深圳北理莫斯科大學
УНИВЕРСИТЕТ МГУ–ППИ В ШЭНЬЧЖЭНЕ
SHENZHEN MSU-BIT UNIVERSITY

2023

第二届分析与计算研讨会

The MSU-BIT Workshop on Analysis and Computation

主办单位：深圳北理莫斯科大学

莫大-北理-深北莫应用数学联合研究中心

粤港澳(国家)应用数学中心 深圳分中心

2023 年 11 月 24-26 日 • 深圳

一、会议组织(Organization)

（一）会议目标（Objectives）

This workshop aims to bring together domestic scholars and researchers in the field of theoretical, applied and computational mathematics, and share the latest research progress and prospects in the relevant research areas. The Faculty of Computational Mathematics and Cybernetics, Shenzhen MSU-BIT University will host "The Second MSU-BIT Workshop on Analysis and Computation" from Nov 24th to 26th, 2023.

（二）科学委员会（Scientific Committee）（按姓名首字母顺序排序）

楼　元	上海交通大学
倪维明	香港中文大学（深圳）
宋明辉	哈尔滨工业大学
汤　涛	北京师范大学-香港浸会大学联合国际学院
王学锋	香港中文大学（深圳）
杨　彤	香港理工大学
张　波	中科院数学与系统科学研究院
邹　军	香港中文大学

（三）组织委员会（Organizing Committee）

刘宏宇	香港城市大学	hongyu.liuip@gmail.com
李海刚	北京师范大学	hgli@bnu.edu.cn
张　晔	深圳北理莫斯科大学	ye.zhang@smbu.edu.cn
李景治	南方科技大学	lijz@sustech.edu.cn
何酉子	深圳北理莫斯科大学	youzihe@smbu.edu.cn

（四）执行委员会（executive committee）

丁明慧	香港城市大学	mingding@cityu.edu.hk
段超华	香港城市大学	chduan3-c@my.cityu.edu.hk
胡跃光	香港城市大学	yueghu2-@my.cityu.edu.hk
孟庆乐	香港城市大学	qinmeng@cityu.edu.hk

二、会议信息(Quick Information)

（一）会议时间（Time）：2023 年 11 月 24 日-11 月 26 日

日　期	会议内容	地点
11月24日	会议报到、自由讨论	雅邦朗悦国际酒店/深圳北理莫斯科大学主楼3楼
11月25日	会议报到、会议开幕式、会议主题报告、交流讨论	深圳北理莫斯科大学图书馆1楼视听室
11月26日	会议主题报告、交流讨论	深圳北理莫斯科大学图书馆1楼视听室

