反问题与计算成像国际会议

Workshop on Inverse Problems and Computational Imaging

程 序 册

南开大学

2024 年 11 月 22-24 日

主办单位

南开大学陈省身数学研究所

南开大学数学科学学院

南开大学数学交叉科学中心

会议主席

包　刚　　浙江大学

会议组委会

陈发来　　中国科学技术大学

胡广辉　　南开大学

吴春林　　南开大学

张　波　　中国科学院数学与系统科学研究院

会务组

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反问题与计算成像国际会议日程

2024 年 11 月 21 日（星期四）	
14:00-20:00	**报　到　　地点：南开大学嘉园宾馆**
18:00-20:00	**晚　餐　　地点：南开大学嘉园宾馆**
2024 年 11 月 22 日（星期五）上午　　地点：陈省身数学研究所二层 216	
08:30-08:45	**开幕式致辞　　主持人：胡广辉**
08:45-09:00	**合影**
学术报告 I　主持人：包刚 浙江大学	
09:00-09:40	沈佐伟 新加坡国立大学 Deep Approximation via Deep Learning
09:40-10:15	程晋 复旦大学 Runge Approximation and Learning based Numerical Methods for Lame Equations
10:15-10:35	**茶歇**
学术报告Ⅱ　主持人：沈佐伟 新加坡国立大学	
10:35-11:10	姚正安 中山大学　(线上) 分数阶偏微分方程在图像处理和网络安全中的应用
11:10-11:45	刘继军 东南大学
12:00-13:30	**午餐　　地点：南开大学嘉园宾馆**
2024 年 11 月 22 日（星期五）下午　地点：陈省身数学研究所二层 216	

学术报告Ⅲ 主持人：程晋 复旦大学	
14:00-14:35	李松 浙江大学 基于傅里叶测量的相位恢复理论与算法
14:35-15:10	吴国宝 香港浸会大学 Uniform Recovery Guarantees for Quantized Corrupted Sensing
15:10-15:45	王彦飞 中国科学院地质与地球物理研究所 Model-driven and data-driven inverse problems and intelligent computing
15:45-16:05	**茶歇**
学术报告Ⅳ 主持人：陈发来 中国科学技术大学	
16:05-16:40	孙文昌 南开大学 Recovery of signals from wrapped frame coefficients
16:40-17:15	马坚伟 哈尔滨工业大学 智能地球物理技术进展
17:15-17:50	庞彤瑶 清华大学 Self-supervised Image Restoration Based on Neural Representation and Bayesian Inference
18:00-20:30	**晚宴**
2024 年 11 月 23 日（星期六）上午 地点：陈省身数学研究所二层 216	
学术报告Ⅴ 主持人：张波 中国科学院数学与系统科学研究院	
08:20-08:55	李培军 中国科学院数学与系统科学研究院 Stability for inverse random source problems
08:55-09:30	陆帅 复旦大学 Function and derivative approximation by shallow neural networks
09:30-10:05	徐翔 浙江大学 Numerical Algorithms for Inverse Spectral Problems Based on Trace Formulas

10:05-10:20	**茶歇**
学术报告Ⅵ 主持人：李培军 中国科学院数学与系统科学研究院	
10:20-10:55	杨晓琪 香港理工大学 稀疏优化问题稳定性的最新进展
10:55-11:30	许志强 中国科学院数学与系统科学研究院 Stability of Least Square Approximation under Random Sampling
11:30-12:05	吴勃英 哈尔滨工业大学
12:10-13:30	**午餐　　地点：南开大学嘉园宾馆**
2024 年 11 月 23 日（星期六）下午　地点：陈省身数学研究所二层 216	
学术报告Ⅶ 主持人：陆帅 复旦大学	
14:00-14:35	魏婷 兰州大学 Simultaneous identification of the order and potential coefficient in a time fractional diffusion-wave equation by a deep neural networks method
14:35-15:10	杨家青 西安交通大学 The obstacle scattering problem for biharmonic equations
15:10-15:45	郭玉坤 哈尔滨工业大学 Mathematical and numerical studies of an inverse source problem for the biharmonic equation
15:45-16:05	**茶歇**
学术报告Ⅷ 主持人：薛运华 南开大学	
16:05-16:40	段玉萍 北京师范大学 Robust Regularization Methods for Non-line-of-sight Imaging
16:40-17:15	金其余　内蒙古大学 Quaternion Nuclear Norms Over Frobenius Norms Minimization for Robust Matrix Completion

