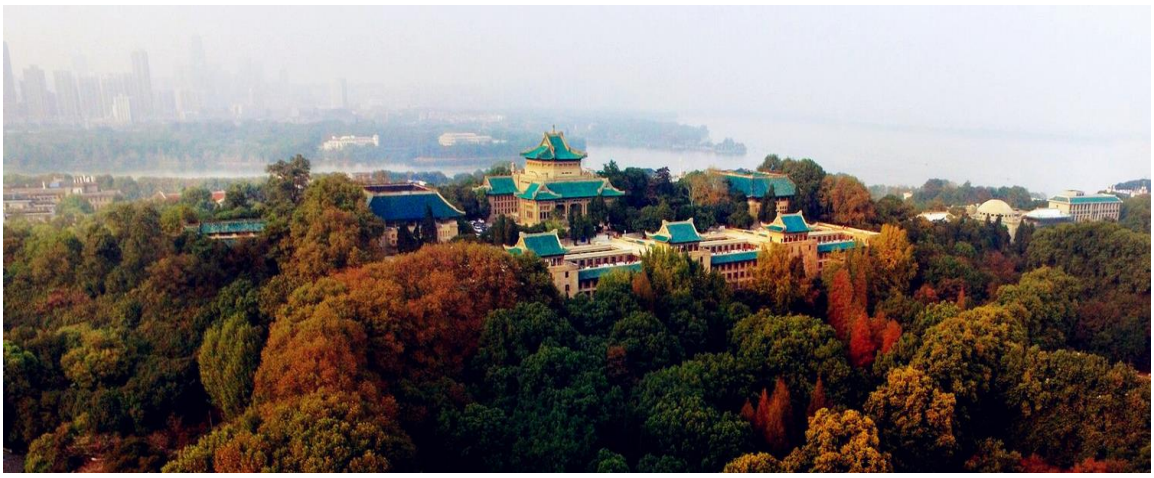
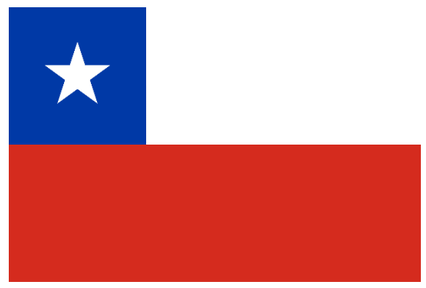
Third Sino-Chilean Conference on Nonlinear Partial Differential Equations and Nonlinear Analysis

School of Mathematics and Statistics

Wuhan University

December 9-12 , 2016





Third Sino-Chilean Conference

on Nonlinear Partial Differential Equations and Nonlinear Analysis

Wuhan, China, December 9th-12th, 2016

Invited speakers:

Weiwei Ao (Wuhan Univ.)
Daomin Cao (AMSS)
Carmen Cortázar (PUC)
Marek Fila (Comenius Univ.)
Yinbin Deng (CCNU)
Yanheng Ding (AMSS)
Marta Garcia-Huidobro (PUC)
Nassif Ghoussoub (UBC)
Ignacio Guerra (Univ. Santiago)
Zongming Guo (Henan Normal Univ.)
Meiyue Jiang (Peking Univ.)
Wantong Li (Lanzhou Univ.)
Zhaoli Liu (Capital Normal Univ.)
Yiming Long (Nankai Univ.)
Fethi Mahmoudi (Univ. de Chile)
Raúl Manasevic (Univ. de Chile)
Frank Pacard (École Polytechnique)
Shuangjie Peng (CCNU)
Xiaofeng Ren (G. Washington Univ.)
Kelei Wang (Wuhan Univ.)
Zhiqiang Wang (Tianjin Univ.)
Shusen Yan (Univ. New England)
Jingxue Yin (SCNU)
Liqun Zhang (AMSS)
Zhitao Zhang (AMSS)
Feng Zhou (ECNU)
Wenming Zou (Tsinghua Univ.)

Organizing Committee: Weiwei Ao, Juan Dávila, Juncheng Wei, Hua Chen, M. Musso, M. del Pino, Kelei Wang

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WUHAN UNIVERSITY 1893 武漢大學

CAPDE
Center for the Analysis of Partial Differential Equations

Schedule at a glance

Registration：Dec.8, 14:00-18:00, Wuhan Jun Yi Dynasty Hotel（君宜王朝大饭店）

or Dec.9, 08:00-08:30, School of mathematics and statistics, Wuhan University

December 9, Friday, Morning	
08:30 – 09:00	Opening and photo
09:00 – 09:50	M. Del Pino
09:55 – 10:45	Wenming Zou
10:45 – 11:05	Tea break
11:05 – 11:55	Feng Zhou
12:00 – 14:00	Lunch
December 9, Friday, Afternoon	
14:00 – 14:50	Zhiqiang Wang
14:55 – 15:45	Juan Davila
15:45 – 16:05	Tea break
16:05 – 16:55	Chunhua Jin
17:00– 17:50	Carmen Cortazar
18:00 – 19:30	Dinner

December 10, Saturday, Morning	
09:00 – 09:50	Monica Musso
09:55 – 10:45	Zhaoli Liu
10:45 – 11:05	Tea break
11:05 – 11:55	Yanheng Ding
12:00 – 14:00	Lunch
December 10, Saturday, Afternoon	
14:00 – 14:50	Raul Manasevich
14:55 – 15:45	Meiyue Jiang
15:45 – 16:05	Tea break
16:05 – 16:55	Zhitao Zhang
17:00– 17:50	Garcia-Huidobro
18:00 – 19:30	Banquet