备注：具体安排见“会议日程”。

（二）会议地点（Conference Venue）

深圳北理莫斯科大学图书馆 1 楼视听室

会议注册(Registration)：11 月 24 日 14:00—17:30 雅邦朗悦国际酒店/深圳北理莫斯科大学主楼 3 楼

（三）会议餐饮（Meals）

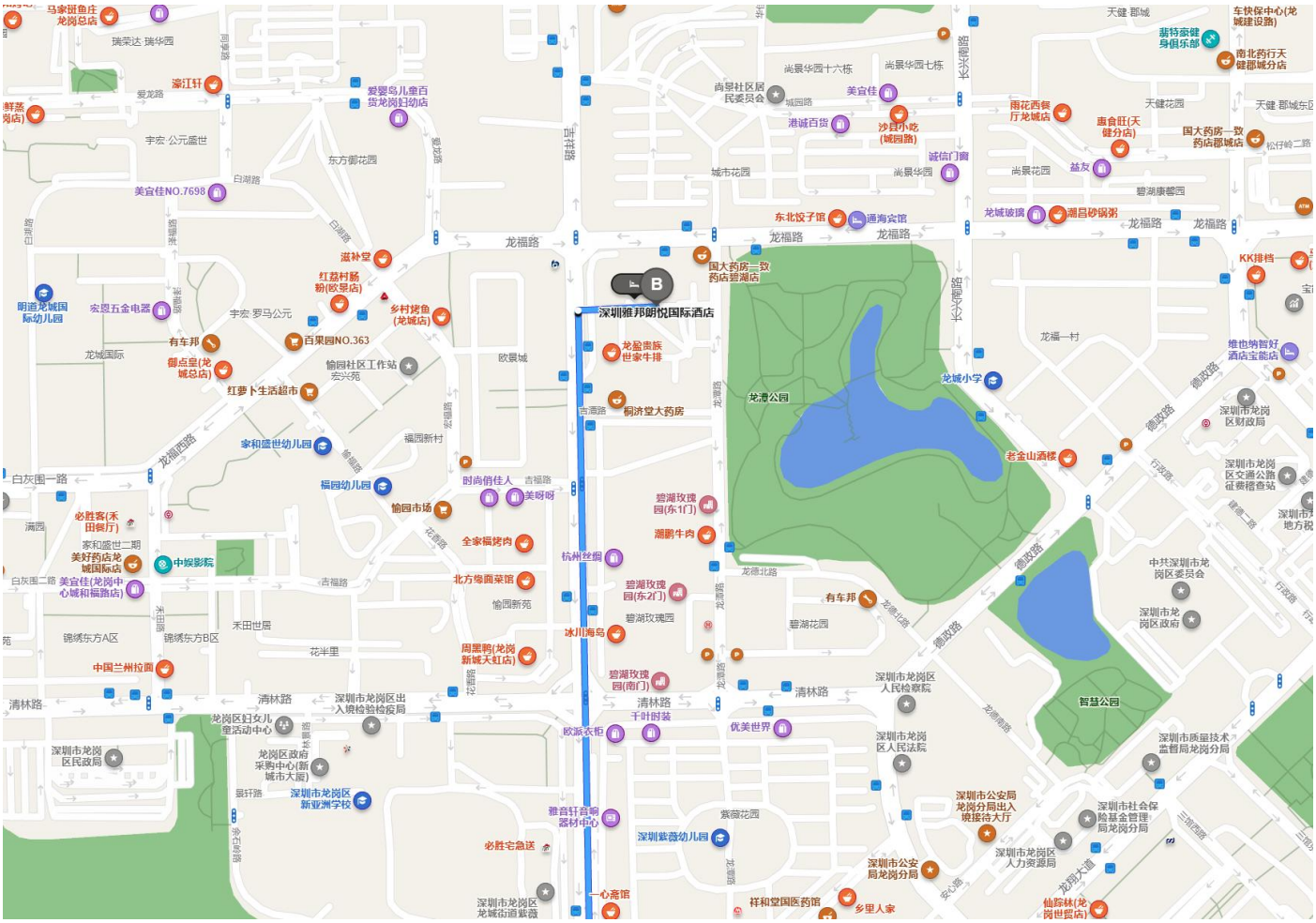
深圳北理莫斯科大学一食堂三楼/奥林宾馆

（四）会议住宿(Accommodation)

11 月 24 日—11 月 26 日：雅邦朗悦国际酒店/深圳北理莫斯科大学 2B&3B

（五）交通路线（Traffic routes）

深圳北理莫斯科大学地址：广东省深圳市龙岗区大运新城国际大学园路 1 号



雅邦朗悦国际酒店地址：深圳市龙岗区中心城吉祥中路 588 号

三、 会议日程(Program Schedule)

第一天(Day 1): Nov 24, 2023	
14:00-17:30	Registration
17:30-19:30	Dinner&discussion

第二天(Day 2): Nov 25, 2023	
Chair: Ye Zhang	
08:45-09:00	开幕式及校长讲话 (Opening Speech by SMBU Rector)
Chair: Meiyue Jiang	
09:00-09:30	张超 Equivalence of different solutions to double phase equations
09:30-10:00	李莉 Well-posedness of 3D Navier-Stokes and MHD equations with partial hyper-dissipation
10:00-10:20	**Tea break**
Chair: Zhian Wang	
10:20-10:50	邱蔚峰 Global W^{2,p} estimates for elliptic equations in non-divergence form
10:50-11:20	赵泽华 On the long time behavior and decaying property of nonlinear dispersive equations
Afternoon Session	
Chair: Zhengjian Bai	
14:00-14:30	朱全新 Event-triggered control problems of stochastic nonlinear delay systems
14:30-15:00	宋义壮 Stability of the isotropic conductivity reconstruction using magnetic resonance electrical impedance tomography (MREIT)