17:15-17:50	赵越 华中师范大学 Scattering resonances and inverse source scattering problems
18:00-19:30	**晚餐　　地点：南开大学嘉园宾馆**
2024 年 11 月 24 日（星期日）上午　地点：陈省身数学研究所二层 216	
学术报告 IX 主持人：杨孝平 南京大学	
08:20-08:55	董彬 北京大学 PDEformer: Towards a Foundation Model for Solving Parametric PDEs and Beyond
08:55-09:30	陈冲 中国科学院数学与系统科学研究院 Convergence Analysis of the Nonlinear Kaczmarz Method for Systems of Nonlinear Equations with Component-wise Convex Mappings
09:30-10:05	金正猛　南京邮电大学 Regularized CNNs Based on Geodesic Active Contour and Edge Predictor for Image Segmentation
10:05-10:15	**茶歇**
学术报告 X 主持人：董彬 北京大学	
10:15-10:50	张波 中国科学院数学与系统科学研究院 Kernel Machine and Inverse Scattering Problems
10:50-11:25	赖俊 浙江大学 Determining the nonlinear energy potential in phase-field system
12:00-13:30	**午餐　　地点：南开大学嘉园宾馆**
2024 年 11 月 24 日（星期日）下午　地点：陈省身数学研究所二层 216	
学术报告 XI 主持人：孙瑶 中国民航大学	
14:00-14:35	刘晓东 中国科学院数学与系统科学研究院 A journey of source reconstruction by the direct sampling methods

14:35-15:10	张海文　中国科学院数学与系统科学研究院 Iterative regularized contrast source inversion type methods for the inverse medium scattering problem
15:10-15:30	**茶歇**
学术报告 XII　主持人：陈冲　中国科学院数学与系统科学研究院	
15:30-16:05	常慧宾　天津师范大学
16:05-16:40	曾超　南开大学 Lp minimization for image restoration and low-rank matrix recovery
17:30-19:00	**晚餐**　　**地点：南开大学嘉园宾馆**

报告题目与摘要

Convergence Analysis of the Nonlinear Kaczmarz Method for Systems of Nonlinear Equations with Component-wise Convex Mappings

陈冲　　中国科学院数学与系统科学研究院

Motivated by a class of nonlinear imaging inverse problems, for instance, multispectral computed tomography (MSCT), we study the convergence theory of the nonlinear Kaczmarz method (NKM) for solving the system of nonlinear equations with component-wise convex mapping, namely, the function corresponding to each equation being convex. Such kind of nonlinear mapping may not satisfy the commonly used component-wise tangential cone condition (TCC). For this purpose, we propose a novel condition named relative gradient discrepancy condition (RGDC), and make use of it to prove the convergence and even the convergence rate of the NKM with several general index selection strategies, where these strategies include the cyclic strategy and the maximum residual strategy. Particularly, we investigate the application of the NKM for solving nonlinear systems in MSCT image reconstruction. We prove that the nonlinear mappings in this context fulfill the proposed RGDC rather than the component-wise TCC, and provide a global convergence of the NKM based on the previously obtained results. Numerical experiments further illustrate the numerical convergence of the NKM for MSCT image reconstruction.

Runge Approximation and Learning based Numerical Methods for Lame Equations

程晋　　复旦大学

Runge approximation is one of interesting properties for partial differential equations, which means that the solutions of a partial differential equation in a small domain can uniformly approximated by the solutions of the partial differential equation in a large domain. In this talk, we prove the quantitative Runge approximation property for Lame equations. By this result, we propose the learning based numerical methods for Lame equations. The generality of this method is proved. The error analysis and numerical experiments are presented.

PDEformer: Towards a Foundation Model for Solving Parametric PDEs and Beyond

董彬　　北京大学

Deep learning has emerged as a dominant approach in machine learning and has achieved remarkable success in various domains such as computer vision and natural language processing. Its influence has progressively extended to numerous research areas within the fields of science and engineering. In this presentation, I will outline our work on the design and training of a foundation model, named PDEformer, which aims to serve as a flexible and efficient solver across a spectrum of parametric PDEs. PDEformer is specifically engineered to facilitate a range of downstream tasks, including but not limited to parameter estimation and system identification. Its design is tailored to accommodate applications necessitating repetitive solving of PDEs, where a balance between efficiency and accuracy is sought.