December 11, Sunday, Morning	
09:00 – 09:50	Liqun Zhang
09:55 – 10:45	Ignacio Guerra
10:45 – 11:05	Tea break
11:05 – 11:55	Xiaofeng Ren
12:00 – 14:00	Lunch
December 11, Sunday, Afternoon (Special Session for Young Researchers)	
14:00 – 14:25	Aliang Xia
14:30 – 14:55	Yong Liu
15:00 – 15:25	Rui Huang
15:30 – 15:50	Tea break
15:50– 16:15	Zhengping Wang
16:20-16:45	Lan Tang
16:50-17:15	Weiwei Ao
17:20-17:45	Kelei Wang
18:00 – 19:30	Dinner

December 12, Monday, Morning	
09:00 – 09:50	Shuangjie Peng
09:55 – 10:45	Shusen Yan
10:45 – 11:05	Tea break
11:05 – 11:55	Hui Liu
12:00 – 13:30	Lunch
December 12, Monday, Afternoon	
Free discussion	

Detailed Program

December 9, Friday, Morning

8:00 Go to the math department from the hotel by shuttle bus

Chair: Hua Chen

08:30 – 09:00 Opening and Photo

09:00 – 09:50 M. Del Pino (Universidad de Chile)
Singularity formation for the two-dimensional harmonic map flow into S^2

09:55 – 10:45 Wenming Zou (Tsinghua University)
On a doubly critical Schrodinger system in R^4 with steep potential wells

10:45 – 11:05 Tea break

11:05 – 11:55 Feng Zhou (East China Normal University)
Singular solutions with prescribed singular set for a biharmonic equation

12:00 – 14:00 Lunch

December 9, Friday, Afternoon

Chair: Yinbin Deng

14:00 – 14:50 Zhiqiang Wang (Tianjin University / Utah State University)
Asymptotics in coupled nonlinear Schr\"odinger equations with large mixed couplings

14:55 – 15:45 Juan Davila (Universidad de Chile)
Holder estimates for solutions of a MEMS equation

15:45 – 16:05 Tea break

Chair: Juan Davila

16:05 – 16:55 Chunhua Jin (South China Normal University)
Large Time Periodic Solution to the Coupled Chemotaxis-fluid Model

17:00 – 17:50 Carmen Cortazar (Pontificia Universidad Católica de Chile)
Near field asymptotics for the porous medium equation in exterior domains

18:00 – 19:30 Dinner

19:30 Go back to hotel by shuttle bus

December 10, Saturday, Morning

8:30 Go to the math department from the hotel

Chair: M. del Pino

09:00 – 09:50 Monica Musso (Pontificia Universidad Católica de Chile)
Infinite-time bubbling in the critical nonlinear heat equation

09:55 – 10:45 Zhaoli Liu (Capital Normal University)
Solutions to a class of quasilinear elliptic equations and their sign properties

10:45 – 11:05 Tea break

11:05 – 11:55 Yanheng Ding (Academy of Mathematics and System Sciences)
Some recent results on Dirac equations etc.

12:00 – 14:00 Lunch

December 10, Saturday, Afternoon

Chair: Jianfu Yang

14:00 – 14:55 Raul Manasevich (Universidad de Chile)
Some results for the n-Laplacian in R^n

14:55 – 15:45 Meiyue Jiang (Peking University)
Dirichlet problem for 1-Laplacian and Minimizers of Rudin-Osher-Fatemi Functionals

15:45 – 16:05 Tea break

Chair: Monica Musso

16:05 – 16:55 Zhitao Zhang (Academy of Mathematics and System Sciences)
Uniqueness, existence and concentration of positive ground states for Kirchhoff type problems

17:00 – 17:50 Garcia Huidobro (Pontificia Universidad Católica de Chile)
Boundary singularities of positive solutions to the quasilinear equation $-\Delta_p u + |\nabla u|^q = 0$

18:00 – 19:30 Banquet at Jiangnan Xiaoguanyuan Restaurant

19:30 Go back from the restaurant to the hotel by shuttle bus

December 11, Sunday, Morning

8:30 Go to the math department from the hotel

Chair: Chaojiang Xu

09:00 – 09:50 Liqun Zhang (Academy of Mathematics and System Sciences)
Continuous Weak Solutions of Boussinesq Equations

09:55 – 10:45 Ignacio Guerra (Universidad Santiago de Chile)
Multiplicity of solutions for an elliptic equation with a singular nonlinearity and a gradient term

10:45 – 11:05 Tea break

11:05 – 11:55 Xiaofeng Ren (George Washington University)
The spectrum of the torus profile to a geometric variational problem with long range interaction

12:00 – 14:00 Lunch

December 11, Sunday, Afternoon

Chair:

14:00 – 14:25 Aliang Xia (Jiangxi Normal University)
Principal eigenvalues of fully nonlinear integro-differential elliptic equations with a drift term

14:30 – 14:55 Yong Liu (North China Electric Power University)
Nondegeneracy of a lump to the 2 + 1 Toda lattice

15:00– 15:25 Rui Huang (South China Normal University)
Asymptotic stability of non-monotone traveling waves for time-delayed nonlocal dispersion equations

15:30-15:50 Tea break

Chair:

