2023 年国际生物数学与医学应用研讨会

2023 International Symposium on Biological Mathematics and Medical Applications

（2023.5.12-14 | Nanjing, China）

Program

主办单位:

南京信息工程大学 (NUIST)

加拿大约克大学疾病建模中心 (CDM)

江苏省工业与应用数学学会 (JSIAM)

目 录

Announcement (English version)

2023 International Symposium on Biological Mathematics and Medical Applications

The **Nanjing University of Information Science and Technology** (NUIST) is proud to announce that we will be hosting the **2023 International Symposium on Biological Mathematics and Medical Applications**. This symposium will provide an international forum for interdisciplinary experts to present their latest research findings, share innovative ideas, identify challenges and opportunities, and promote international collaborations in biological mathematics and medical applications. It will also provide an excellent opportunity for young researchers and students to interact with our leading scientists and learn hands-on research experience in these fields.

This International Symposium is jointly hosted by **Nanjing University of Information Science and Technology**, **Centre for Disease Modelling (CDM)** of **York University**, and **Jiangsu Society for Industrial and Applied Mathematics (JSIAM)**. It is one of the important activities of the Science and Technology Activity Month of NUIST, and will be held on May 12-14 (Beijing Time: UTC+8) in the form of a series of specialized topics.

Register in advance: https://docs.qq.com/form/page/DWm5DZEJ4c3Zlb09X

▪ Time and place

1. Time
Check-in time: 14:00-21:00 on May 12, 2023
Check-in place: Nanqi Hotel, NUIST
2. Online venue: VoovMeeting
3. Offline address: Meteorological Building, NUIST
4. Place of accommodation: Nanqi Hotel, NUIST

▪ Contact Information

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▪ Sponsors

Nanjing University of Information Science and Technology (NUIST), China
Canadian Centre for Disease Modelling (CDM), York University, Canada
Jiangsu Society for Industrial and Applied Mathematics (JSIAM), China

会议通知 (Chinese version)

2023 年国际生物数学与医学应用研讨会

（第二次通知）

为促进生物数学、微分方程及医学应用等方向的交叉研究与发展，增强国内外同行专家的学术交流与合作，提高相关领域青年教师和研究生的学术水平和学术视野，由**南京信息工程大学、加拿大约克大学疾病建模中心（CDM）、江苏省工业与应用数学学会**联合主办的“2023 年国际生物数学与医学应用研讨会”将于 2023 年 5 月 12 日至 14 日在**中国南京**通过线上线下混合式方式举行。

欢迎生物数学及生物医学领域的专家学者和研究生踊跃参加。

一、会议时间与地点

1. 会议时间

报到时间：2023 年 5 月 12 日 14:00—21:00

报到地点：南气宾馆（盘新路入口，高德地图：南气宾馆西北门；百度地图：南京信息工程大学-北 2 门）

会议时间：2023 年 5 月 13 日至 14 日中午

2. 线上会议地点：腾讯会议平台

3. 线下会议地址：南京信息工程大学东苑气象楼

4. 住宿地点：南气宾馆

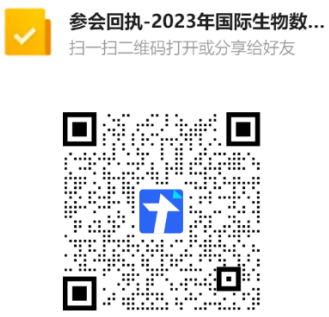
二、会议安排

1. 会议报告：特邀报告、青年论坛、研究生论坛

2. 会议注册：参会人员请根据下列方式之一注册（**请已注册人员再次登录，点击“修改结果”，补充填写第 4、5 条到达、离开南京的时间及车次等信息**）。

（1）网址填写： https://docs.qq.com/form/page/DWm5DZEJ4c3Zlb09X

（2）二维码填写：



3. 会议微信群：为方便通知与联系，请注册后加入如上本次会议微信群。

三、会议费用及参会要求

1. 线下会议注册费：教师为 800 元/人，研究生为 500 元/人（凭学生证）。

2. 线上参会免收注册费。

3. 食宿费：会议统一安排食宿，交通费及食宿费用自理，会议无伙食补贴。

4. 会务费缴费方式：

（1）二维码缴费（**优先推荐**）：请您通过支付宝扫描下方二维码；若您所在单位要求通过公务卡对公支付注册费，请您提前在支付宝绑定公务卡后再进行二维码扫码支付。

（2）银行对公转账：

户名：南京信息工程大学

银行账号：10115401040000228

开户行：中国农业银行股份有限公司南京盘城支行

对公转账请务必备注：“单位名称+姓名+生物数学会务费”，并将转账凭证发送至邮箱：anqi@nuist.edu.cn 或微信：18745746090.

注：

（1）缴费为一人一缴

（2）由于参会人员较多，为了便于财务开具发票，建议在 2023 年 5 月 10 日之前完成缴费。

（3）发票类型为电子发票，开具后将直接发送链接到缴费预留手机号。

四、乘车路线

1. 南京禄口机场至南京信息工程大学路线：

（1）乘坐地铁 S1 号线至南京南站转地铁 3 号线至泰冯路站转地铁 S8 号线至南京信息工程大学站下，全程约 2 小时。

（2）乘坐出租车或网约车（约 170 元），全程约 1 小时 10 分钟。

2. 南京南站至南京信息工程大学路线：

（1）乘坐地铁 3 号线至泰冯路站转地铁 S8 号线至南京信息工程大学站下，全程约 1 小时 10 分钟。

（2）乘坐出租车或网约车（约 85 元），全程约 50 分钟。

3. 南京站至南京信息工程大学路线：

（1）乘坐地铁 3 号线至泰冯路站转地铁 S8 号线至南京信息工程大学站下，全程约 50 分钟。

（3）乘坐出租车或网约车（约 45 元），全程约 35 分钟。

五、会议联系人

1. 南京信息工程大学

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2. 加拿大约克大学

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南京信息工程大学数学与统计学院
江苏省应用数学（南京信息工程大学）中心
江苏省系统建模与数据分析国际合作联合实验室
加拿大约克大学疾病建模中心（CDM）
江苏省工业与应用数学学会
2023 年 5 月 5 日

Schedule

May 12, Friday Afternoon (Beijing time: UTC+8)

Registration and Check-in

Time	Place	Chair
14:00-21:00	Building 1, Nanqi Hotel, NUIST	Qi An (安琪)
18:30-20:00 Dinner		

May 13, Saturday Morning (Beijing time: UTC+8)

Online: VoovMeeting (腾讯会议) ID 594-449-956

Offline: Lecture Hall, 1st Floor, Meteorological Building (气象楼一楼报告厅)

Opening Ceremony

Time	Items	Chair
08:30-09:00	· Welcome speech · Group photo	Wenjun Liu (刘文军)

Invited Talks

Time	Speaker	Institution	Title	Chair
09:00-09:40	Huaiping Zhu (朱怀平)	York University, Canada (加拿大约克大学)	Modelling the impact of medical resources on the transmission dynamics and control of infectious diseases	Xuezhi Li (李学志)
09:40-10:20	Wendi Wang (王稳地)	Southwest University (西南大学)	Bifurcation Analysis of Disease Transmission Models	
10:20-10:40 Break				
10:40-11:20	Gangmin Ning (宁钢民)	Zhejiang University (浙江大学)	Computational Model for Microcirculation - From Branch to Network	Zhigui Lin (林支桂)
11:20-12:00	Zhaosheng Feng (冯兆生)	University of Texas Rio Grande Valley, USA	Diffusional Systems of Infection Process: Analysis and Simulation	
12:10-13:00 Lunch				

May 13, Saturday Afternoon (Beijing time: UTC+8)

Group A

Online: VoovMeeting (腾讯会议) ID 594-449-956

Offline: Conference Room 1114, 11th Floor, Meteorological Building (气象楼 1114 会议室)

Invited Talks

Time	Speaker	Institution	Title	Chair
14:00-14:40	Pierre Auger	French Academy of Sciences, France	TBA	Yong Jiang (蒋勇)
14:40-15:10	Shengqiang Liu (刘胜强)	Tiangong University (天津工业大学)	Study on the asymptotic behavior of two kinds of reaction-diffusion epidemic models	Weiming Wang (王玮明)
15:10-15:40	Hui Wan (万辉)	Nanjing Normal University (南京师范大学)	Modeling the impact of awareness programs on the transmission dynamics of dengue and optimal control	
15:40-16:10	Pei Yuan (袁沛)	York University, Canada (约克大学)	Modelling for informing public health policy on prevention and control of COVID-19 epidemics in Toronto, Canada	
16:10-16:30 Break				
16:30-17:00	Yiwen Tao (陶亦文)	Zhengzhou University (郑州大学)	Comparative study of physics-based model and machine learning model for epidemic forecasting and countermeasure	Wendi Wang (王稳地)
17:00-17:30	Chengxia Lei (类成霞)	Jiangsu Normal University (江苏师范大学)	The SIS Epidemic Reaction-diffusion Model with Spontaneous Infection in a Spatially Heterogeneous Environment	
17:30-18:00	Xuebing Zhang (张学兵)	Nanjing University of Information Science and Technology (南京信息工程大学)	Dynamics analysis of a diffusive predator-prey model with spatial memory and nonlocal fear effect	
18:30-20:00 Dinner				