15:00-15:30	岳海天 Invariant Gibbs measures for 2D NLS and 3D cubic NLW
15:30-15:50	**Tea break**
Chair: Rongfang Gong	
15:50-16:20	徐龙娟 Estimates for stress concentration between two adjacent rigid inclusions in Stokes flow
16:20-16:50	黄侠 On sharp discrete Hardy-Rellich inequalities
Chair: Wei Jiang	
16:50-17:20	曹鑫林 The electromagnetic waves generated by a cluster of nanoparticles with high refractive indices and corresponding effective medium
17:20-17:50	张可慧 Image Segmentation with Shape Compactness Regularization

第三天(Day 3): Nov 26, 2023	
Chair: Wei Xiang	
09:00-09:30	李芳 Optimisation of total population in logistic model with nonlocal dispersals and heterogeneous environments
09:30-10:00	高欣 Uniqueness of Transonic Shock Solutions for Two-Dimensional Steady Compressible Euler Flows in an Expanding Nozzle
10:00-10:20	**Tea break**
Chair: Huajun Gong	
10:20-10:50	仇嘉宇 Mathematical theory for the interface mode in 2D photonic structure
10:50-11:20	刘昕宇 A Fourier Approach to Parameter Identification for Gaussian Mixtures
11:20-11:50	骆泳铭 Long time behavior of the focusing NLS on RdTm via the semivirial-vanishing geometry
Chair: Hongyu Liu	
11:50-12:00	闭幕式

四、与会专家名单(List of Participants)

（按姓名首字母顺序排序）

白正简 Zhengjian Bai	厦门大学 Xiamen University
曹阳阳 Yangyang Cao	深圳北理莫斯科大学 Shenzhen MSU-BIT University
曹鑫林 Xinlin Cao	香港理工大学 The Hong Kong Polytechnic University
常燕 Yan Chang	哈尔滨工业大学 Harbin Institute of Technology
陈博超 Bochao Chen	东北师范大学 Northeast Normal University
陈荣亮 Rongliang Chen	中国科学院深圳先进技术研究院 Shenzhen Institute of Advanced Technology，Chinese Academy of Sciences
陈阳 Yang Chen	深圳北理莫斯科大学 Shenzhen MSU-BIT University
陈振荣 Zhenrong Chen	哈尔滨工业大学（深圳） Harbin Institute of Technology, Shenzhen
邓又军 Youjun Deng	中南大学 Central South University
丁明慧 Minghui Ding	香港城市大学 City University of Hong Kong
段北平 Beiping Duan	深圳北理莫斯科大学 Shenzhen MSU-BIT University
段超华 Chaohua Duan	香港城市大学 City University of Hong Kong
费晓旭 Xiaoxu Fei	中南大学 Central South University
费泽韬 Zetao Fei	香港科技大学 Hong Kong University of Science and Technology
季丽娜 Lina Ji	深圳北理莫斯科大学 Shenzhen MSU-BIT University
郜广宇 Guangyu Gao	哈尔滨工业大学 Harbin Institute of Technology
高欣 Xin Gao	香港城市大学 City University of Hong Kong

高宇 Yu Gao	吉林大学 Jilin University
龚华均 Huajun Gong	深圳大学 Shenzhen University
龚荣芳 Rongfang Gong	南京航空航天大学 Nanjing University of Aeronautics and Astronautics
古惠鹏 Huipeng Gu	南方科技大学 Southern University of Science and Technology
郭俊鑫 Junxin Guo	南方科技大学 Southern University of Science and Technology
郭沛芫 Peiyuan Guo	南京航空航天大学 Nanjing University of Aeronautics and Astronautics
郭玉坤 Yukun Guo	哈尔滨工业大学 Harbin Institute of Technology
郝霞 Xia Hao	河北师范大学 Hebei Normal University
何酉子 Youzi He	深圳北理莫斯科大学 Shenzhen MSU-BIT University
胡跃光 Yueguang Hu	香港城市大学 City University of Hong Kong
黄麟雅 Linya Huang	南京航空航天大学 Nanjing University of Aeronautics and Astronautics
黄侠 Xia Huang	华东师范大学 East China Normal University
蒋美跃 Meiyue Jiang	北京大学 Peking University
蒋维 Wei Jiang	武汉大学 Wuhan University
金邦梯 Bangti Jin	香港中文大学 The Chinese University of Hong Kong
孔令政 Lingzheng Kong	中南大学 Central South University
赖军将 Junjiang Lai	闽江学院 Minjiang University
雷琪 Qi Lei	湖南大学 Hunan University