15:50-16:15 Zhengping Wang (Wuhan University of Technology)
Stability of traveling waves of three dimensional Gross-Pitaevskii equation

16:20-16:45 Lan Tang (Central China Normal University)
Some remarks on generalized Monge-Ampere equations

16:50-17:15 Weiwei Ao (Wuhan University)
Existence of positive solutions with a prescribed singular set of fractional Yamabe Problem

17:20-17:45 Kelei Wang (Wuhan University)
From fractional Allen-Cahn equation to nonlocal minimal surfaces

18:00 – 19:30 Dinner

19:30 Go back to hotel by shuttle bus

December 12, Monday, Morning

Chair: Juncheng Wei

09:00 – 09:50 Shuangjie Peng (Central China Normal University)
Local uniqueness and periodicity induced by concentration

09:55 – 10:45 Shusen Yan (University of New England)
Planar Vortex Patch in Incompressible Steady Flow

10:45 – 11:05 Tea break

11:05 – 11:55 Hui Liu (Wuhan University)
Multiplicity and stability of closed characteristics on compact star-shaped hypersurfaces in R^{2n}

12:00 Lunch

13:30 Go back to hotel by shuttle bus

Abstract

Existence of positive solutions with a prescribed singular set of fractional Yamabe Problem

Weiwei Ao, Wuhan University

We consider the problem of the existence of positive solutions with prescribed isolated singularities of the fractional Yamabe problem. Near each singular point, these solutions are approximated by the Delaunay-type singular solution which has been studied recently by De la Torre, Del Pino, Mar Gonzalez and J.C. Wei. Away from the singular points, these solutions are approximated by the summation of the Green's function. This result is the analogous result for the classical Yamabe problem studied by Mazzeo and Pacard (1999). This is a joint work with De la Torre, Mar Gonzalez and J.C. Wei.

Near field asymptotics for the porous medium equation in exterior domains

Carmen Cortazar, Pontificia Universidad Catolica de Chile

Let $\mathcal{H} \subset \mathbb{R}^N$ be a non-empty bounded open set. We consider the porous medium equation in the complement of $\mathcal{H}$, with zero Dirichlet data on its boundary and non-negative compactly supported integrable initial data.

Kamin and Vázquez, in 1991, studied the large time behavior of solutions of such problem in space dimension 1. Gilding and Goncerzewicz, in 2007, studied this same problem dimension 2. However, their result does not say much about the behavior when the points are in the so called near field scale. In particular, it does not give a sharp decay rate, neither a nontrivial asymptotic profile, on compact sets. In this paper we characterize the large time behavior in such scale, thus completing their results.

This a joint work with Fernando Quiros (Universidad Autonoma de Madrid, Spain) and Noem Wolanski (Universidad de Buenos Aires, Argentina).

Holder estimates for solutions of a MEMS equation

Juan Davila, Universidad de Chile

We prove sharp Holder estimates for sequences of positive solutions of a nonlinear elliptic problem with negative exponent. As a consequence, we prove the existence of solutions with isolated ruptures in a bounded convex domain in two dimensions. This is joint work with Kelei Wang (Wuhan University) and Juncheng Wei (University of British Columbia).

Singularity formation for the two-dimensional harmonic map flow into S^2

Manuel Del Pino, Universidad de Chile

We construct finite time blow-up solutions to the 2-dimensional harmonic map flow into the sphere S^2,

$$\begin{cases} u_t = \Delta u + |\nabla u|^2 u \text{ in } \Omega \times (0,T) \\ u = \varphi \text{ on } \partial\Omega \times (0,T) \\ u(\cdot,0) = u_0 \text{ in } \Omega \end{cases}$$

where Ω is a bounded, smooth domain in $\mathbb{R}^2$ and $u : \Omega \times (0,T) \to S^2$, $u_0 : \bar{\Omega} \to S^2$ smooth, $\varphi = u_0|_{\partial}\Omega$. Given any points $q_1, \cdots, q_k$ in the domain, we find initial and boundary data so that the solution blows-up precisely at those points. The profile around each point is close to an asymptotically singular scaling of a 1-corrotational harmonic map. We prove stability of this phenomenon if $k = 1$. This is joint work with Juan Davila and Juncheng Wei.

Some recent resultd on Dirac equations etc.

Yanheng Ding, AMSS

Under the strongly indefinite framework we obtain some results on:

- the existence,concentration and exponential decay for semiclassical solutions of Dirac equation and the reaction-diffusion systems, etc.;
- bifurcation of Dirac equation on spin manifolds, by extending Del Pino etc.s local mountain pass arguments to strongly indefinite problems.

Multiplicity of solutions for an elliptic equation with a singular nonlinearity and a gradient term

Ignacio Guerra, Universidad Santiago de Chile

We consider the problem

$$\begin{aligned} -\Delta u &= \lambda \frac{(1+|\nabla u|^q)}{(1-u)^p}, \quad 0 < u < 1, \quad \text{in} \quad B, \\ u &= 0 \qquad \text{on} \quad \partial B, \end{aligned}$$

where B is the unit ball in $\mathbb{R}^N$, $p > 0$, $q \geq 0$ and $\lambda \geq 0$.

The problem with $q = 0$ is well know. In fact, Joseph & Lundgren found that for $2 < N < 4\frac{p}{p+1} + 4\sqrt{\frac{p}{p+1}} + 2$ there are infinitely many solutions for some $\lambda = \lambda_* > 0$. On the other hand, they also found that for $N \geq 4\frac{p}{p+1} + 4\sqrt{\frac{p}{p+1}} + 2$ there exists λ^* such that there exists a unique solution for each $0 < \lambda < \lambda^*$.