May 13, Saturday Afternoon (Beijing time: UTC+8)

Group B

Online: VoovMeeting (腾讯会议) ID 423-605-815

Offline: Conference Room 713, 7th Floor, Meteorological Building (气象楼 713 会议室)

Invited Talks

Time	Speaker	Institution	Title	Chair
14:00-14:40	Pierre Auger	French Academy of Sciences, France	TBA	Yong Jiang (蒋勇)
14:40-15:10	Lai Zhang (张来)	Yangzhou University (扬州大学)	Refining species generality from a dynamical view of realized niche	Gangmin Ning (宁钢民)
15:10-15:40	KaiFa Wang (王开发)	Southwest University (西南大学)	A new method for the joint estimation of instantaneous reproductive number and serial interval during epidemics	
15:40-16:10	Hui Huang (黄辉)	Jiangsu Province Hospital of Chinese Medicine (江苏省中医院)	Multimodal ultrasound and assessment of plaque vulnerability (多模态超声与斑块易损性评估)	
16:10-16:30 Break				
16:30-17:00	Xianyi Li (李先义)	Zhejiang University of Science and Technology (浙江科技学院)	Global asymptotic stability of a rational difference equation with higher order	Zhipeng Qiu (邱志鹏)
17:00-17:30	Haitao Song (宋海涛)	Shanxi University (山西大学)	Dynamic modeling and intervention evaluation of COVID-19 transmission (COVID-19 传播动力学建模及干预评估)	
17:30-18:00	Anum Shafiq	Nanjing University of Information Science and Technology (南京信息工程大学)	Application of probabilistic error analysis to a double stratified magnetohydrodynamic Marangoni Casson nanofluid	
18:30-20:00 Dinner				

May 14, Sunday Morning (Beijing time: UTC+8)

Online: VoovMeeting (腾讯会议) ID 423-605-815

Offline: Conference Room 713, 7th Floor, Meteorological Building (气象楼 713 会议室)

Graduate Forum

Time	Speaker	Institution	Title	Chair
08:00-08:20	Haiyan Xu (徐海燕)	Yangzhou University (扬州大学)	Blow-up phenomenon of generalized pulse logistic diffusion problem (广义脉冲 logistic 扩散问题的爆破现象)	Yancong Xu (徐衍聪)
08:20-08:40	Shuangyan Yang (杨双艳)	Ningxia University (宁夏大学)	Sliding dynamics and optimal control of avian influenza model with saturated incidence rate	
08:40-09:00	Yanning An (安雁宁)	Nanjing University of Information Science and Technology (南京信息工程大学)	Mathematical models and existence of solutions for atherosclerosis in early stage	
09:00-09:20	Wei You (尤薇)	Ningxia University (宁夏大学)	Finite-time contraction stability of a stochastic reaction-diffusion dengue model with impulse and Markov switching	
09:20-09:40	Kai Wang (王凯)	Nanjing University of Aeronautics and Astronautics (南京航空航天大学)	Traveling wave solutions of a nonlocal partially degenerate model for Aedes aegypti	
09:40-10:00 Break				

10:00-10:20	Weixin Chen (陈维新)	Ningxia University (宁夏大学)	Stability and Hopf bifurcation in the echinococcosis model with mixed time delays and spatial diffusion	Guangying Lv (吕广迎)
10:20-10:40	Huixia Li (李慧霞)	Nanjing University of Aeronautics and Astronautics (南京航空航天大学)	Mathematical model of Alzheimer's disease with prion proteins interactions and treatment	
10:40-11:00	Mengdie Yang (杨梦蝶)	Nanjing University of Information Science and Technology (南京信息工程大学)	Risk assessment of atherosclerotic cardiovascular disease based on feature selection of L1-CBFS	
11:00-11:20	Erhui Li (李二辉)	Henan Institute of Science and Technology (河南科技学院)	Global dynamics of an endemic disease model with vaccination, the asymptomatic and the symptomatic in complex networks	
11:40-12:40 Lunch				
Free discussion Return trip				

Abstract-Invited Talks

(Alphabetic order)

TBA: TBA

Pierre Auger

UMI IRD 209 UMMISCO, Bondy, France

TBA

Biography: Pierre Auger is a member of the French Academy of Sciences. His research field concerns the mathematical modeling of biological systems. He has developed an original approach to the integration of the organizational levels of these complex systems, which allows numerous applications, in agronomy or in medicine for example. In order to avoid the difficulties caused by a large number of variables and parameters in the process of model analysis, he presents a novel mathematical method to establish a simplified model according to the time scales of the processes occurring in different levels of biological system. They are mainly methods of aggregation of variables in dynamic systems. These methods were applied by Pierre Auger to the dynamics of populations and communities for the consideration of individual behaviors in population models and for the description of the spatial dynamics of a population in heterogeneous environments. In addition, he has also established mathematical models for the propagation of the depolarization wave in the ventricular wall of the heart and multiple problems in the thiofs fisheries. More recently, Pierre Auger has worked on modeling in epidemiology, more specifically on the effects of non-pharmaceutical protection and containment measures on the dynamics of the Covid-19 epidemic.

Diffusional Systems of Infection Process: Analysis and Simulation

Zhaosheng Feng

University of Texas System, China

In this talk, we apply diffusional systems to characterize the infection process of the severe acute respiratory syndrome coronavirus in a heterogeneous environment. The well-posedness of the solution and global stability of uninfected steady state are discussed. Numerical simulations are performed to illustrate theoretical results and to reveal that diffusion, spatial heterogeneity and incidence types have evident impacts on the SARS-CoV-2 infection.

Biography: 冯兆生，美国德克萨斯大学 RGV 分校 Carlos and Stephanie Manrique de Lara 讲席教授。主要研究方向是非线性分析，动力系统，数学物理问题，数值计算与模拟等，曾于2015和2021年两次获得德克萨斯大学年度杰出科研成就奖。现任国际知名学术期刊 CNSNS 的共同主编和 EJDE 的执行主编，和多个国际 SCI 杂志的编委及 AIMS 应用数

学系列丛书的编委。

多模态超声与斑块易损性评估

Hui Huang

Jiangsu Province Hospital of Chinese Medicine, China

动脉粥样硬化（AS）是全球心脑血管疾病发生及其致死的主要原因。该疾病具有多年的亚临床期，其特征是动脉壁的脂肪条纹逐渐发展为 AS 斑块。AS 可能局限于某一器官的供血动脉，但通常几个血管床受到影响。AS 斑块可转变为易损斑块，易破裂。易损斑块的特征是薄纤维帽、富含脂质的坏死核心、斑块内炎症、新生血管及出血。易损斑块的急性破裂可能引起局部血栓形成，并可能导致受累动脉部分或全部闭塞或更远端的栓塞。根据动脉闭塞的部位和程度，动脉粥样硬化斑块破裂可能导致危及生命的临床并发症，包括中风、心肌梗死和外周动脉疾病。颈动脉粥样硬化斑块是中风和短暂性脑缺血发作（TIA）的重要原因，也是系统性动脉粥样硬化存在的一个指标。为了识别易破裂的颈动脉斑块患者，已经发展了几种成像模式。超声的特点使其成为筛查颈动脉 AS 患者寻找易损斑块的理想成像方法。斑块易损性的特征，包括表面溃疡、内部新生血管及成分，可通过使用超声造影（CEUS）及实时剪切波弹性成像（SWE）评估。本汇报的目的是在数学界综述斑块易损性的超声评估方法及其目前的局限性，以期擦出火花，从数学角度出发，帮助临床易损斑块的识别，造福患者。

Biography: 黄辉，硕士研究生、主任医师，江苏省中医院超声医学科血管亚专业学组组长，南京信息工程大学兼职硕士研究生导师，从事临床超声诊断及教学19年。主持和参与省部级及厅局级项目9项（其中主持2项），以第一作者或通讯作者发表论著20多篇，以第一完成人获得江苏省中医院新技术引进奖和科学技术进步奖各1项。现任江苏省医学会超声医学分会浅表学组秘书。擅长前列腺经直肠法专科超声诊查、颈动脉超声造影、颈动脉脉搏波检测、血液透析人工内瘘术前及术后血管评估、颌面部皮瓣移植血管匹配度评估、胡桃夹综合症及肾动脉狭窄的评估、下肢穿通支静脉血运循环探查、颈颅一体化超声评估等。

The SIS Epidemic Reaction-diffusion Model with Spontaneous Infection in a Spatially Heterogeneous Environment

Chengxia Lei

Jiangsu Normal University, China

We consider three SIS epidemic reaction-diffusion models with spontaneous infection, and study the global stability of the endemic equilibrium in homogeneous environment, and explore the asymptotic profiles of the endemic steady state for (large or small) diffusion rates or advection

in the spatially heterogeneous environment. Compared to the case that there is no spontaneous infection or no advection, our results reveal that the advection can cause the concentration of the population at the downstream, and the spontaneous infection can enhance the persistence of infectious disease, and hence the disease becomes more threatening.