李春 Chun Li	深圳北理莫斯科大学 Shenzhen MSU-BIT University
李芳 Fang Li	中山大学 Sun Yat-sen University
李海刚 Haigang Li	北京师范大学 Beijing Normal University
李宏杰 Hongjie Li	清华大学 Tsinghua University
李加勉 Jiamian Li	深圳北理莫斯科大学 Shenzhen MSU-BIT University
李景治 Jingzhi Li	南方科技大学 Southern University of Science and Technology
李敬宇 Jingyu Li	东北师范大学 Northeast Normal University
李莉 Li Li	宁波大学 Ningbo University
李凌丰 Lingfeng Li	香港心脑血管健康工程研究中心 Hong Kong Cardio-Cerebral Vascular Health Engineering Research Center
李善强 Shanqiang Li	福建理工大学 Fujian University of Technology
李玉萍 Yuping Li	哈尔滨工业大学（深圳） Harbin Institute of Technology, Shenzhen
李籽良 Ziliang Li	南方科技大学 Southern University of Science and Technology
历宇涵 Yuhan Li	香港城市大学 City University of Hong Kong
林增 Zeng Lin	中国科学院深圳先进技术研究院 Shenzhen Institute of Advanced Technology，Chinese Academy of Sciences
凌端朋 Duanpeng Ling	南方科技大学 Southern University of Science and Technology
刘宏宇 Hongyu Liu	香港城市大学 City University of Hong Kong
刘可伋 Keji Liu	上海财经大学 Shanghai University of Finance and Economics
刘晓慧 Xiaohui Liu	南京航空航天大学 Nanjing University of Aeronautics and Astronautics

刘欣冉 Xinran Liu	南京航空航天大学 Nanjing University of Aeronautics and Astronautics
刘昕宇 Xinyu Liu	香港科技大学 Hong Kong University of Science and Technology
龙吟秋 Yinqiu Long	南方科技大学 Southern University of Science and Technology
卢咏君 Catharine Lo	香港城市大学 City University of Hong Kong
龙海娥 Haie Long	深圳北理莫斯科大学 Shenzhen MSU-BIT University
卢健民 Jianmin Lu	南方科技大学 Southern University of Science and Technology
芦永明 Yongming Lu	深圳北理莫斯科大学 Shenzhen MSU-BIT University
骆泳铭 Yongming Luo	深圳北理莫斯科大学 Shenzhen MSU-BIT University
吕俊良 Junliang Lyu	吉林大学 Jilin University
吕志远 Zhiyuan Lyu	香港中文大学 The Chinese University of Hong Kong
马云云 Yunyun Ma	东莞理工学院 Dongguan University of Technology
孟品超 Pinchao Meng	长春理工大学 Changchun University of Science and Technology
孟庆乐 Qingle Meng	香港城市大学 City University of Hong Kong
苗志强 Zhiqiang Miao	湖南大学 Hunan University
穆景源 Jingyuan Mu	深圳北理莫斯科大学 Shenzhen MSU-BIT University
彭文健 Wenjian Peng	香港城市大学 City University of Hong Kong
覃善林 Shanlin Qin	中国科学院深圳先进技术研究院 Shenzhen Institute of Advanced Technology，Chinese Academy of Sciences
仇嘉宇 Jiayu Qiu	香港科技大学 Hong Kong University of Science and Technology

邱美兰 Meilan Qiu	惠州学院 Huizhou University
邱蔚峰 Weifeng Qiu	香港城市大学 City University of Hong Kong
Saravanakumar Ramasamy	深圳北理莫斯科大学 Shenzhen MSU-BIT University
沈俊 Jun Shen	南京航空航天大学 Nanjing University of Aeronautics and Astronautics
申晴 Qing Shen	深圳北理莫斯科大学 Shenzhen MSU-BIT University
宋义壮 Yizhuang Song	山东师范大学 Shandong Normal University
孙春龙 Chunlong Sun	南京航空航天大学 Nanjing University of Aeronautics and Astronautics
孙凡博 Fanbo Sun	中南大学 Central South University
孙家鼐 Jiaao Sun	南方科技大学 Southern University of Science and Technology
孙绍宇 Shaoyu Sun	长春理工大学 Changchun University of Science and Technology
孙优 You Sun	北京理工大学 Beijing Institute of Technology
汤天翔 Tianxiang Tang	深圳北理莫斯科大学 Shenzhen MSU-BIT University
陶琳琳 Linlin Tao	香港浸会大学 Hong Kong Baptist University
陶龙越 Longyue Tao	东北师范大学 Northeast Normal University
滕怀君 Huaijun Teng	北京大学 Beijing Normal University
童恭圣 Gongsheng Tong	中南大学 Central South University
王超 Chao Wang	深圳北理莫斯科大学 Shenzhen MSU-BIT University
王丽 Li Wang	香港城市大学 City University of Hong Kong