Here we study the existence of solutions for this problem when $q > 0$. In particular, we found for $p = 1$, a range of q and N where there exists $\lambda_* > 0$ such that are infinitely many solutions for $\lambda = \lambda_*$.

Asymptotic stability of non-monotone traveling waves for time-delayed nonlocal dispersion equations

Rui Huang, South China Normal University

This talk is concerned with the stability of non-monotone traveling waves to a nonlocal dispersion equation with time-delay, a time-delayed integro-differential equation. When the equation is crossing-monostable, the equation and the traveling waves both loss their monotonicity, and the traveling waves are oscillating as the time-delay is big. We prove that all non-critical traveling waves, including those oscillatory waves, are time-exponentially stable, when the initial perturbation around the waves are small. The adopted approach is the technical weighted-energy method. Numerical simulations in different cases are also carried out, which further confirm our theoretical result. Finally, as a corollary of our stability result, we immediately obtain the uniqueness of the traveling waves for the non-monotone integro-differential equation, which was open so far as we know. This is a point work with M. Mei, K. Zhang and Q. Zhang.

Boundary singularities of positive solutions to the quasilinear equation $-\Delta_p u + |\nabla u|^q = 0$

Marta Garcia-Huidobro Campos, Pontificia Universidad Catolica de Chile

We study the boundary behaviour of the positive solutions of (E) $-\Delta_p u + |\nabla u|^q = 0$ in a domain $\Omega \subseteq \mathbb{R}^N$, when $N \geq p > q > p-1$. We show the existence of a critical exponent $q_* < p$ such that if $p-1 < q < q_*$ there exist positive solutions of (E) with an isolated singularity on $\partial\Omega$ and that these solutions belong to two different classes of singular solutions. If $q_* \leq q < p$ no such solution exists and actually any boundary isolated singularity of a positive solution of (E) is removable. We prove that all the singular positive solutions are classified according to the two types of singular solutions that we have constructed.

Dirichlet problem for 1-Laplacian and Minimizers of Rudin-Osher-Fatemi Functionals

Meiyue Jiang, Peking University

Let $\Omega \subset \mathbb{R}^2$ be a bounded domain, and ϕ be a given function. In this talk we will discuss the Dirichlet problem of 1-Laplaian:

$$\begin{aligned} -\triangle_1 u &= 0, \quad x \in \Omega \\ u &= \phi, \quad x \in \partial\Omega, \end{aligned}$$

where $\triangle_1 u = div(\frac{\nabla u}{|\nabla u|})$ and the minimizers of the functional

$$E_1(u) = \int_\Omega |\nabla u| dx + \int_{\partial\Omega} |u - \phi| ds.$$

This functional is related to the following Rudin-Osher-Fatemi functional

$$E_K(u) = \int_\Omega |\nabla u| dx + \frac{\lambda}{2} \int_{\Omega \setminus K} |u - \phi|^2 dx$$

from image inpainting, where $K \subset \Omega$. Some explicit formulas of minimizers for simple ϕ will be discussed.

The results are joint works with Kewei Zhang.

Large Time Periodic Solution to the Coupled Chemotaxis-fluid Model

Chunhua Jin, South China Normal University

In this paper, we deal with the time periodic problem for the coupled chemotaxis-fluid model with logistic growth term. We prove the existence of large time periodic solution in spatial dimension $N = 2, 3$. Furthermore, we also show that if the time periodic source g and the potential force $\nabla\varphi$ belong to $C^{\alpha, \frac{\alpha}{2}}(\overline{\Omega} \times \mathbb{R})$, the solution is also a classical solution.

Multiplicity and stability of closed characteristics on compact star-shaped hypersurfaces in $\mathbb{R}^{2n}$

Hui Liu, Wuhan University

The problems of closed characteristics of Hamiltonian systems on prescribed energy hyper- surfaces are important in Hamiltonian dynamics, and many famous mathematicians have made contributions to them. For the convex hypersurface case, there exist a lot of beautiful results on multiplicity and stability of closed characteristics, but for the star-shaped case, the corre- sponding results are few. In recent years, we have established some new resonance identities of closed characteristics on star-shaped hypersurfaces, which are successfully used to obtain new results on multiplicity and stability of closed characteristics. In this talk, I will give a survey of our results. These are joint works with Huagui Duan, Yiming Long and Wei Wang.

Nondegeneracy of a lump to the $2+1$ Toda lattice

Yong Liu, North China Electric Power University

The two dimensional Toda lattice

$$\Delta q_n = e^{q_{n-1} - q_n} - e^{q_n - q_{n+1}}, n \in \mathbb{Z},$$

has a lump solution $\{Q_n\}$ given explicitly by

$$Q_n(x, y) = \ln \frac{\frac{1}{4} + \left(n - 1 + 2\sqrt{2}x\right)^2 + 4y^2}{\frac{1}{4} + \left(n + 2\sqrt{2}x\right)^2 + 4y^2}.$$

Using linearized Backlund transformation, we show that $\{Q_n\}$ is nondegenerated in the sense that the linearized Toda lattice

$$\Delta\phi_n = e^{Q_{n-1}-Q_n}\left(\phi_{n-1}-\phi_n\right) - e^{Q_n-Q_{n+1}}\left(\phi_n-\phi_{n+1}\right), n \in \mathbb{Z},$$

has no nontrivial decaying kernel ϕ_n satisfying $\phi_{n+1}(x,y) = \phi_n\left(x+\frac{1}{2\sqrt{2}}, y\right)$.