Biography: 类成霞，江苏师范大学数学统计学院，2017 年 6 月博士毕业于中国科学技术大学；分别主持国家自然科学基金和江苏省自然科学基金青年项目一项；主要从事偏微分方程在生物数学上的应用方面的研究。

Global asymptotic stability of a rational difference equation with higher order

Xianyi Li

Zhejiang University of Science and Technology, China

得到一高阶有理差分方程的全局渐近稳定性。作为应用，解决了几个公开问题与猜想。

Biography: 李先义，二级教授，博士生导师，浙江省“钱江学者”特聘教授，浙江科技学院“科大学者”；至今发表科研论文 110 余篇，完整解决了国际期刊上多个“Open Problems and Conjectures”，主持科研项目 20 余项，先后被评为“湖南省青年骨干教师”、“湖南省新世纪‘121’人才工程”人选、“湖南省学科带头人”、 “广东省‘千百十’人才工程省级培养对象”等；获“湖南省高校科技工作先进工作者”、“上海市研究生优秀成果”（优博）、全国第三届“秦元勋常微分方程奖”等科研奖励与荣誉 20 多项；担任中国博士后科学基金，国家自然科学基金、“双千计划”、“万人计划”及科技进步奖等的评审专家， 以及多个国际期刊的主编、副主编、荣誉编委、编委等。

Study on the asymptotic behavior of two kinds of reaction-diffusion epidemic models (两类反应扩散流行病模型渐近行为研究)

Shengqiang Liu

Tiangong University, China

在本次报告中，我们汇报如下两类反应扩散流行病模型的全局动力学。首先研究具有一般发生率的反应扩散寨卡模型，在该模型中宿主和蚊媒具有不同的扩散率。通过基本再生数、极限系统和渐近自治半流理论得到正稳态的全局渐近稳定性。第二类模型中，我们考虑异质性空间背景下具有人类行为方式影响的退化反应扩散霍乱模型。在该模型中易感人群和染病人群具有不同的扩散率，霍乱弧菌不具有移动性。考虑扩散率和人类行为改变对疾病传播风险---基本再生数之间的关系，并进一步分析扩散对正稳态渐近动力学行为的影响。

Biography: 刘胜强，天津工业大学数学科学学院教授、博士生导师。2002 年于中国科学院数学研究所获博士学位，曾任厦门大学数学科学学院副教授、哈尔滨工业大学教授，自

2019 年 10 月起任现职。现任中国数学会生物数学专业委员会副主任兼秘书长，为天津市高校学科领军人才培养计划人选、《Mathematical Biosciences and Engineering》编委。研究领域为生物数学、动力系统。先后主持国家自然科学基金 4 项，出版专著 1 本、参与编著两本，先后指导博士生 11 人，硕士生 15 人，在 SIAM Journal on Applied Mathematics、Journal of Differential Equations、Journal of Nonlinear Science、Bulletin of Mathematical Biology、Mathematical Biosciences 等应用数学领域知名学术期刊上发表 SCI 论文 90 余篇。

Computational Model for Microcirculation - From Branch to Network

Gangmin Ning

Zhejiang University, China

Microcirculation is the terminal of the cardiovascular system. It plays essential role in maintaining physiological function of living bodie, responsible for facilitating the exchange of substances between tissues and blood. The microcirulation is composed of a complex network comprised of arterioles, veins, capillaries and their interconnections. Presently, it lacks methods for investigating the features of microcirculation network and in practice only a limited number of vascular bifurcations can be observed. Addressing the challenges, a computational model was developed to reconstruct the complete network using data derived from vascular branches, meanwhile analytical methods were proposed to explore the spatiotemporal characteristics of the microcirculation network. With experiment data, the model was applied on the analysis of chicken embryo yolk sac membrane (YSM), and the patterns within the YSM vascular network during the development of chicken embryo was discovered. Aided by the machine learning algorithm of generative adversarial networks (GANs), a vascular growth model was developed to generate a vascular tree approaching to the real situation and its capacity in modeling the microcirculatory function was validated.

Biography: 宁钢民， 分别获得浙江大学生物医学工程学士、硕士学位，德国 Ilmenau 技术大学生物医学工程博士学位。浙江大学生物医学工程系教授、博士生导师，德国 Charité医学中心访问教授，首都体育学院客座教授。兼任中国微循环学会监事长，电子病历与智能专家系统教育部工程研究中心副主任，全国生物医学工程专业学位研究生教育协作组副组长，IEEE 高级会员，中国生物医学工程学会高级会员。主要研究方向为生理系统建模技术，有限样本条件下的智能医学技术，运动评估及康复技术。研究成果获浙江省科技进步一等奖 1 项、二等奖 3 项，浙江省医药卫生科技一等奖、二等奖各 1 项。

Gangmin Ning, graduated with Bachelor and Master degree in Biomedical Engineering from Zhejiang University in China, and Dr.-Ing degree in Biomedical Engineering from Ilmenau Technical University in Germany. He is now a Professor and PhD supervisor at the Department of Biomedical Engineering at Zhejiang University, a visiting professor at Charité Medical Center in Germany, and a guest professor at Capital University of Physical Education and Sports. He also servers as the Director of the Supervisory Board of the Chinese Microcirculation Society, Deputy Director of the Electronic Medical Record and Intelligent Expert System Engineering Research

Center of the Ministry of Education, Coordinator of the National Biomedical Engineering Professional Degree Graduate Education Cooperation Group, a senior member of IEEE, and a senior member of the Chinese Society of Biomedical Engineering. His main research fields include physiological system modeling, application of artificial intelligence in medicine under limited data conditions, and mobility ability assessment and enhancement technology. He has received one first award and three second awards for Science and Technology Advancement of Zhejiang Province, as well as one first award and one second award for Medical and Health Technology of Zhejiang Province.

Application of probabilistic error analysis to a double stratified magnetohydrodynamic Marangoni Casson nanofluid

Anum Shafiq

Nanjing University of Information Science and Technology, China

In this study, we examine the consequences of double stratification in the Marangoni convection flow of the Casson nanofluid model towards a surface. Marangoni convective flow is driven by temperature and concentration gradients due to its permeable surface. Brownian diffusion, Thermophoretic attribute, and twofold stratification are used to collect facts in Marangoni convection Casson nanofluid. Heat and mass transfer are investigated using various physical flow parameters. The nonlinear structure of the governing partial differential equations (PDEs) is translated into nonlinear ordinary differential equations (ODEs) using some relevant classical transformations. The Runge Kutta fourth-order algorithm is used to numerically solve a modified set of ODEs. The demonstration portrays are intended to demonstrate how different flow parameters affect velocity, temperature, and concentration profiles. To analyse the variation in heat transfer and its relevance in industrial zones, Nusselt numbers are arranged in tabular form.

Biography: Dr. Anum Shafiq is currently an Associate Professor at the School of Mathematics and Statistics, Nanjing University of Information Science and Technology, China. She is appearing in the world's Top 2% Scientists list of 2022 for the single year released by Stanford University and this list was published on 10th October 2022. She received her Ph.D. in 2016 from Quaid -i-Azam University Islamabad, Pakistan. She works as an Assistant Professor in department of mathematics, in prestigious universities of Pakistan for four years. After that she did postdoctoral research from the year 2019 to Jan 2020 at North West University, South Africa. Her research is mostly focused on numerical methods for boundary value problems, implementation of computational techniques based on traditional as well as heuristic paradigms, Newtonian and non-Newtonian nanofluids flow and microorganisms, Multidisciplinary applications of Mathematics, etc. She is the winner of a number of awards and scholarships. She is an editorial board member of many reputed journals and has published more than 110 research papers in SCI indexed journals with a research h-index of over 39 and citations over 3827 as per Web of Sciences. She is a potential reviewer of top-ranking research journals. Dr. Shafiq acts as a resource person and gives invited talks on many workshops and conferences held at the national and international level.

COVID-19传播动力学建模及干预评估

Haitao Song

Shanxi University, China

自从2019年12月份，新冠肺炎的快速传播造成了全球大流行。首先，基于新冠肺炎病毒的流行病学，我们建立了具有硬隔离和密切接触追踪隔离措施的新冠肺炎传播动力学模型。计算出了全国和湖北的基本再生数，证实了硬隔离和密切接触追踪隔离措施的有效性，在当前防控措施下，我们发现了一个值得关注的现象—二次爆发（多次爆发）现象，估计了二次爆发的峰值、峰值到达时间及累计感染数量。最后评估了复工复学对二次爆发的影响。其次，针对武汉新冠肺炎的传播，我们建立了一个数学模型，调查新冠在武汉的传播，评估干预措施的有效性，立足于数学模型和百度迁徙数据及确诊数据，我们计算出武汉的基本再生数是7.53，截止到1月23日，武汉感染数量是47180.干预措施使得武汉的感染数量减少了99%. 最后，针对2020年4月哈尔滨市的新冠疫情，通过数学模型和实际数据，我们计算了模型的基本再生数和有效再生数，结果发现哈尔滨市新冠疫情最终规模是174人，其中54%病例被发现，46%病例没有发现，干预措施使得哈尔滨新冠疫情很快得到控制。