王丽丽 Lili Wang	湖南大学 Hunan University
王璐 Lu Wang	哈尔滨工业大学（深圳） Harbin Institute of Technology, Shenzhen
王迎奥 Yingao Wang	北京理工大学 Beijing Institute of Technology
王艺融 Yirong Wang	中南大学 Central South University
王治安 Zhian Wang	香港理工大学 The Hong Kong Polytechnic University
汪贤超 Xianchao Wang	哈尔滨工业大学 Harbin Institute of Technology
吴倩倩 Qianqian Wu	南京航空航天大学 Nanjing University of Aeronautics and Astronautics
吴畏 Wei Wu	吉林大学 Jilin University
向伟 Wei Xiang	香港城市大学 City University of Hong Kong
肖浩强 Haoqiang Xiao	湖南大学 Hunan University
徐磊 Lei Xu	中国科学院深圳先进技术研究院 Shenzhen Institute of Advanced Technology，Chinese Academy of Sciences
徐龙娟 Longjuan Xu	首都师范大学 Capital normal university
许龙强 Longqiang Xu	长春理工大学 Changchun University of Science and Technology
闫争争 Zhengzheng Yan	中国科学院深圳先进技术研究院 Shenzhen Institute of Advanced Technology，Chinese Academy of Sciences
杨建勋 Jianxun Yang	深圳北理莫斯科大学 Shenzhen MSU-BIT University
杨志鹏 Zhipeng Yang	南方科技大学 Southern University of Science and Technology
尹伟石 Weishi Yin	长春理工大学 Changchun University of Science and Technology
游俊韬 Juntao You	深圳大学 Shenzhen University

袁靖 Jing Yuan	南方科技大学 Southern University of Science and Technology
袁文平 Wenping Yuan	哈尔滨工业大学（深圳） Harbin Institute of Technology, Shenzhen
岳海天 Haitian Yue	上海科技大学 ShanghaiTech University
张超 Chao Zhang	哈尔滨工业大学 Harbin Institute of Technology
张海 Hai Zhang	香港科技大学 Hong Kong University of Science and Technology
张济鳞 Jilin Zhang	香港城市大学 City University of Hong Kong
张锦阳 Jinyang Zhang	香港科技大学 Hong Kong University of Science and Technology
张可慧 Kehui Zhang	香港浸会大学 Hong Kong Baptist University
张培豪 Peihao Zhang	北京师范大学 Beijing Normal University
张申 Shen Zhang	香港城市大学 City University of Hong Kong
张文龙 Wenlong Zhang	南方科技大学 Southern University of Science and Technology
张晔 Ye Zhang	深圳北理莫斯科大学 Shenzhen MSU-BIT University
张振 Zhen Zhang	南方科技大学 Southern University of Science and Technology
赵燕 Yan Zhao	北京师范大学 Beijing Normal University
赵泽华 Zehua Zhao	北京理工大学 Beijing Institute of Technology
郑家愉 Jiayu Zheng	深圳北理莫斯科大学 Shenzhen MSU-BIT University
郑光辉 Guanghui Zheng	湖南大学 Hunan University
郑如松 Rusong Zheng	深圳北理莫斯科大学 Shenzhen MSU-BIT University

周庆 Qing Zhou	深圳北理莫斯科大学 Shenzhen MSU-BIT University
周伟盛 Weisheng Zhou	吉林大学 Jilin University
朱丽艳 Liyan Zhu	中南大学 Central South University
朱全新 Quanxin Zhu	湖南师范大学 Hunan Normal University

五、报告摘要(Abstracts)