Solutions to a class of quasilinear elliptic equations and their sign properties

Zhaoli Liu, Capital Normal University

We consider existence of multiple solutions to a class of parameter-dependent quasilinear elliptic equations. Sign properties of the solutions are also studied. The solutions are obtained by two different methods. One is a perturbation method incorporated into the arguments of invariant sets of descending flow, and six solutions with sign properties are obtained using this method. The other is a cut off method, and using this method more and more solutions are obtained as the parameter gets larger and larger. It is expected that those solutions are sign-changing solutions. For more constrained nonlinearities, we prove existence of more and more sign-changing solutions as the parameter gets larger and larger. (This is joint work with Yongtao Jing, Zhi-Qiang Wang and myself.)

Infinite-time bubbling in the critical nonlinear heat equation

Monica Musso, Pontificia Universidad Catolica de Chile

In this talk I will present two results concerning construction of infinite time bubbling solutions for critical nonlinear heat equations of Fujita type.

The first result is on a smooth bounded domain Ω in $\mathbb{R}^n$, $n \geq 5$. We consider the classical semilinear heat equation at the critical Sobolev exponent

$$u_t = \Delta u + u^{\frac{n+2}{n-2}} \quad \text{in } \Omega \times (0,\infty), \quad u = 0 \quad \text{on } \partial\Omega \times (0,\infty).$$

Given any integer $k \geq 1$, we prove the existence of a positive smooth solution $u(x,t)$ which blows-up by bubbling in infinite time near k points $q_1, \ldots, q_k$ in Ω. More precisely, for large time t, u takes the approximate form

$$u(x,t) \approx \sum_{j=1}^{k} \alpha_n \left(\frac{\mu_j(t)}{\mu_j(t)^2 + |x-\xi_j(t)|^2}\right)^{\frac{n-2}{2}}.$$

Here $\xi_j(t) \to q_j$ and $0 < \mu_j(t) \to 0$, as $t \to \infty$. We find that $\mu_j(t) \sim t^{-\frac{1}{n-4}}$ as $t \to +\infty$. This work is in collaboration with Manuel del Pino and Carmen Cortázar.

The second result is on the whole space $\mathbb{R}^3$. We construct a globally defined radially symmetric positive solution to

$$u_t = \Delta u + u^5, \quad \text{in} \quad \mathbb{R}^3 \times (0, \infty),$$

with $\lim_{r\to\infty} r^\gamma u(r,0) = A > 0$, for some $\gamma > 1$. We show that, as $t \to \infty$,

$$\|u(r,t)\|_\infty \sim \frac{1}{t^{\frac{\gamma-1}{2}}}, \quad \text{if} \quad 1 < \gamma < 2, \quad \|u(r,t)\|_\infty \sim \frac{1}{\sqrt{t}}, \quad \text{if} \quad \gamma > 2,$$

and

$$\|u(r,t)\|_\infty \sim \frac{\ln t}{\sqrt{t}}, \quad \text{if} \quad \gamma = 2.$$

This work is in collaboration with Manuel del Pino and Juncheng Wei.

Some results for the n-Laplacian in R^n

Raul Manasevich, Universidad de Chile

In this talk we will first review some early results related to the existence of ground states solutions for the 'n-Laplacian' in R^n,

$$div(|\nabla u|^{n-2}\nabla u) + f(u) = 0, \ n > 1 \tag{0.0.1}$$

that hold for a large class of nonlinearities f. These results hold without imposing any restriction on $f(u)$ for large values of u. We then show how to extend these results to problems of the form

$$div(|\nabla u|^{n-2}\nabla u) + a(|x|)f(u) = 0, \ n > 1$$

where is $a(|x|)$ is a power and x is in R^n.

Local uniqueness and periodicity induced by concentration

Shuangjie Peng, Central China Normal University

We will talk about the following poly-harmonic equations with critical exponents:

$$(-\Delta)^m u = K(y) u^{\frac{N+2m}{N-2m}}, \quad u > 0 \quad \text{in } \mathbb{R}^N,$$

where $N > 2m+2, m \in \mathbb{N}_+, K(y)$ is positive and periodic in its first k variables $(y_1, \cdots, y_k)$, $1 \le k < \frac{N-2m}{2}$. Under some conditions on $K(y)$ near its critical point, we prove the existence and local uniqueness of solutions with infinitely many bubbles. The local uniqueness result implies that some bubbling solutions preserve the symmetry of the scalar curvature $K(y)$. Moreover, we also show that the conditions imposed are optimal to obtain such results.