Biography: 宋海涛，山西大学复杂系统研究所，副教授，博士生导师，加拿大约克大学博士后，美国数学会《数学评论》(Mathematical Reviews)评论员。主要研究领域为生物数学、传染病模型、时滞微分方程的稳定性和分支。本硕博就读于哈尔滨工业大学，于 2014 年获得数学博士学位，并于 2016-2018 年在加拿大约克大学做博士后研究（合作导师是朱怀平教授）。主持 2 项国家自然科学基金（面上项目和青年项目）和 5 项省部级项目，参与 1 项国家自然科学基金重点项目，在微分方程相关领域发表学术论文 20 余篇。获得山西省高等学校优秀青年学术带头人、三晋英才-青年优秀人才、山西大学五四青年奖章。

Comparative study of physics-based model and machine learning model for epidemic forecasting and countermeasure

Yiwen Tao

Zhengzhou University, China; Henan Academy of Big Data, China

Forecasting the transmission pattern of infectious diseases is imperative to provide valuable insights into the growth of outbreaks and optimize medical resources. In this talk, we introduce a comparative study of physics-based model and machine learning model for epidemic forecasting and countermeasure based on the criteria of accuracy and practicality. We develop four machine learning models, including back-propagation (BP), long short-term memory (LSTM), support vector machine (SVM), extreme learning machine (ELM), and a reaction-diffusion model, incorporating the heterogeneity of susceptibility, lockdown, population movement, and dynamic dependent rates. The experimental results demonstrate the superiority of BP in forecasting

accuracy, while the physics-based model presents comprehensive insights into the disease dynamics, including stability and potential control strategies.

Biography: 陶亦文，郑州大学硕士生导师，现主持国家自然科学基金青年基金、中国博士后科学基金面上项目、河南省重点研发与推广专项（科技攻关）项目，以第一作者/通讯作者在SIAM Journal on Mathematics、Journal of Nonlinear Science 等期刊上发表论文。

Modeling the impact of awareness programs on the transmission dynamics of dengue and optimal control

Hui Wan

Nanjing Normal University, China

In this talk, I'll introduce a mathematical model to study the impact of awareness programs on dengue transmission. Our results suggest that awareness programs have significant impacts on dengue transmission dynamics although they cannot affect the basic reproduction number, R0. When R0 is less than one, awareness programs can shorten the prevailing time effectively. When R0 is larger than one, awareness programs may destabilize the unique interior equilibrium and a stable periodic solution appears due to Hopf bifurcation. In particular, we find that the occurrence of Hopf bifurcation depends not only on the intensity of awareness programs but also on the level of R0. Besides, large fluctuations in the number of infected individuals caused by the stable periodic solution may bring pressure on limited medical resources. Therefore, different from intuitive ideas, blindly increasing the intensity of awareness programs is not necessarily conducive to controlling the transmission of dengue. The decision-making department should decide to adopt different publicity strategies according to the current level of R0. Finally, we consider the optimal control problem of the model and find the optimal control strategy corresponding to awareness programs by Pontryagin's Maximum Principle. The results manifest that the optimal control strategy can effectively mitigate the transmission of dengue.

Biography: 万辉，南京师范大学数学科学学院教授，中国生物数学会常务理事，美国《数学评论》(Mathematical Reviews)评论员；主要研究方向包括生物与生态数学模型研究、传染病动力学、微分方程与动力系统及其应用等；2009年博士毕业于南京师范大学，导师崔景安教授；2009年至2010年，在加拿大约克大学从事博士后研究工作，导师朱怀平教授；2017年访问美国普渡大学，合作导师冯芝兰教授；在 Journal of Theoretical Biology、Bulletin of Mathematical Biology、 Mathematical Biosciences、Discrete and Continuous Dynamical Systems 等国际国内重要刊物上发表论文多篇；主持在研国家自然科学基金面上项目1项，主持完成国家自然科学基金青年基金项目1项，主持完成国家自然科学基金天元基金项目1项。

A new method for the joint estimation of instantaneous reproductive number and serial interval during epidemics

Kaifa Wang

Southwest University, China

Although some methods for estimating the instantaneous reproductive number during epidemics have been developed, the existing frameworks usually require information on the distribution of the serial interval and/or additional contact tracing data. However, in the case of outbreaks of emerging infectious diseases with an unknown natural history or undetermined characteristics, the serial interval and/or contact tracing data are often not available, resulting in inaccurate estimates for this quantity. In the present study, a new framework was specifically designed for joint estimates of the instantaneous reproductive number and serial interval. Concretely, a likelihood function for the two quantities was first introduced. Then, the instantaneous reproductive number and the serial interval were modeled parametrically as a function of time using the interpolation method and a known traditional distribution, respectively. Using the Bayesian information criterion and the Markov Chain Monte Carlo method, we ultimately obtained their estimates and distribution. The simulation study revealed that our estimates of the two quantities were consistent with the ground truth. Seven data sets of historical epidemics were considered and further verified the robust performance of our method. Therefore, to some extent, even if we know only the daily incidence, our method can accurately estimate the instantaneous reproductive number and serial interval to provide crucial information for policymakers to design appropriate prevention and control interventions during epidemics.

Biography: 王开发，西南大学教授。主要从事生物数学、生物统计与计算医学方面的研究，包括病毒感染动力学机理、临床数据分析和传染病建模。

Bifurcation Analysis of Disease Transmission Models

Wendi Wang

Southwest University, China

Bifurcations are common in disease evolution. The prediction of bifurcation is very important for the management of disease prevention. I first introduce the possible mechanisms to identify bifurcations for epidemic models. Then I talk about our studies for the bifurcation in disease transmission models that exhibit the bifurcations of codimension 2 and codimension 3.

Biography: 王稳地，西南大学二级教授，博士生导师, 2005年获得重庆市名师称号, 2018年获得重庆市最美教师称号; 从事生物数学的研究, 在种群动力学和传染病动力学建模和分析方面发表论文100多篇，8次入选 Elsevier 数学类高引用论文作者; 已经主持国家自然科学基金课题7项、教育部项目2项。

Modelling for informing public health policy on prevention and control of COVID-19 epidemics in Toronto, Canada

Pei Yuan

York University, Canada

COVID-19 has caused varying degrees of pandemic in various countries and regions around the world. The public health department has adopted a series of control policies to mitigate the spread of the disease, such as lockdowns, stay-at-home policies, school closures, travel restrictions, vaccine campaigns, etc. The implementation of these policies has significantly affected the progression of COVID-19. In this talk, I will introduce a series of mathematical modeling studies regarding COVID-19 conducted over the past three years in collaboration with the Public Health Agency of Canada and the Toronto Public Health. The studies focus on mitigation strategies, epidemic prediction, reopening, and vaccination strategies, taking into account the actual epidemic prevention needs of public health sectors, and highlighting the scientific value of mathematical models in aiding public health decision-making.

Biography: Dr. Pei Yuan is a postdoc in the Department of Mathematics and Statistics at York University, Canadian Centre for Disease Modelling (CDM) and One Health Modelling Network for Emerging Infections (OMNI-RÉUNIS). She obtained her PhD in applied mathematics from York University in 2021. Her research interests include dynamical systems, ordinary differential equations, bifurcation theory and applications, modelling and analysis in mathematical ecology and epidemiology. She works in a broad field of application including modelling and control of infectious diseases, and zoonotic diseases, as well as tea pest control, climate change and mosquito-borne diseases, data-driven statistical modeling and analysis. During the pandemic, she has been working with Public Health Agency of Canada and Toronto Public Health on data-driven predictive modeling and building the dashboard (internal) for controlling COVID-19 in Toronto.

Refining species generality from a dynamical view of realized niche

Lai Zhang

Yangzhou University, China

Biodiversity loss is occurring at an unprecedented rate globally, but its consequences on ecosystem robustness remain difficult to predict. Extinctions of species with different dietary niche breadths (species generality) can produce unequal outcomes. However, the existing diverse definitions of species generality may obscure our understanding of species loss consequence on ecosystem robustness. Here, we assessed five generality metrics at both the species- and the network-level: binary generality, effective link generality, and link strength-, biomass- and energy flux- weighted generality. We used a multi-trophic food web model in combination with empirical data to explore the relationship between generality and species richness. We further performed secondary extinction experiments by sequentially removing species with either maximal or minimal generality. We examine food web robustness to species loss based on realized or fundamental dietary niche. At the network-level, all considered generality metrics increase with species richness, albeit at markedly different rates. The relative richness of generalists to

specialists stays roughly invariant. Our sequential species elimination experiment demonstrates substantial variability in ecosystem robustness responses to different generality metrics. In both generality ranking scenarios, removing generalists measured by biomass-weighted generality is the most detrimental to food web robustness, suggesting that species with dominant biomass should be of high biodiversity concern. Our work recommends that studies investigating biodiversity conservation under various anthropogenic forcing should include biomass-weighted metrics and pay more attention to species' dietary niche realized in the current food webs instead of the dietary niche recorded in the historic food webs.