（按姓名首字母顺序排序）

The electromagnetic waves generated by a cluster of nanoparticles with high refractive indices and corresponding effective medium theory

Xinlin Cao
The Hong Kong Polytechnic University

Abstract: We estimate the electromagnetic fields generated by a cluster of dielectric nanoparticles which are small scaled but enjoy high contrast of their relative permittivity, embedded into a background made of a vacuum. Under certain ratio between their size and contrast, these nanoparticles generate resonances, called all-dielectric resonances. We first characterize the dominant field generated by a cluster of such dielectric-resonating nanoparticles. In this point-interaction approximation, the nanoparticles can be distributed to occupy volume-like domains or low dimensional hypersurfaces where periodicity is not required. Then we investigate the corresponding effective electromagnetic medium with periodic distribution under some mild assumptions. We show that even though the dielectric nanoparticles are merely generated by the contrasts of their permittivity (and not their permeability), the effective medium is a perturbation of the permeability and not the permittivity. Both of the cases for the effective permeability being positive definite and negative definite are studied.

Uniqueness of Transonic Shock Solutions for Two-Dimensional Steady Compressible Euler Flows in an Expanding Nozzle

Xin Gao
City University of Hong Kong

Abstract: In this talk, we consider the uniqueness of transonic shock solutions in an expanding nozzle, with given nonuniform upcoming supersonic flows on the entrance of the nozzle and appropriate pressure on the exit of the nozzle. One of the key difficulties is to establish the a priori estimates for the subsonic solutions behind the shock front without the assumption that the flow behind the shock front is a small perturbation of a uniform subsonic solution. Another difficulty is to prove the uniqueness of the positions of intersection points between the shock fronts and the walls of the nozzle. Furthermore, the uniqueness of shock positions as well as the transonic shock solutions can be established via contraction arguments. This is a joint work with Prof. Beixiang Fang and Prof. Wei Xiang.

On sharp discrete Hardy-Rellich inequalities

Xia Huang
East China Normal University

Abstract: Although the history of Hardy inequalities found its origin somehow in the discrete setting, the discrete Hardy-Rellich inequalities are much less understood comparing to the continuous situation. We will show discrete Hardy-Rellich inequalities on N with $\Delta^{\frac{k}{2}}$ and optimal constants, for any $k \geq 1$. Our approach is to establish some sharp first order Hardy inequalities using weighted equality, and then to handle the higher order cases by iteration. We provide also a first order Leray type inequality on N with the same constants as the continuous setting. The main idea to get weighted equalities works also for general graphs. This is a joint work with Professor Dong Ye at ECNU.

Optimisation of total population in logistic model with nonlocal dispersals and heterogeneous environments

Fang Li
Sun Yat-sen University

Abstract: In this talk, we consider a single species model with nonlocal dispersal strategy and investigate how the dispersal rate of the species and the distribution of resources affect the total population. First, we show that the upper bound for the ratio between total population and total resource is of order $\sqrt{d}$. More importantly, we provide an optimal condition on the distribution of resources such that the above ratio is of order $\squr{d}$. Some applications will be discussed. These results reveal essential discrepancies between local and nonlocal dispersal strategies.

Effective boundary conditions for the heat equation on a domain with thin layer

Jingyu Li
Northeast Normal University

Abstract: To protect a body from overheating, engineers usually coat the body with a thin thermal insulator (such as turbine engine blades painted by an insulator). In cell biology, some chemical substances do not react in the bulk region of the cell, but react (and diffuse) very fast in the membrane, which results in cell polarization. The dynamic of a population could be very complex in the presence of a geometrical barrier. These phenomena can all be modeled by a diffusion equation on a body containing a thin layer (coated outside or included inside), where the diffusion rates in

the thin layer could be very different from that in the bulk body. Mathematically, this is a multiscale problem. In numerical simulation, it is also time-consuming to simulate this problem. An effective strategy is to identify the effective approximate problems on the bulk domain excluding the behavior of the solution on the thin layer. This will result in the so-called effective boundary or effective transmission condition (EBC or ETC). In this talk, we present some results and methods of how to characterize these conditions as the thickness of the thin layer shrinks. One can find that not only the usual Dirichlet, Neumann and Robin EBC can be derived, but also some exotic EBC and even dynamical EBC and bulk-surface equation can be derived. We will also discuss the lifespan of such EBC. Various ETC can be also derived using our strategy if the thin layer is included inside.