The spectrum of the torus profile to a geometric variational problem with long range interaction

Xiaofeng Ren, The George Washington University

The profile problem for the Ohta-Kawasaki diblock copolymer theory is a geometric variational problem. The energy functional is defined on sets in $\mathbb{R}^3$ of prescribed volume and the energy of an admissible set is its perimeter plus a long range interaction term related to the Newtonian potential of the set. This problem admits a solution, called a torus profile, that is a set enclosed by an approximate torus of the major radius 1 and the minor radius q. There is a way to set up the profile problem in a function space as a integro-partial differential equation. The linearized operator $\mathcal{L}$ of the problem at the torus profile is decomposed into a family of linear integro-ordinary differential operators $\mathcal{L}^m$ where the index $m = 0, 1, 2, ...$ is called a mode. The spectrum of $\mathcal{L}$ is the union of the spectra of the $\mathcal{L}^m$'s. It is proved that for each m, when q is sufficiently small, $\mathcal{L}^m$ is positive definite. (0 is an eigenvalue for both $\mathcal{L}^0$ and $\mathcal{L}^1$, due to the translation and rotation invariance.) As q tends to 0, more and more $\mathcal{L}^m$'s become positive definite. However no matter how small q is, there is always a mode m of which $\mathcal{L}^m$ has a negative eigenvalue. This mode grows to infinity like $q^{-3/4}$ as $q \to 0$. This is joint work with Juncheng Wei.

Some Remarks on Generalized Monge-Ampere Equations

Lan Tang, Central China Normal University

We consider the generalized Monge-Ampere equations and the related comparison principle would be given. Moreover, we also study the solvability of the Dirichlet problem of the generalized Monge-Ampere equations.

From fractional Allen-Cahn equation to nonlocal minimal surfaces

Kelei Wang, Wuhan University

For singularly perturbed Allen-Cahn equations and Ginzburg-Landau equations, it is known that their singular limits are minimal submanifolds. In this talk I will discuss a result on the fractional Allen-Cahn equation, linking its limit to the so called stationary fractional minimal surfaces. In contrast to the classical case, here we can obtain a rather strong convergence result, as well as many good estimates. This is a joint work with Vincent Millot and Yannick Sire.

Stability of traveling waves of three dimensional Gross-Pitaevskii equation

Zhengping Wang, Wuhan University of Technology

We present some recent results on the stability of traveling waves of three dimensional Gross-Pitaevskii (GP)equation. The GP equation is a nonlinear Schrodinger equation with nonzero condition at infinity, which has traveling waves with non-vanishing limit at infinity, first discovered by physicists (Jones, Roberts et al.) in 1980s. The existence of such traveling waves has been studied a lot in recent years by Betheul, Saut, Maris and many others. However, the stability and dynamical behaviors of these traveling waves are not well understood. In collaboration with professors Zhiwu Lin and Chongchun Zeng, we proved a nonlinear stability criterion for 3D traveling waves of GP equation as conjectured in the physical literature.

Asymptotics in coupled nonlinear Schrödinger equations with large mixed couplings

Zhiqiang Wang, Tianjin University /Utah State University

We discuss work on existence and qualitative property of positive solutions for coupled nonlinear Schrodinger equations. Depending upon the system being attractive or repulsive, solutions may tend to be component-wisely synchronized or segregated. We report recent work on the effect of mixed couplings for which coexistence of synchronization and segregation may occur, in particular, we examine the asymptotic behavior of least energy solutions for large mixed couplings of multi-scales.

Principal eigenvalues of fully nonlinear integro-differential elliptic equations with a drift term

Aliang Xia, Jiangxi Normal University

I will present the existence of principal eigenvalues of fully nonlinear integro-differential elliptic equations with a drift term via the Krein-Rutman theorem which based on regularity up to boundary of solutions. We also show the simplicity of the eigenfunctions in viscosity sense by a nonlocal version of ABP estimate. This work joint with Alexander Quaas (U. Santa Matia, Chile) and Ariel Salort (U. Buenos Aires, Argentina).

Planar Vortex Patch in Incompressible Steady Flow

Shusen Yan, University of New England

We investigate a steady planar flow of an ideal fluid in a bounded domain and focus on the vortex patch problem with prescribed vorticity strength. There are two methods to deal with the existence for this problem: the vorticity method and the stream function method. A long standing open problem is whether these two entirely different methods result in the same solution. In this talk, we will give a positive answer to this problem by studying the local uniqueness of the solutions.

This talk is based on the joint works with Daomin Cao, Yuxia Guo and Shuangjie Peng.

Uniqueness, existence and concentration of positive ground states for Kirchhoff type problems

Zhitao Zhang, AMSS

Kirchhoff type equations have been studied extensively by many researchers, which is related to the stationary analogue of the equation

$$u_{tt} - \left(a + b\int_{\Omega} |\nabla u|^2\right)\Delta u = g(x,t) \tag{0.0.2}$$

proposed by Kirchhoff as an extension of the classical D'Alembert's wave equation for free vibrations of elastic strings, Kirchhoff's model takes into account the changes in length of the string produced by transverse vibrations. We first show some recent results on nonlocal problems.

We also prove the uniqueness of positive ground state for the Kirchhoff type equations in $\mathbb{R}^3$ with constant coefficients

$$\begin{cases} -(a + b\int_{\mathbb{R}^3} |\nabla u|^2)\Delta u + cu = d|u|^{p-1}u \quad in\ \mathbb{R}^3, \\ u > 0, \quad u \in H^1(\mathbb{R}^3), \end{cases}$$

where a, b, c, $d > 0$ are positive constants, $3 < p < 5$. Then we use the uniqueness results to obtain the existence and concentration theorems of positive ground states to the Kirchhoff type equations with competing potential functions

$$-(\epsilon^2 a + \epsilon b\int_{\mathbb{R}^3} |\nabla u|^2)\Delta u + V(x)u = K(x)|u|^{p-1}u \quad in\ \mathbb{R}^3$$

for a sufficiently small positive parameter ϵ.