Biography: 张来，扬州大学数学科学学院教授，博士生导师，扬州大学教务处副处长。2012年2月博士毕业于丹麦科技大学(Technical University of Denmark)，2011年12月到2016年8月在瑞典于墨奥大学(Umea university)做博士后，2016年9月获副教授岗位，2017年6月获研究员终身岗，2017年9月加入扬州大学数学科学学院。在理论生态学国际权威期刊如Global Change Biology, Proceedings of the Royal Society of London, Methods in Ecology and Evolution, Evolution, Journal of Animal Ecology 以及生物数学期刊如 Bulletin of Mathematical Biology, Journal of Theoretical Biology, Mathematical Biosciences, Theoretical Ecology, Physical Review E等共发表SCI论文50余篇。2018年入选江苏省特聘教授人才计划以及荣获第二届江苏省工业与应用数学奖--青年奖, 2018年并获江苏省自然科学基金面上项目和国家自然科学基金面上项目各1项。

Dynamics analysis of a diffusive predator-prey model with spatial memory and nonlocal fear effect

Xuebing Zhang

Nanjing University of Information Science and Technology, China

In this study, we analyze a delayed diffusive predator-prey model with spatial memory and a nonlocal fear effect, by taking into account the fact that the effect of fear on the growth rate of prey is delayed. First, we verify the existence and boundedness of the solution of the proposed model. Then all steady states are considered, and the conditions under which they are stable are analyzed in light of the model parameters. For the non-delayed model, local/global stability and bifurcations are studied at constant steady states. For the delayed model, we use the delay as the bifurcation parameter to study the Hopf bifurcation and Turing-Hopf bifurcation. Finally, numerical simulations are presented to validate our theoretical findings. It demonstrates that the system exhibits a variety of spatiotemporal patterns as a result of spatial memory delay and nonlocal fear effect delay.

Biography: Xuebing Zhang, an Associate Professor of the School of Mathematics and Statistics, Nanjing University of Information Science and Technology. He received his doctorate from Nanjing University of Aeronautics and Astronautics in 2017. His main research interests are dynamic analysis of reaction diffusion biological population model. He has published more than 30 papers in academic journals such as Journal of Theoretical Biology, Mathematical Biosciences, Nonlinear Dynamics. He received funding from the Natural Science Foundation of Jiangsu

Province.

Modelling the impact of medical resources on the transmission dynamics and control of infectious diseases

Huaiping Zhu

York University, Canada

TBA

Biography: 朱怀平，加拿大约克大学应用数学首席教授、疾病建模中心（CDM）和约克大学并行计算与模拟实验室（LAMPS）主任。长期从事动力系统分支理论及其应用、希尔伯特第十六问题、种群生态学与传染病学的数学建模和应用分析研究、气候变化模拟和影响、以及蚊虫疾病的实时预报和防控等研究工作。朱怀平教授在数学及生物数学的国际顶级或高水平期刊上累计发表文章100多篇，是动力系统分支理论和应用领域的著名专家，在国际著名的微分方程杂志发表了单篇长达112页论文。多次组织举办了动力系统分支理论以及应用，生物数学，气候变化以及影响等学术会议，并先后在重要国际会议做特邀报告20余次。作为项目负责人获得加拿大国家工程和自然科学基金会(NSERC)，国家创新基金(CFI)，加拿大健康研究院（CIHR),加拿大公共卫生部(PHAC)，以及安大略省卫生部、环境部、科技部等部委的资助。2007年曾获安大略省青年科学研究奖。

Abstract-Graduate Forum

(Alphabetic order)

Mathematical models and existence of solutions for atherosclerosis in early stage

Yanning An

Nanjing University of Information Science and Technology, China

In this paper, we establish a new model of atherosclerosis based on fluid-structure interaction(FSI) model of blood vessel. The model consists of Navier-Stokes equation, Biot equations, and reaction-diffusion equations, which involves the effect of blood flow velocity on the concentration of low density lipoprotein(LDL) and other biological components. For proving the existence of weak solutions, we first divide the new model into FSI sub-model and coupled reaction-diffusion sub-model. Then, using Roth's method and operator splitting numerical scheme, we obtain the existence of weak solution of FSI model. In order to solve the nonlinear term representing the consumption of oxidized lowdensity lipoprotein(oxLDL), we construct a regular system. The results in FSI sub-model together with Schauder's fixed point theorem allow us to obtain the existence of non-negative weak solutions for original system by showing the existence and non-negativity of weak solutions for the regular system.

Stability and Hopf bifurcation in the echinococcosis model with mixed time delays and spatial diffusion

Weixin Chen

Ningxia University, China

In this paper, an echinococcosis model with mixed time delays and spatial diffusion is proposed, which describes the dynamic behaviour of echinococcosis transmission from dogs to livestock. The local stability conditions of the positive equilibrium point of the system is investigated by using the Routh-Hurwitz criterio. Moreover, based on the linear approximation method of nonlinear systems, the Hopf bifurcation behavior at the positive equilibrium point is analyzed by regarding the delay as a bifurcation parameter. Numerical simulations are presented to provide a better understanding of the theoretical results.

Global dynamics of an endemic disease model with vaccination, the asymptomatic and symptomatic in complex networks

Erhui Li

Henan Institute of Science and Technology, China

In this work, we analyze the global dynamics of an endemic mathematical model incorporating direct immunity by vaccination and the transport from the asymptomatic to the symptomatic in complex networks. Through calculations, we obtain the disease-free equilibrium and the endemic equilibrium. The basic reproduction number R_0 is defined by the existence of the endemic equilibrium. By analyzing the characteristic equation of equilibria and constructing suitable Lyapunov functionals, the stability of steady states is proved. Numerical simulations in scale-free networks and Possion networks are performed. The results validate the correctness of our theoretical analyses.

Mathematical model of Alzheimer's disease with prion proteins interactions and treatment

Huixia Li

Nanjing University of Aeronautics and Astronautics, China

The accumulation of β-amyloid (Aβ) is one of the most important pathogenic factors in the occurrence of Alzheimer's disease (AD). Studies have shown that oligomers are more toxic in the process of Aβ aggregation because oligomers can interact with receptors such as prion proteins (Prpc) and the interaction causes Prpc to be misfolded into pathogenic oligomeric prion proteins (Prpol). In this paper, we propose an AD model including two types of Aβ, the interaction of oligomers with Prpc and anti-Aβ drugs treatment. The existence, uniqueness, and non-negativity of the solutions are analyzed. Furthermore, we prove that the model admits a unique globally asymptotically stable equilibrium, which means the drug cannot cure AD completely. Finally, we present some numerical simulations and investigate the relative contributions to AD with two types of Aβ, Aβ40 and Aβ42. In addition, elastic analysis description Aβ42 paranuclei can be used as a therapeutic target.

Traveling wave solutions of a nonlocal partially degenerate model for Aedes aegypti

Kai Wang

Nanjing University of Aeronautics and Astronautics, China

This work is devoted to investigate the existence of traveling wave solutions for a partially degenerate Aedes aegypti model with nonlocal effects. In this talk, I will first introduce the transmission mechanism of dengue fever, and then review the research status of the disease, so as to lead to the model of this paper. Next, the main results of this work will be given and I will show the outline proof of the results. Finally, the theoretical results are verified numerically. We study the effects and the sensitivity of parameters on the wave speed and the basic reproduction number, respectively.

广义脉冲 logistic 扩散问题的爆破现象

Haiyan Xu

Yangzhou University, China

为了探究区域演化和脉冲对物种生存，灭亡及爆破的影响，我们提出并研究了演化区域上具有脉冲效应的广义logistic模型。首先引入生态再生指标这一阈值；其次，研究解的长时间行为并给出了物种灭亡，持续生存以及爆破的充分条件；最后，数值拟合表明：区域演化率越大越有利于物种生存，收获脉冲对物种生存起到消极作用，而出生脉冲则产生积极作用甚至导致爆破现象发生。

Risk assessment of atherosclerotic cardiovascular disease based on feature selection of L1-CBFS

Mengdie Yang

Nanjing University of Information Science and Technology, China

To achieve risk assessment of atherosclerotic cardiovascular disease, the number of features directly affects the performance of the model. In this paper, we propose a L1 regularized mutual information feature selection algorithm based on copula (L1-CBFS). The data set was based on real medical visit data, including pulse wave velocities measured by the ultrafast pulse wave velocity (ufPWV) device. Firstly, the L1-CBFS algorithm was combined with four classifiers, namely, Gradient lifting tree (GBDT), Ultimate Gradient Enhancement (XGBoost), Light gradient Enhancement Machine (LightGBM) and Random Forest (RF), to evaluate the classification performance. Finally, the optimal feature subset that the feature selection algorithm contributes significantly to the target task is obtained. The experimental results show that L1-CBFS-LightGBM model has the best performance, the accuracy of 91.34%, macro precision of 91.39%, macro recall of 91.07%, and macro F1 score of 90.4%.

Sliding dynamics and optimal control of avian influenza model with saturated incidence rate

Shuangyan Yang

Ningxia University, China

In this paper, we develop a susceptible-infective-susceptible-infected-recovered avian influenza model with saturated incidence rate and three control measures, which is proposed to evaluate the comprehensive effects of different control measures on the spread of avian influenza. Based on the threshold policy, the threshold level is used as the reference index of whether to take control measures. No control measures will be taken when the total number of infected birds and

humans is less than the threshold level. Otherwise, the three control measures will be implemented simultaneously to mitigate the spread of the disease. Furthermore, by using the Utkin equivalent control method, the existence of sliding mode equation and its dynamics are investigated. Additionally, the method of dynamic programming is introduced to study the optimal control for the model. Through constructing and proving the existence of viscosity solution of the corresponding Hamilton-Jacobi-Bellman equation, the optimal control pair is further obtained. Finally, numerical simulations are performed to illustrate the corresponding theoretical analysis results.