Well-posedness of 3D Navier-Stokes and MHD equations with partial hyper-dissipation

Li Li
Ningbo University

Abstract: It is well-known that if one replaces standard velocity and magnetic dissipation by hyper-dissipations, the magnetohydrodynamic equations are well-posed. This paper considers the 3D Navier-Stokes and magnetohydrodynamic equations with partial fractional hyper-dissipation. It is proved that when each component of the velocity and magnetic field lacks dissipation along some direction, the existence and conditional uniqueness of the solution still hold. This paper extends the previous results in (Yang, Jiu and Wu J. Differential Equations 266(1): 630–652, 2019) to a more general case.

A Fourier Approach to Parameter Identification for Gaussian Mixtures

Xinyu Liu
Hong Kong University of Science and Technology

Abstract: This talk discusses how to learn parameters from Fourier measurements of one-dimensional Gaussian mixture models. We will review related methods and introduce our algorithm, which utilizes the Hankel structure of Fourier data. We show that a separation condition for variances is necessary to stably recover all components under certain noise levels. Our method can also be applied to high dimensional cases**.**

Long time behavior of the focusing NLS on RdTm via the semivirial-vanishing geometry

Yongming Luo
Shenzhen MSU-BIT University

Abstract: In this talk, we present some recent results concerning the long time behavior of the focusing nonlinear Schrödinger equation (NLS) on the semiperiodic spaces RdTm. The main new tool is a general framework based on the so-called semivirial-vanishing geometry, with whose help we are able to establish results such as existence of ground states, large data scattering and blow-up for the underlying model.

Mathematical theory for the interface mode in 2D photonic structure

Jiayu Qiu
Hong Kong University of Science and Technology

Abstract: In this talk, we present our recent results of the interface mode in 2D photonic structures. In the first work, we prove the existence and uniqueness of the interface modes in a two-dimensional photonic waveguide. When we apply a perturbation to the original structure, the interface mode is bifurcated from the Dirac point.It should be pointed out that the spectral no-fold assumption is essential for our results. Our second work illustrates its importance, where we construct a resonant mode when the spectral no-fold assumption fails. The difference between the resonant mode and interface mode is shown by the negative imaginary part of the eigenvalue. Finally, we extend the idea of our works to a 2D photonic graphene with a sharp interface, where we discuss the interface modes along either a zigzag- or armchair-type interface.

Global W^{2,p} estimates for elliptic equations in non-divergence form

Weifeng Qiu
City University of Hong Kong

Abstract: This presentation is devoted to establishing global W2,p estimate for strong solutions to the Dirichlet problem of uniformly elliptic equations in the non-divergence form where the domain is a Lipschitz polyhedra.

Stability of the isotropic conductivity reconstruction using magnetic resonance electrical impedance tomography (MREIT)

Yizhuang Song

Shandong Normal University

Abstract: Magnetic resonance electrical impedance tomography (MREIT) is a high-resolution imaging modality that aims to reconstruct the objects' conductivity distributions at low frequency using the measurable z-th component of the magnetic flux density obtained from an MRI scanner. Traditional reconstruction algorithms in MREIT use two data subject to two linearly independent current densities. However, the temporal resolution of such a MREIT image is relatively low. Recently, a single current harmonic B_z algorithm has been proposed to improve the temporal resolution. Even though a series of reconstruction algorithms have been proposed in the last two decades, the theoretical studies of MREIT are still quite limited. This talk presents the stability theorems for two datum and a single data-based isotropic conductivity reconstruction using MREIT. Using the regularity theory of elliptic partial differential equations, we prove that the only instability in the inverse problem of MREIT comes from taking the second-order derivative of the measured data B_z, the z-th component of the magnetic flux density. To get a stable reconstruction from the noisy B_z data, we note that the edge structure of ∇B_z reveals the edge features in the unknown conductivity and provides an edge-preserving denoising approach for the ∇B_z data. We use a modified Shepp-Logan phantom model to validate the proposed theory and the denoising approach.