Continuous Weak Solutions Of Boussinesq Equations

Liqun Zhang, AMSS

The Boussingesq equations was introduced in understanding the coupling nature of the thermodynamics and the fluid dynamics. We prove the existence of continuous periodic weak solutions of the Boussinesq equations which either satisfies the prescribed kinetic energy or some other property.

This is a jointed work with Tao tao.

Singular solutions with prescribed singular set for a biharmonic equation

Feng Zhou, East China Normal University

Positive singular radial entire solutions of a biharmonic equation with subcritical exponent are considered. We obtain the existence and the expansions of such singular radial solutions at the singular point 0. These can be obtained via the entire radial solutions of the equation with supercritical exponent and the Kelvin transformation. Using these singular radial entire solutions, we can construct solutions with a prescribed singular set for a Navier boundary value problem. This is a joint work with Z.M. Guo and J.C. Wei.

On a doubly critical Schrodinger system in R^4 with steep potential wells

Wenming Zou, Tsinghua University

I will talk the following two-component elliptic system

$$\begin{cases} \Delta u - (\lambda a(x) + a_0)u + u^3 + \beta v^2 u = 0 & \text{in } \mathbb{R}^4, \\ \Delta v - (\lambda b(x) + b_0)v + v^3 + \beta u^2 v = 0 & \text{in } \mathbb{R}^4, \\ (u, v) \in H^1 \times H^1, \end{cases}$$

where $a_0, b_0 \in \mathbb{R}$ are constants; $\lambda > 0$ and $\beta \in \mathbb{R}$ are parameters and $a(x), b(x) \geq 0$ are potential wells which are not necessarily to be radial symmetric. By using the variational method, we investigate the existence of ground state solutions and general ground state solutions (i.e., possibly semi-trivial) to this system. Indeed, to the best of our knowledge, even the existence of semi-trivial solutions is also unknown in the literature. We observe some concentration behaviors of ground state solutions and general ground state solutions. The phenomenon of phase separations is also excepted. It seems that this is the first result definitely describing the phenomenon of phase separation for critical system in the whole space R4. Note that both the cubic nonlinearities and the coupled terms of the system are all of critical growth with respect to the Sobolev critical exponent.

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General Information

1. Accommodation is in Junyi Dynasty Hotel （君宜王朝大饭店）. There will be reception at the hotel from 14:00 to 18:00, Dec. 8. Reception dinner is also in this hotel, starting from 18:00.

2. The conference will be held at the Lecture Hall in School of Mathematics, Wuhan University.

3. Wireless internet is accessiable in the Lecture Hall, no need of password.

4. Lunch and dinner except the banquet will be served at Luojia Villa Hotel （珞珈山庄）, located in the campus of Wuhan Univeristy.

The banquet will held at Jiangnan Xiaoguanyuan Restaurant（江南小观园） on Dec. 10.

5. There will be a shuttle bus from Junyi Dynasty Hotel to School of Mathematics and Statistics. Detailed time is as follows:

(i) Dec. 9: 8:00, pick up at Junyi to School of Mathematics and Statistics;

(ii) Dec.10-12: 8:30, pick up at Junyi to School of Mathematics and Statistics;

(iii) Dec. 9 & 11: 19:30, Luojia Villa Hotel to Junyi;

(iv) Dec. 10: 19:30, pick up at Jiangnan Xiaoguanyuan Restaurant to Junyi;

(v) Dec. 12: 13:30, Luojia Villa Hotel to Junyi.

6. In any case, you can contact us by

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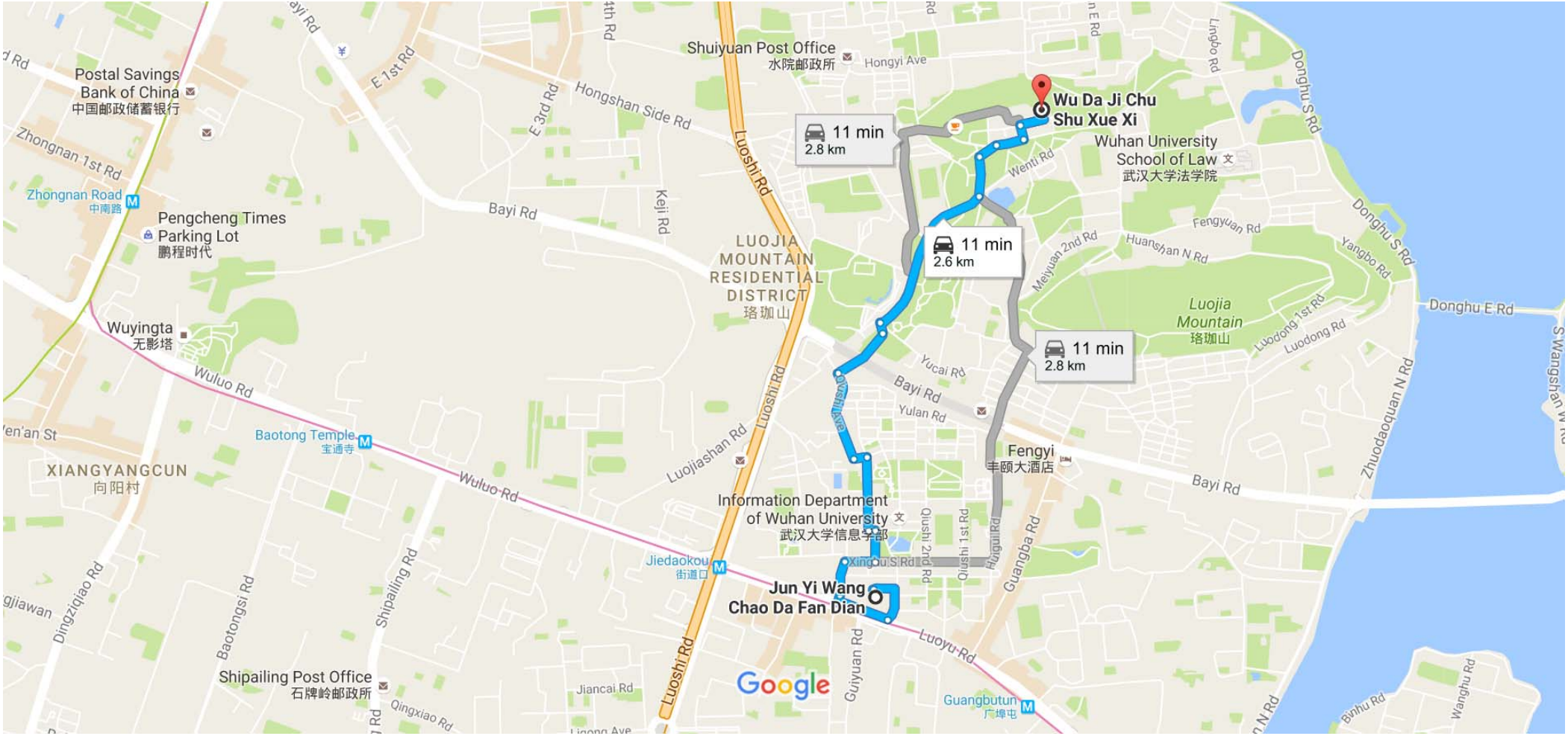
Jun Yi Dynasty Hotel to School of Mathematics and Statistics, Wuhan University