Finite-time contraction stability of a stochastic reaction-diffusion dengue model with impulse and Markov switching

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From the perspective of prevention and treatment of dengue, it is important to reduce the number of infections to a certain range in a limited time. That is, the study of finite time contraction stability (FTCS) of dengue system is a meaningful topic. In this paper, a dengue epidemic model with reaction-diffusion, impulse and Markov switching is proposed. By constructing an equivalent system, the existence and uniqueness of the global positive solution is proved. Then, based on the average impulsive interval method and the bounded impulsive interval method, sufficient conditions are obtained to ensure the finite-time contraction stability of the dengue model. Finally, numerical examples are given to illustrate the theoretical results and the numerical results show the influences of impulse, control strategies and noise intensity on the finite-time contraction stability of the system.

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(Till 11am, 2023/05/10, to be continued)

A Brief Introduction to the SMS of NUIST

School of Mathematics and Statistics, Nanjing University of Information Science and Technology (NUIST), China

About NUIST

NUIST, formerly named **Nanjing Institute of Meteorology**, was established in 1960 and enjoys the reputation as "the cradle of meteorological talents in China".

In 1978: Listed as one of the 88 National Key Universities in China.

In 2004: Renamed as **Nanjing University of Information Science & Technology**.

In 2017: Selected as National "Double-First-Class" Construction University.

Rankings: #41 in Best Global Universities in China / #511 in Best Global Universities (U.S. News);

#50-71 in Mainland China / #401-500 in World-University-Rankings-2020 (ARWU).

A^+: Meteorology was ranked Top 1 in subject assessment by the MOE and rated A^+ in China.

About School of Mathematics and Statistics

The School of Mathematics and Statistics (SMS) in NUIST, is eligible to offer Master's and PhD programs in **Mathematics**, Master's program in **Statistics**, Professional Master's program in **Applied Statistics**, as well as postdoctoral positions of Mathematics. **Mathematics** is not only a key subject of China Meteorological Administration, but also a key subject of Jiangsu Province.

The School also offers three undergraduate majors including Information and Computing Science, Applied Statistics, and Mathematics and Applied Mathematics, which are all key majors of Jiangsu Province, China. Both Information and Computing Science, and Applied Statistics were selected as the **First-class** undergraduate major by the MOE.

Rankings: #30 in Mathematics **in China** / #166 in Mathematics (U.S. News);

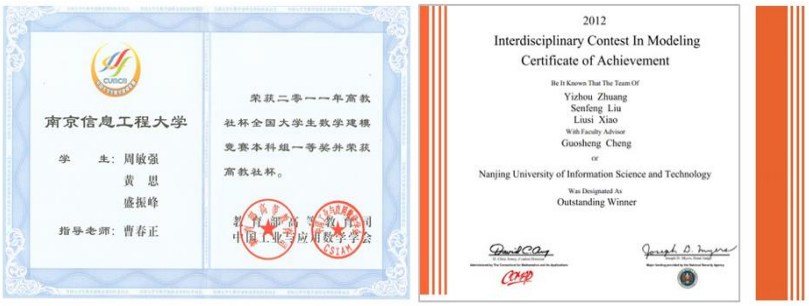
49-75 in Mathematics **in mainland China** / #301-400 in Mathematics (ARWU).

Faculty: The School has personnel of highly qualified teachers with strong research capabilities. The School currently has over 110 faculty members, including 32 professors and 21 PhD supervisors, 41 associate professors / associate researchers.

Honor & Awards:

- Norbert Gerbier-Mumm International Award, World Meteorological Organization (2001)

- National Thousand Talents Program, Fok Ying-Tong Education Foundation, Distinguished Professor of Jiangsu Province, etc.
- **Outstanding** award in COMAP's Mathematical Contest in Modeling (MCM) / Interdisciplinary Contest in Modeling (ICM) (2012, 2018, 2019, 2022)
- The only prize of the highest rank, namely the **Higher Education Press Cup**, in the National Mathematical Modeling Contest for undergraduates (2011)


南京信息工程大学

学　生：周敏强
黄　思
盛振峰

指导老师：曹春正

荣获二零一一年高教社杯全国大学生数学建模竞赛本科组一等奖并荣获高教社杯。

2012
Interdisciplinary Contest In Modeling
Certificate of Achievement
Be It Known That The Team Of
Yizhou Zhuang
Senfeng Liu
Liusi Xiao
With Faculty Advisor
Guosheng Cheng
or
Nanjing University of Information Science and Technology
Was Designated As
Outstanding Winner

2018
Interdisciplinary Contest In Modeling
Certificate of Achievement
Be It Known That The Team Of
Haixu Hong
Mengshi Cui
Shu Liu
With Faculty Advisor
Lianhua Zhu
or
Nanjing University of Information Science & Technology
Was Designated As
Outstanding Winner

- The first class award for National teaching achievement by the MOE (2014)
- The first class award for teaching achievement of Jiangsu Province (2011, 2017)
- Many awards as national brand curriculum, excellent curriculum of Jiangsu Province, key textbook of Jiangsu Province, excellent textbook of China Meteorological Administration

Research in School of Mathematics and Statistics

Research Areas and Features:

- We focus on the problem-driven theoretical research, and a strong research team has been formed in the fields of fluid dynamics, scientific calculation, statistical inference, time series, algebra and number theory, etc.
- We emphasize on the intersection and integration with the atmospheric sciences, develop mathematical technology to solve key problems in interdisciplinary research, and carry out extensive and in-depth research on the application of multiple linear models to typhoon

diagnosis, the application of control theory to data assimilation, earth system model and other atmospheric mathematics, etc.

Platform: National Center for Applied Mathematics (jointly), **Center for Applied Mathematics of Jiangsu Province**, **Jiangsu International Joint Laboratory on System Modeling and Data Analysis**, **Statistical Research Base of Jiangsu Province**, **Foreign Experts Studio of Jiangsu Province**, 4 enterprise cooperative education platforms of MOE, and 5 enterprise postgraduate workstations of Jiangsu Province, which can provide excellent social resource for enhancing the students' innovation and enterprise ability.

International and Industrial Collaboration: On average, about 30 mathematicians or business experts from around the world visit the School each year for 2 to 4 weeks, conducting joint research with local mathematicians and statisticians, holding seminars, and making themselves available for consultation with students working in their area. Through teaching partnership and active cooperative research projects, the school has close ties with the industry such as Huawei and Neusoft.

Fund: In the past five years, the academic team of the School has received 55 National projects and 76 other level projects, including 973 Program, National Key Research and Development Program of China, Key Program of NSFC and so on, altogether 39.8 million (CNY).

Publications: More than 400 papers in SCI journals like **Trans. Amer. Math. Soc.**, **Adv. Math.**, **J. Funct. Anal.**, **Sci. China Math.**, **Arch. Ration. Mech. Anal.**, **SIAM** journals, **IEEE** journals, etc, and more than 30 monographs and textbooks, in the past five years.

Education in School of Mathematics and Statistics

Aims: Advancing mathematical and statistical knowledge through novel and insightful research. Training experts in not only mathematics but also other academic, industrial, and applied fields.

International Joint Training Program: International cooperation with **University of Reading**, **Florida State University, Carleton University**, etc., carrying out joint enrollment and training of undergraduate, master and PhD students, as well as regular academic exchanges.

Employment and Further Education: High quality employment rate is over 98.2%, including research, teaching and technology development in the field of government agencies, research institution, education, IT, meteorology, finances and so on. The rate of studying abroad as a postgraduate is over 30%, and many graduates have been enrolled in domestic and foreign famous universities such as **Cornell University**, **University of Edinburgh**, **Columbia University**, **Imperial College London**, **Tsinghua University**, **Chinese Academy of Sciences**, etc.

Future of Our Students: The School cultivates a number of prominent alumni including "National Major Talent Project" and tenured professors in USA and European countries, and makes important contributions in the field of numerical prediction, climatic statistics, data assimilation and the application of differential equation, etc.

Website: https://math.nuist.edu.cn/3305/list.htm Email address: sms@nuist.edu.cn

Team Introduction

Biomathematics and Applied Differential Equations Team

The team focuses on theory of differential equations, control methods and numerical inversion algorithms, and applied them to complex fluids, biomathematics and data assimilation, which promotes the theoretical development and efficient applications in meteorological satellite data assimilation. In the past five years, the research results are published in *Adv. Math., ARMA, JDE, JFA, CPDE, CVPDE, SIAM, MB* and other journals, a total of 98 SCI papers. The team has carried out 17 projects of National Natural Science Foundation of China and 5 projects of Science and Technology Plan of Jiangsu Province. The team has won the first prize of Educational Science Research Achievement of Jiangsu Province (Science and Technology Research Category), Mathematics Achievement Award of Jiangsu Province, Youth Award of Jiangsu Society for Industrial and Applied Mathematics, etc.