Estimates for stress concentration between two adjacent rigid inclusions in Stokes flow

Longjuan Xu

Capital normal university

Abstract: It is important in material sciences and fluid mechanics to study the field enhancements in the narrow region between two inclusions. Complex fluids including particle suspensions usually result in complicated flow behavior. This talk concerns estimates for stress concentration between two adjacent rigid inclusions in Stokes flow. We establish the pointwise upper bounds of the gradient and the second-order partial derivatives for Stokes flow in the presence of two closely located strictly convex inclusions in dimensions two and three. Moreover, the lower bounds of the gradient estimates at the narrowest place of the narrow region show the optimality of the blow-up rate. We also show the optimal blow-up rate of Cauchy stress tensor. In dimensions greater than three, the upper bounds of the gradient are established.

Invariant Gibbs measures for 2D NLS and 3D cubic NLW

Haitian Yue

ShanghaiTech University

Abstract: In this talk, we'll present our results about invariant Gibbs measures for the periodic nonlinear Schrödinger equation (NLS) in 2D, for any (defocusing and renormalized) odd power nonlinearity, and for cubic NLW in 3D. This is joint work with Bjoern Bringmann (IAS), Yu Deng (USC) and Andrea Nahmod (UMass Amherst).

Equivalence of different solutions to double phase equations

Chao Zhang

Harbin Institute of Technology

Abstract: Double phase functionals were first introduced by V. V. Zhikov in 1980s to characterize the features of the strongly anisotropic materials, homogenization and Lavrentiev phenomenon. Since M. Colombo and G. Mingione solved the basic regularity issue on such functionals in 2015, the relevant theory on this kind of problems has made rapid progress from the variational point of view, but, in sharp contrast, viscosity theory is rarely explored. In this talk we present the regularity of viscosity solutions to double phase equations, together with the inner relationship between such solutions and the weak solutions in Musielak-Orlicz-Sobolev space.

Image Segmentation with Shape Compactness Regularization

Kehui Zhang

Hong Kong Baptist University

Abstract: We propose two algorithms to solve a high-order segmentation model that incorporates a compactness term involving pairwise potentials. Existing algorithms suffer from computational inefficiency and difficulty in reaching a local minimum due to the need for fine-tuning numerous parameters. To address these issues, we employ the Fenchel-Legendre transformation to reformulate the model as a min-max problem. We introduce a simple primal-dual optimization algorithm, PD-TD, to solve this reformulated model. Additionally, we relax the solution constraint and propose another algorithm, PD-STD, which achieves superior performance.

Based on the variational explanation of softmax layer, the PD-STD algorithm can be integrated with DCNNs to incorporate spatial priors and ensure compact-shaped outputs. Our methods demonstrate improved efficiency and effectiveness, as evidenced through various image segmentation experiments. Specifically, we apply

our methods to the popular DeepLabV3 and IrisParseNet image segmentation networks, and our results showcase higher mIoU, dice, and compactness metrics on noisy Iris datasets. Notably, when tested on a noisy dataset with a higher noise level than the training dataset, our method significantly improves mIoU by 20\%.

On the long time behavior and decaying property of nonlinear dispersive equations

Zehua Zhao

Beijing Institute of Technology

Abstract: In this talk, we discuss the long time behavior and decaying property of nonlinear dispersive equations. We will see that for many typical defocusing models, the linear behavior dominates in the long run. We will use NLS as an example model. This talk is mainly based on the joint works with C. Fan (AMSS, CAS) and G. Staffilani (MIT), together with some very recent progress and generalizations.

Event-triggered control problems of stochastic nonlinear delay systems

Quanxin Zhu

Hunan Normal University

Abstract: In this report, we introduce the the event-triggered feedback control problem of stochastic nonlinear delay systems with exogenous disturbances. By introducing the notation of input-to-state practical stability and an event-triggered strategy, we establish the input-to-state practically exponential mean-square stability of the suggested system. Moreover, we investigate the stabilization result by designing the feedback gain matrix and the eventtriggered feedback controller, which is expressed in terms of linear matrix inequalities. Also, the lower bounds of inter-execution times by the proposed event-triggered control method are obtained. Finally, an example is given to show the effectiveness of the proposed method. Compared with large number of results for discrete-time stochastic systems, only a few results have appeared on the event-triggered control for continuous-time stochastic systems. In particular, there has been no published papers on the event-triggered control for continuous-time stochastic delay systems. Our work is a first try to fill the gap on the topic.