Robust Regularization Methods for Non-line-of-sight Imaging

段玉萍　　北京师范大学

Non-Line-of-Sight (NLOS) imaging, a typical inverse problem, reconstructs hidden objects' shapes, positions, or motions by analyzing indirectly obtained optical or acoustic signals. Unlike traditional imaging, NLOS captures signals via complex reflections and scatterings, then uses inversion to recover obscured information. Mathematically, NLOS imaging is an ill-posed linear inverse problems, which faces challenges like illposedness and noise interference. Thus, we developed a robust and fast NLOS reconstruction method by introducing effective regularization techniques for hidden objects, observation signals, and the system matrix. Results from both synthetic and experimental data demonstrate that our approach accurately recovers hidden objects and outperforms state-of-the-art algorithms in quantitative metrics and visual quality.

Mathematical and numerical studies of an inverse source problem for the biharmonic equation

郭玉坤　　哈尔滨工业大学

This talk concerns an inverse source problem for the biharmonic wave equation. Mathematically, we characterize the radiating and non-radiating sources at a fixed wavenumber. We also derive a Lipschitz stability estimate to determine the radiating source. Numerically, we propose a source reconstruction method based on the Fourier series expansion by multi-frequency boundary measurements. The stability of the proposed method is analyzed and numerical experiments are presented to verify the accuracy and robustness.

Quaternion Nuclear Norms Over Frobenius Norms Minimization for Robust Matrix Completion

金其余　　内蒙古大学

Recovering hidden structures from incomplete or noisy data remains a pervasive challenge across many fields, particularly where multi-dimensional data representation is essential. Quaternion matrices, with their ability to naturally model multi-dimensional data, offer a promising framework for this problem. This paper introduces the quaternion nuclear norm over the Frobenius norm (QNOF) as a novel nonconvex approximation for the rank of quaternion matrices. QNOF is parameter-free and scale-invariant. Utilizing quaternion singular value decomposition, we prove that solving the QNOF can be simplified to solving the singular value L_1/L_2 problem. Additionally, we extend the QNOF to robust quaternion matrix completion, employing the alternating direction multiplier method to derive solutions that guarantee weak convergence under mild conditions. Extensive numerical experiments validate the proposed model’s superiority, consistently outperforming state-of-the-art quaternion methods.

Regularized CNNs Based on Geodesic Active Contour and Edge Predictor for Image Segmentation

金正猛　　南京邮电大学

In this talk, I will introduce a novel regularized convolutional neural network (CNN) based on geodesic active contour (GAC) and edge predictor (EP) for image segmentation. The main idea is to establish a variational problem which integrates the Heaviside function such that the GAC prior is easily added into the problem. Furthermore, an edge predictor module is designed to predict the edges of target objects and an edge predictor function (EPF) is generated instead of the traditional edge indicator function in the GAC. Besides, an iterative convolution soft

thresholding module (ICSTM) is developed to numerically solve the GAC and EPF based variational problem, and merged into an existing CNN to generate our new end-to-end network. It is also proved that the ICSTM algorithm is unconditionally stable. Finally, experimental results on synthetic, MRI and CT images show that the proposed

method is quite competitive with the other state-of-the-art segmentation methods especially in segmenting noisy images with low contrast.

Determining the nonlinear energy potential in phase-field system

赖俊　　浙江大学

The phase-field system is a nonlinear model that has significant applications in the field of material sciences. In this talk, we are concerned with the uniqueness of determining the nonlinear energy potential in a phase-field system consisted of Cahn-Hilliard and Allen-Cahn equations. This system finds widespread applications in the development of alloys engineered to withstand extreme temperatures and pressures. The goal is to reconstruct the nonlinear energy potential through the measurements of concentration fields. We establish the local well-posedness of the phase-field system based on the implicit function theorem in Banach spaces. Both of the uniqueness results for recovering time-independent and time-dependent energy potential functions are provided through the higher order linearization technique.

