounded Lipschitz domains

徐强 兰州大学

This talk is devoted to showing quantitative estimates for elliptic system on bounded Lipschitz domains, arising from stochastic homogenization theory.

We start from introducing a new random scale to make Gloria-Neukamm-Otto's scheme suitable for boundary problems. Then we establish the quenched (annealed) Calderon-Zygmund estimates by a real method developed by Shen, originally from Caffarelli-Peral. Finally, by using the quenched (annealed) regularity estimates given before, we investigate the sharp homogenization error both in strong and weak norms, which quantifies the influence caused by the non-smoothness of the boundary, in the sense of oscillating and fluctuations.

The present work has extended my previous study [SIAM JMA 2016] from a deterministic object to the random case, and the approach developed here has great potential to be applied to other models in terms of PDEs and randomness. This job is cooperated with Dr. Li Wang in Peking University.

Existence results for Kirchhoff-type problems via Morse theory

张彬林 山东科技大学

Abstract. In this talk, we present some existence results for subcritical and critical Kirchhoff-type problems via Morse theory and local linking. We point out that these kinds of problems possess serious difficulties caused by the interactions between the Kirchhoff term and Morse theory. Finally, we give some unsolved problems along this direction.

Boundary regularity for elliptic equations

张凯 上海交通大学

Abstract. In this talk, we introduce some boundary pointwise regularity results for elliptic equations, including boundary Holder regularity, boundary Lipschitz regularity, boundary $C^{1,\alpha}$ regularity and boundary $C^{2,\alpha}$ regularity etc. This talk is a combination of our several work in recent years.

Estimates of the second derivative and gradient of the solutions of generalized p-harmonic equation on Riemannian manifolds

张世金 北京航空航天大学

Abstract. In this talk, first I will introduced some results about the gradient estimate of p-harmonic functions on Riemannian manifolds, including the results of Kotschwar-Ni, Wang-Zhang, Sung-Wang. Then I will introduce the results about the estimates of the second derivative and gradient of the solutions of generalized p-harmonic equation on Riemannian manifold with Ricci curvature bounded from below. This is a joint work with Jiayin Liu and Yuan Zhou.

Instability of Type (II) Lawson-Osserman Cones

张永胜 同济大学

Abstract. We prove instability of Type (II) Lawson-Osserman cones in Euclidean spaces, and thus provide a family of (uncountably many) non-smooth unstable minimal graphs of high codimension versus smooth unstable ones by Lawson-Osserman using a min-max technique. To our knowledge, these are the first such examples of non-smooth unstable non-parametric minimal graphs in the Euclidean setting. This talk is based on a joint work with Prof. Zhaohu Nie.

数学研究院简介

哈工大数学研究院成立于 2016 年 7 月。数学研究院以数学研究为基础，同时致力于推动数学、经济学、物理、工程和计算机科学的交叉学科研究。

在过去的六年里，数学研究院发展迅速。目前，数学研究院有研究人员 22 人，其中国家高层次人才 8 人。此外，研究院还聘请了 2 名国际讲座教授，其中一名为菲尔兹奖得主。关于研究院现有人员列表及其研究领域，请参见研究院网站：<http://im.hit.edu.cn/en/8378/list.htm>。

数学研究院诚邀在数学学科所有方向工作的优秀研究人员加盟。我们将根据您的学术水平和个人经历提供具有国际竞争力的薪酬待遇。详情见研究院网页上的招聘公告。

和传统的数学院系相比，数学研究院具有如下特色：数学研究院是个全新的科研机构，直接隶属于学校，是学校的一个学术特区和高地，因而享有学校的特殊政策和经费倾斜。数学研究院拥有一个由国内外著名数学家组成的学术委员会。它是数学研究院科研学术事务的最高审议、评定和咨询机构。所有涉及到人才引进、内部人员晋升和评估等重大事务均以学术委员会的意见为准。数学研究院只承担少量的教学任务，师资博士后和助理教授没有任何教学任务，其他人员一年只需承担一门课的任务（大约 30-50 学时）。另外，如有必要（比如计划出国访问一年），可适当调整甚至完全减免教学任务。数学研究院的管理理念遵循法国的宽松模式，不侧重文章数量或杂志级别等。其目的是打造一个愉快、舒适、和谐、向上的工作环境，为所有研究人员提供一个利于事业发展的有效平台，让每个人都找到适合自己发展的方式和位置。

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