Principal members

- **Biomathematics**

Qi An (安琪), Kewang Chen (陈克旺), Guangping Hu (胡广平), Yong Jiang (蒋勇), Wenjun Liu (刘文军), Xuebing Zhang (张学兵)

- **Applied Differential Equations**

Rong Chen (成荣), Xueping Huang (黄学平), Temesgen Desta Leta, Zijin Li (李子劲), Yan Li (李琰), Yaning Li (李亚宁), Guangying Lv (吕广迎), Anum Shafiq, Xingdong Tang (唐兴栋), Yanqin Xiong (熊艳琴)

- **Inverse Problem and Control of Differential Equations**

Shunjie Li (李顺杰), Yuchan Wang (王玉婵), Bin Wu (吴斌), Xiaochuan Xu (徐小川)

- **Applications in Image Processing**

Yunjie Chen (陈允杰), Jingshi Li (李景诗), Qianting Ma (马倩婷), Weiwei Xu (徐玮玮)

Representative research projects in the past six years

Wenjun Liu, National Natural Science Foundation of China (Grant No. 11771216) "Mathematical models and dynamics of nonlinear wave propagation in viscoelastic biological tissues", 2018.01-2021.12

Weiwei Xu, National Natural Science Foundation of China (Grant No. 11971243) "Correlation matrix calculation in gene expression data analysis", 2020.01-2023.12

Guangying Lv, National Natural Science Foundation of China (Grant No. 12171247) " Research on stochastic partial differential equations with multiple scales", 2022.01-2025.12

Bin Wu, National Natural Science Foundation of China (Grant No. 12171248) " Inverse

problems and numerical methods in stochastic cardiac electrophysiological System", 2022.01-2025.12

Wenjun Liu, National Natural Science Foundation of China (Grant No. 12271261)" Mathematical Model and Dynamics of Atherosclerosis Based on pulse wave", 2023.01-2026.12

Shunjie Li, National Natural Science Foundation of China (Grant No. 61573192) "Differential flatness of affine nonlinear systems and related problems", 2016.01-2019.12

Yunjie Chen, National Natural Science Foundation of China (Grant No. 61672291) "Research on hippocampus segmentation of multimodal infant brain MRI images", 2017.01-2020.12

Temesgen Desta Leta, National Natural Science Foundation of China for Foreign Young Scholars (Grant No. 11950410502) “Studies on singular nonlinear wave wquations: a dynamical systems approach”, 2020.01-2021.12

Yanqin Xiong, National Natural Science Foundation of China (Grant No. 11701289) "Qualitative analysis and bifurcation of limit cycles for several nonlinear systems", 2018.01-2020.12

Yaning Li, National Natural Science Foundation of China (Grant No. 11801276), "Fujita critical index for fractional superdiffusion equations", 2019.01-2021.12

Shengqian Chen, National Natural Science Foundation of China (Grant no. 11901306) " Model based on artial differential equation for the association between intra-seasonal oscillation of tropical atmosphere and subtropical climate", 2020.01-2022.12

Yuchan Wang, National Natural Science Foundation of China (Grant No. 11901308) "Inverse problems and numerical implementation of nonlinear parabolic equations with nonlocal diffusion coefficients", 2020.01-2022.12

Qianting Ma, National Natural Science Foundation of China (Grant No. 61902192) "Ultrasonic image segmentation of breast tumors based on superpixel analysis and unsupervised clustering model", 2020.01-2022.12

Kewang Chen, National Natural Science Foundation of China (Grant No. 12001287) "Study on fluid-structure interaction model for nonlinear wave propagation in arterial blood flow", 2021.01-2023.12

Qi An, National Natural Science Foundation of China (Grant No. 12101318) "Study on pattern dynamics of population model with memory chemotaxis" 2022.01-2024.12

Yan Li, National Natural Science Foundation of China (Grant No. 12201308) "Study on Symmetry and Existence of Solutions of Nonlocal Pseudo-differential Operator Equations" 2023.01-2025.12

Jingshi Li, National Natural Science Foundation of China (Grant No. 12201310) "An Efficient Numerical Method for Optimal Control Problems of Stochastic Navier-Stokes Equations " 2023.01-2025.12

Yaning Li, Mathematics Tianyuan Foundation of National Natural Science Foundation

of China (Grant No. 11626132) "Existence of Periodic Solutions of Fractional Laplace Equation", 2017.01-2017.12

Wenjun Liu, Key Research and Development Program of Jiangsu Province of China (Social Development) (Grant No. BE2019725) "Non-invasive detection of cardiovascular disease based on pulse wave information", 2019.07-2022.06

Wenjun Liu, Mathematics Tianyuan Foundation of National Natural Science Foundation of China (Grant No. 11926315) "Advanced seminar of fluid-structure interaction and its applications in medical diagnosis", 2020.01-2020.12

Rong Cheng, Mathematics Tianyuan Foundation of National Natural Science Foundation of China (Grant No. 12226412) "Workshop on Tianyuan Mathematics of Differential Dynamic Systems and Variational Methods", 2023.01-2023.12

Wenjun Liu, Jiangsu Natural Science Foundation (Grant No. BK20151523) "Dynamic analysis and stability control of time-delay dissipative viscoelastic systems", 2015.07-2018.06

Xuebing Zhang, Jiangsu Natural Science Foundation (Grant No. BK20150420) "Dynamic analysis and control of time-delay reaction-diffusion population model", 2015.07-2018.06

Representative research achievements in the past six years

Xuebing Zhang etc., Dynamics analysis of a delayed reaction-diffusion predator-prey system with non-continuous threshold harvesting, **Math. Biosci.**, 2017.

Zijin Li etc., Regularity of weak solutions of elliptic and parabolic equations with some critical or supercritical potentials, **J. Differential Equations**, 2017.

Qianting Ma etc., A fractional differential fidelity-based PDE model for image denoising, **Mach. Vision and Appl.,** 2017.

Xingdong Tang etc.，Stability of the traveling waves for the derivative Schrodinger equation in the energy space, **Calc. Var. Partial Differential Equations**, 2017.

Wenjun Liu etc., A note on blow-up of solution for a class of semilinear pseudo-parabolic equations, **J. Funct. Anal.**, 2018.

Qi An etc.. Geometric stability switch criteria in two-delay differential systems with delay dependent parameters, **J. Differential Equations**, 2018.

Xingdong Tang etc., Stability of the sum of two solitary waves for (gDNLS) in the energy space, **J. Differential Equations**, 2018.

Guangying Lv etc., Kinetic solutions for nonlocal scalar conservation laws, **SIAM J. Math. Anal.**, 2018.

Xuebing Zhang etc., Dynamics and pattern formation of a diffusive predator–prey model in the presence of toxicity, **Nonlinear Dynam.**, 2019.

Wenjun Liu etc., Stabilization of a thermoelastic laminated beam with past history, **Appl.**

Math. Optim., 2019.

Guangying Lv etc., BMO and Morrey-Campanato estimates for stochastic convolutions and Schauder estimates for stochastic parabolic equations, **J. Differential Equations**, 2019.

Shunjie Li etc., Maximal feedback linearization and its internal dynamics with applications to mechanical systems on R4, **Int. J. Robust Nonlinear Control.**, 2019.

Qi An etc., Dynamics and pattern formation of a diffusive predator-prey model in the presence of toxicity, **Discrete Contin. Dyn. Syst.**, 2020.

Yunjie Chen etc., Quasi Fourier-Mellin Transform for Affine Invariant Features, **IEEE Trans. Image Process**, 2020.

Bin Wu etc., Carleman estimates for a stochasticdegenerate parabolic equation and applications to null controllability and an inverse random source problem, **Inverse Probl.**, 2020.

Yanqin Xiong etc., Limit cycle bifurcations by perturbing a class of planar quintic vector fields, **J. Differential Equations**, 2020.

Xiaochuan Xu etc., On the inverse spectral stability for the transmission eigenvalue problem with finite data, **Inverse Probl.**, 2020.

Xuebing Zhang etc., Spatiotemporal dynamics of a delayed diffusive ratio-dependent predator–prey model with fear effect, **Nonlinear Dynam.**, 2021.

Yanqin Xiong etc., The maximal number of limit cycles bifurcating from a Hamiltonian triangle in quadratic systems, **J. Differential Equations**, 2021.

Xiaochuan Xu etc., On the stability of the inverse transmission eigenvalue problem from the data of McLaughlin and Polyakov, **J. Differential Equations**, 2022.

Wenjun Liu etc., The strong solutions to the primitive equations coupled with multi-phase moisture atmosphere, **Phys. D**, 2022.

Xingdong Tang etc., Instability of the solitary waves for the 1d NLS with an attractive delta potential in the degenerate case. **Math. Res. Lett.**, 2022.

Guangying Lv etc., Stochastic transport equation with bounded and Dini continuous drift, **J. Differential Equations**, 2022.

Xuebing Zhang etc., Global stability of a rumor spreading model with discontinuous control strategies. **Phys. A**, 2022.

Xingdong Tang etc., Instability of the solitary waves for the generalized derivative nonlinear Schrödinger equation in the degenerate case, **J. Differential Equations**, 2023.