Stability for inverse random source problems

李培军　　中国科学院数学与系统科学研究院

In the field of inverse problems, the estimation of an unknown source term from indirect observations is a fundamental challenge. Random sources add another level of complexity to this problem due to their uncertainties. In this talk, we will focus on the stability estimates for inverse random source problems of wave equations. An overview will be provided on the existing results for estimating the stability of the solution in deterministic settings, and our recent findings will be presented for the stochastic cases.

基于傅里叶测量的相位恢复理论与算法

李松　　浙江大学

报告内容主要介绍基于傅立叶测量的相位恢复理论与算法问题，特别侧重于提升方法与 wf 算法的收敛性问题。报告内容较系统的介绍了我与合作者近几年以来的一些相关工作。

A journey of source reconstruction by the direct sampling methods

刘晓东　　中国科学院数学与系统科学研究院

We present our understanding of the direct sampling methods for inverse source reconstructions. In particular, we introduce a novel direct sampling method which is not only reconstruct the location and shape of the source support, but also determine the source function.

Function and derivative approximation by shallow neural networks

陆帅　　复旦大学

We investigate a Tikhonov regularization scheme specifically tailored for shallow neural networks within the context of solving a classic inverse problem: approximating an unknown function and its derivatives within a unit cubic domain based on noisy measurements. The proposed Tikhonov regularization scheme incorporates a penalty term that takes three distinct yet intricately related network (semi)norms: the extended Barron norm, the variation norm, and the

Radon-BV seminorm. These choices of the penalty term are contingent upon the specific architecture of the neural network being utilized. We establish the connection between various network norms and particularly trace the dependence of the dimensionality index, aiming to deepen our understanding of how these norms interplay with each other. We revisit the universality of function approximation through various norms, establish rigorous error-bound analysis for the Tikhonov regularization scheme, and explicitly elucidate the dependency of the dimensionality index, providing a clearer understanding of how the dimensionality affects the approximation performance and how one designs a neural network with diverse approximating tasks. It is a joint work with Yuanyuan Li (Fudan University).

Self-supervised Image Restoration Based on Neural Representation and Bayesian Inference

庞彤瑶　　清华大学

Image restoration involves recovering high-quality images from degraded or limited measurements, a task with applications in many fields such as science and medicine. Recently, deep learning has emerged as a prominent tool for many problems, including image restoration. However, most deep learning methods for this purpose are supervised, requiring large amounts of paired training data with ground-truth images.

In this talk, I will introduce a self-supervised method that leverages neural representation of images and a Bayesian framework, using only observed measurements for training. This approach even demonstrates performance comparable to supervised methods. To fully exploit neural representations, we will explore parameter priors and neural network architecture. While neural networks often function as “black-box” models, our approach aims to offer an intuitive understanding of their representational power, as evidenced by strong experimental results.

Recovery of signals from wrapped frame coefficients

孙文昌　　南开大学

We show that for certain frames, a signal is uniquely determined by the fractional parts of its frame coefficients. As a result, a signal can be recovered from its wrapped frame coefficients. We study the robustness of recovery and give a method to construct frames which have the optimal robustness.

Simultaneous identification of the order and potential coefficient in a time fractional diffusion-wave equation by a deep neural networks method

魏婷　　兰州大学

I will talk about a nonlinear inverse problem of identifying simultaneously the order of fractional derivative and a space-dependent potential coefficient in a one-dimensional time-fractional diffusion wave equation from the lateral Cauchy data. The existence and uniqueness of the weak solution for the corresponding direct problem is studied. Based on the solution of direct problem, the uniqueness for the simultaneous determination of fractional order and space-dependent potential coefficient is proved by the analytic continuation, Laplace transformation and Gel$'$fand-Levitan theory under some suitable conditions to the given data. The Lipschitz continuity of the forward operator is discussed and the ill-posedness of the inverse problem is illustrated. Moreover, we employ a self-adaptive algorithm combined with a fractional physics-informed method (self-adaptive fPINNs) to find the numerical fractional order and space-dependent potential coefficient simultaneously. The numerical experimental results for

three examples fully indicate the effectiveness of the numerical method.