School of Mathematics and Statistics to Luojia Villa Hotel

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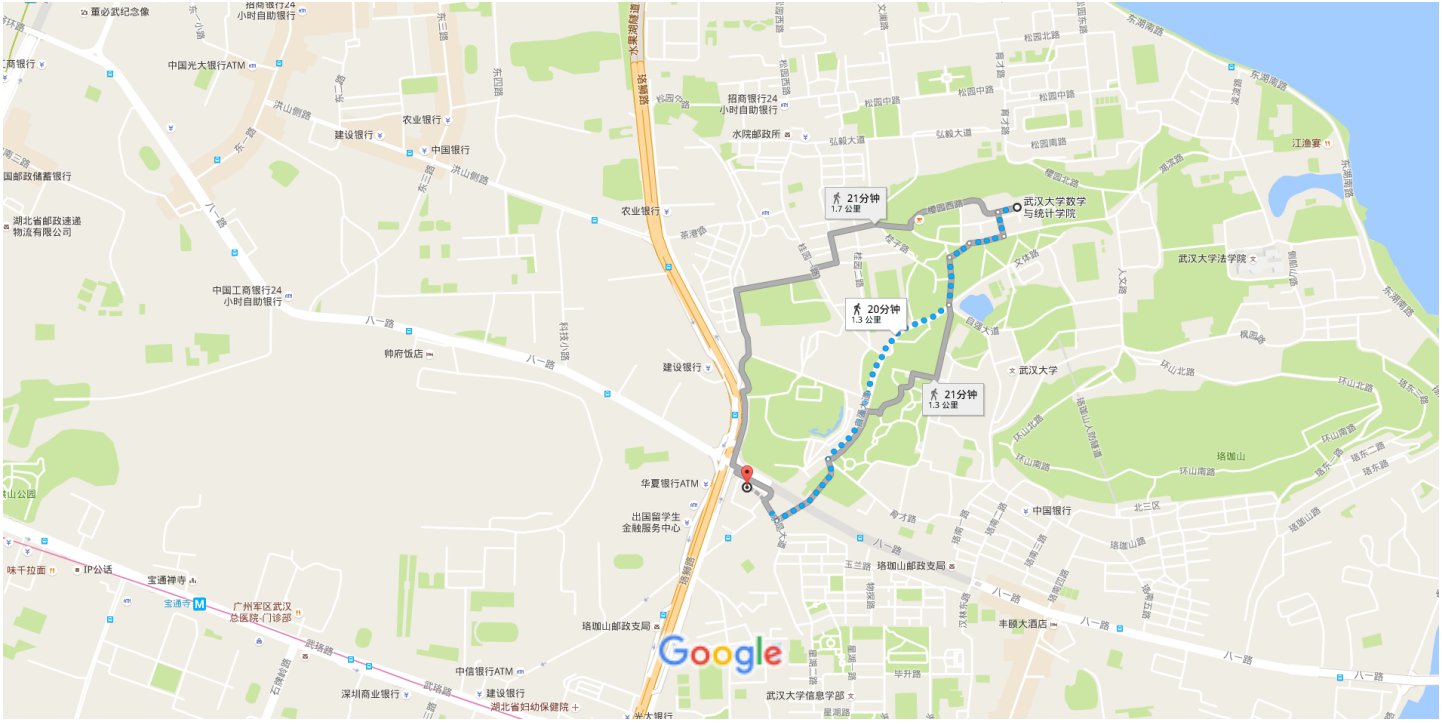
From School of Mathematics and Statistics to Jiangnan Xiaoguanyuan Restrauant



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