Xueping Huang, Semi-linear elliptic inequalities on weighted graphs, **Calc. Var. Partial Differential Equations**, 2023

Published Textbooks

Wenjun Liu, Yuepeng Wang, Feida Jiang etc. **Equations of Mathematical Physics:**

Models, Methods and Applications (2nd), Science Press, 2021. (Welcome to join QQ group **933354732** for teaching discussion)

Gang Li, Wenjun Liu, Feida Jiang etc. **Equations of Mathematical Physics: Models, Methods and Applications**, Science Press, 2017.

Wenjun Liu, Jian Ding, Rong Cheng and Shengqi Yu, **Ordinary Differential Equations-Theory, Methods and Applications**, World Academic Press, 2013.

Online MOOC

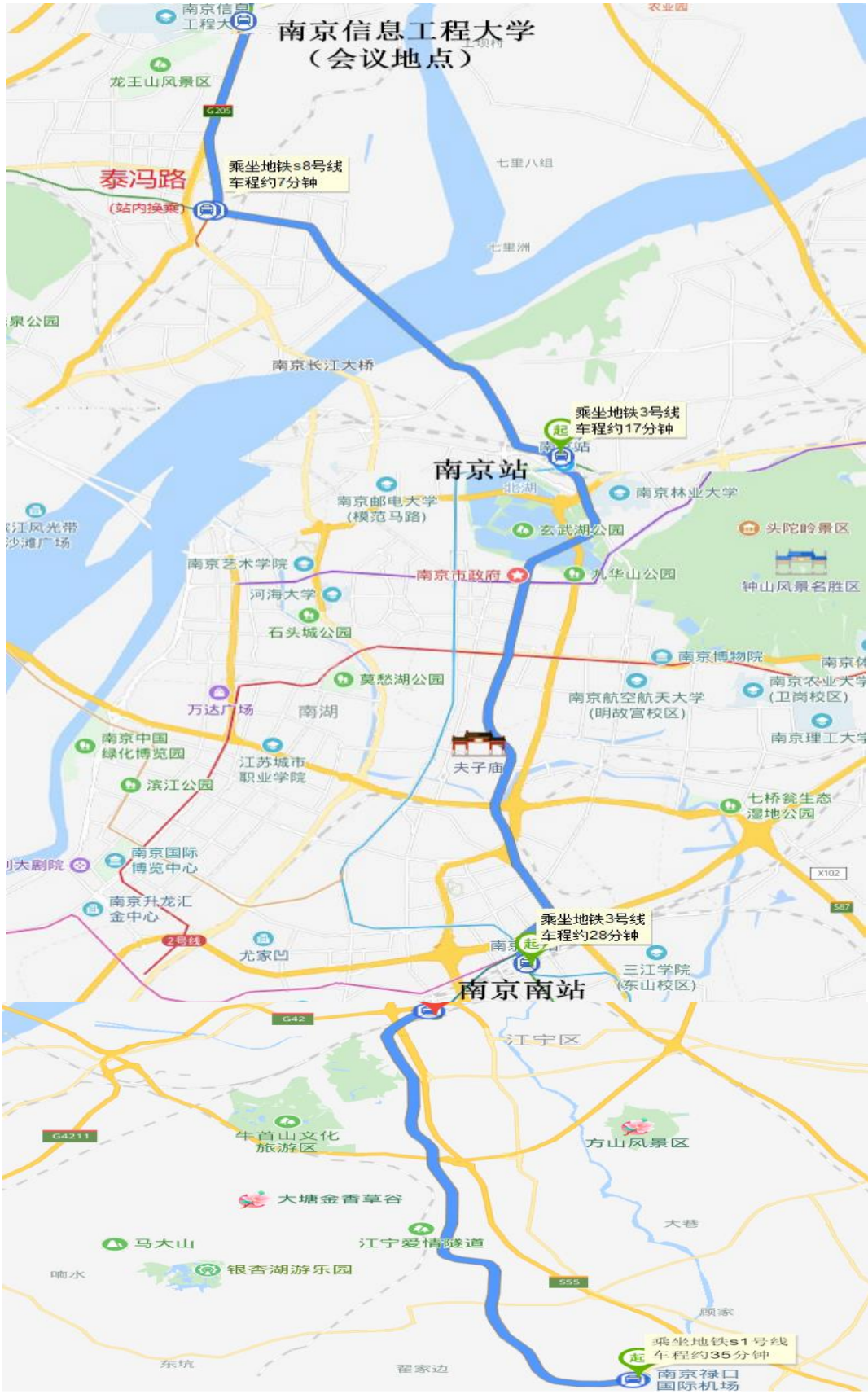
Differential Equation (masters), National postgraduate education wisdom education platform, https://www.gradsmartedu.cn/course/nuistP04011A66899 (suitable for postgraduate students majoring in Mathematics)

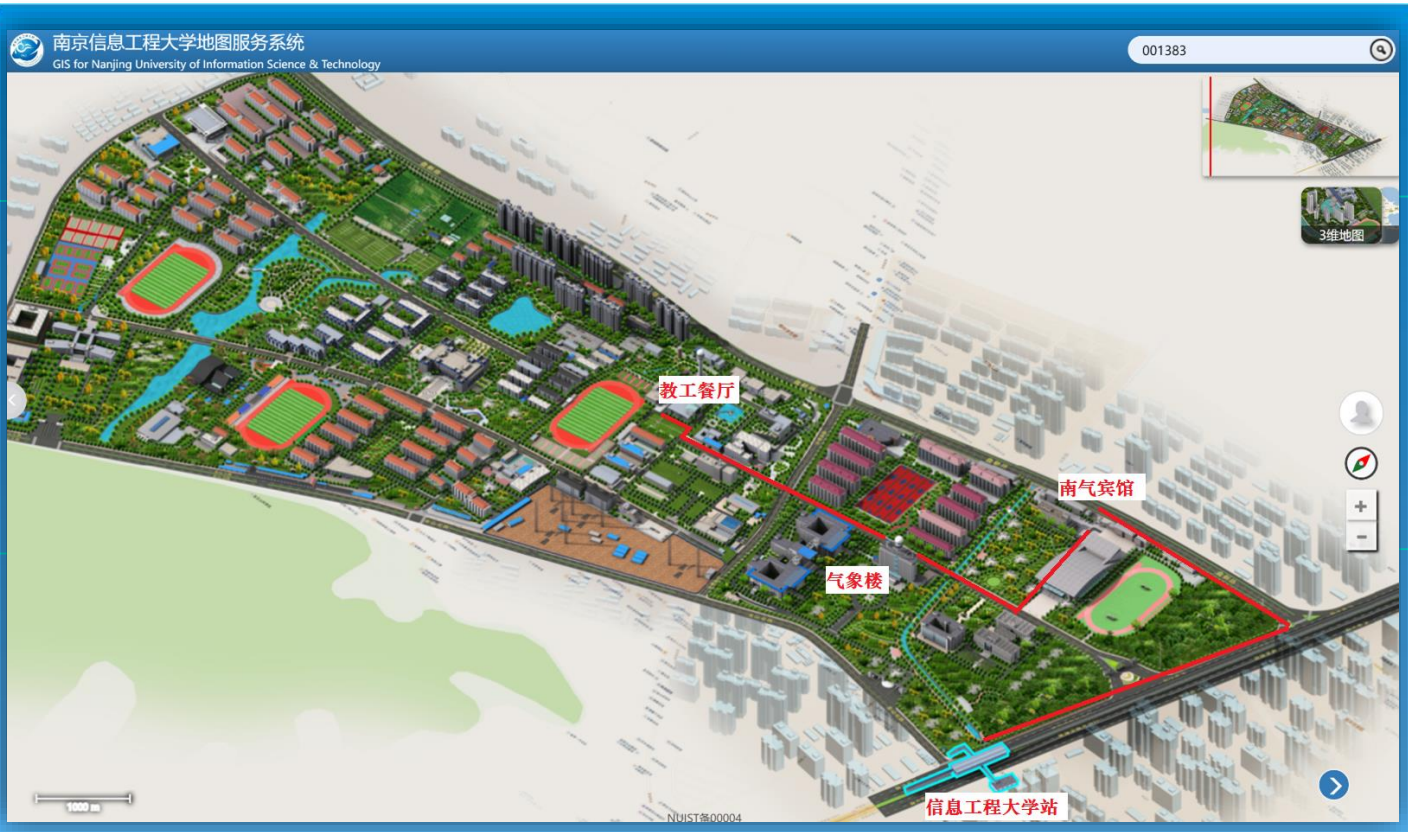
Equations of Mathematical Physics (research includes), National postgraduate education wisdom education platform, https://www.gradsmartedu.cn/course/nuistP04011A53524 (suitable for undergraduate students majoring in Mathematics, and non-mathematical postgraduate students majoring in Applied Meteorology et al.)

Equations of Mathematical Physics, Chinese University MOOC, https://www.icourse163.org/course/NUIST-1461957161?tid=1470000446 (suitable for undergraduate students majoring in Atmospheric science, Electronic Information and Mathematics et al.)

Traffic Guidance

（We look forward to your guidance at any time）





南京信息工程大学
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NANJING UNIVERSITY OF INFORMATION SCIENCE & TECHNOLOGY

祝您生活愉快！

Wish you a happy life.