Uniform Recovery Guarantees for Quantized Corrupted Sensing

吴国宝　　香港浸会大学

In this talk, we discuss quantized corrupted sensing where the measurements are contaminated by unknown corruption and then quantized by a dithered uniform quantizer. We study uniform guarantees for Lasso that ensure the accurate recovery of all signals and corruptions using a single draw of the sub-Gaussian sensing matrix and uniform dither. Some theoretical results are presented.

Numerical Algorithms for Inverse Spectral Problems Based on Trace Formulas

徐翔　　浙江大学

In this talk, we will discuss some recent progress on numerical algorithms for inverse spectral problems for the Sturm-Liouville and damped wave operators. Instead of inverting the map from spectral data to unknown coefficients directly, we propose a novel method to reconstruct the coefficients based on inverting a sequence of trace formulas which bridge the spectral and geometry information in terms of a series of nonlinear Fredholm integral equations. Numerical examples are presented to verify the validity and effectiveness of the proposed numerical algorithms. The impact of different parameters involved in the algorithm is also discussed.

Stability of Least Square Approximation under Random Sampling

许志强　　中国科学院数学与系统科学研究院

In this talk, we investigate the stability of the least squares approximation within the univariate polynomial space of a certain degree. This approximation involves identifying a polynomial that closely approximates a function over a specific domain, based on samples taken from that function at randomly selected points, according to a designated measure. Our primary aim is to determine the sampling rate needed to ensure the stability of this approximation. Under the assumption that the sampling points are independent and identically distributed with respect to a Jacobi weight function, we present the necessary sampling rates for maintaining stability. In particular, we show that for uniform random sampling, a sampling rate proportional to the square of the degree is required to ensure stability. By integrating these findings with previous work by Cohen-Davenport-Leviatan, we conclude that, for uniform random sampling, the optimal sampling rate for guaranteeing the stability of the approximation is similarly proportional to the square of the degree, with an additional logarithmic factor. Motivated by this result, we extend an existing impossibility theorem, which was initially applicable to equally spaced samples, to the case of random samples. This extension highlights the trade-off between accuracy and stability when it comes to recovering analytic functions.

The obstacle scattering problem for biharmonic equations

杨家青　　西安交通大学

In this talk, we consider the obstacle scattering problem for biharmonic equations with the Dirichlet boundary condition in both two and three dimensions. Firstly, some basic properties are derived for the scattered fields, which leads to a simple criterion for the uniqueness of the solution. Then a new definition for the far-field pattern is introduced, where the correspondence between the far-field pattern and scattered field is established. With these

preparations, we prove the existence of a unique solution in associated Sobolev spaces by the boundary integral equation method, which relies on a natural decomposition of the biharmonic operator and the theory of the pseudodifferential operator. Moreover, the inverse problem in determining the shape and location of the obstacle is studied. By establishing some novel reciprocity relations between the far-field pattern and the scattered field, we show that the obstacle can be uniquely recovered from the far-field or near field measurements at a fixed frequency.

稀疏优化问题稳定性的最新进展

杨晓琪　　香港理工大学

稀疏优化模型的恢复界/相对平静性质对于机器学习和压缩传感中的算法收敛分析非常重要。我们将回顾最近通过受限等距性质和受限特征值条件获得的稀疏优化的一些恢复界结果。拟利普希茨性质和利普希茨连续性是稳定性分析的核心,他们是较恢复界/平静性质更强的稳定性质。我们将讨论集值映射的投影上导数,并将其应用于获得集值映射的完整表征的以具有相对于闭凸集的拟利普希茨性质。我们将介绍扩展 1 范数正则化问题（或 Lasso）的利普希茨连续性。

分数阶偏微分方程在图像处理和网络安全中的应用

姚正安　　中山大学

阐述分数阶偏微分方程理论和计算方法。探讨其在计算机工程中的应用，尤其是在计算机安全、图像处理方面的应用。

Lp minimization for image restoration and low-rank matrix recovery

曾超　　南开大学

Lp (0<p<1) minimization has advantages over L1 minimization in sparse reconstruction, and Schatten p-quasi-norm minimization has advantages over nuclear norm minimization in recovering low-rank matrices. We discuss some therotical results and algorithms of Lp (Schatten p-quasi-norm) minimization in image restoration and low-rank matrix recovery.

Kernel Machine and Inverse Scattering Problems

张波　　中国科学院数学与系统科学研究院

In this talk we connect machine learning techniques, in particular, kernel machine learning, to inverse source and scattering problems. We show the proposed kernel machine learning has demonstrated generalization capability and has a rigorous mathematical foundation. The proposed learning is based on the Mercer kernel, the reproducing kernel Hilbert space, the kernel trick, as well as the mathematical theory of inverse source and scattering theory, and the restricted Fourier integral operator. The kernel machine learns a multi-layer neural network which outputs an ϵ-neighborhood average of the unknown or its nonlinear transformation. We then apply the general architecture to the multi-frequency inverse source problem for a fixed observation direction and the Born inverse medium scattering problem. We establish mathematically justified kernel machine indicator with demonstrated capability in both shape identification and parameter identification, under very general assumptions on the physical unknown. More importantly, stability estimates are established in the case of both noiseless and noisy measurement data. Of central importance is the interplay between a restricted Fourier integral operator and a corresponding

Sturm-Liouville differential operator. Several numerical examples are presented to demonstrate the capability of the proposed kernel machine learning.

Iterative regularized contrast source inversion type methods for the inverse medium scattering problem

张海文　　中国科学院数学与系统科学研究院

This talk is concerned with the inverse problem of reconstructing an inhomogeneous medium from the acoustic far-field data. The contrast source inversion (CSI) methods are the well-known algorithms for such kind of inverse scattering problem, which are very fast and efficient. Recently, we propose two iterative regularized CSI-type methods. Our methods have very low computational complexity. Moreover, we prove the global convergence of the proposed methods. Numerical experiments show that our methods are very robust and have faster convergence rates than the original CSI-type methods.

Scattering resonances and inverse source scattering problems

赵越　　华中师范大学

Inverse source problem is an important research subject in inverse scattering problems. Numerical methods such as recursive linearization and Fourier method have been developed to recover the sources. In this talk, we present a stability estimate for the inverse source problem in an inhomogeneous medium. We employ data at multiple wave numbers and the stability increases as the bandwidth of the wave number increases, which explains the increasing stability observed in numerical experiments. The key ingredient in the analysis is to employ scattering theory to investigate the resolvent and achieve a resonance-free region. This method is unified and can be applied to other wave equations. Motivated by the study of inverse source problems, I also present our recent results on scattering resonances of the resolvent of the Schrodinger operator with critically singular potentials.

陈省身数学研究所简介

陈省身数学研究所（原南开数学研究所）成立于 1985 年，由数学大师陈省身教授创建，并亲自担任第一任所长直至 1992 年，诺贝尔奖获得者杨振宁教授于 1986 年在所内建立了理论物理研究室。

陈省身数学研究所是一座开放型的研究所，其目的是延揽中外数学家，促进中国纯粹和应用数学的发展，立足中国国内培养高层次数学人才。办所方针是“立足南开，面向全国，放眼世界”。

陈省身数学研究所自建所以来，通过承办大型的学术活动年，培养了一大批享誉海内外的中青年数学家；通过各种形式的学术交流活动大大促进了中国纯粹和应用数学的发展，有力提升了我国在国际数学界的地位。同时，为了促进我国数学事业的全面发展，于 2005 年启动了“访问学者计划”，该计划为国内外来访学者提供适当的资助，每年还将特别保留一定的名额资助国内中西部及边远地区的数学研究者来所进行研究工作。自 2008 年 11 月开始，陈省身数学研究所启动了按年度开展的“学术活动征集计划”，旨在吸引更多活跃在国际学术研究前沿的国内外数学家参与陈省身数学研究所的学术活动。

研究所拥有一支具有国际水平的精干研究团队，其中包括中国科学院院士 4 人（含发展中国家科学院院士 3 人），国家自然科学基金“杰出青年”基金获得者 7 人，教育部“跨/新世纪优秀人才支持计划”人才 6 人，国家“百千万人才工程”入选者 3 人。科研团队的主要研究方向包括：微分几何、非线性分析与辛几何、组合学、动力系统、算子代数、密码学、编码理论、信息论、数学物理、理论物理等。

研究所成立以来一直得到了教育部(前国家教育委员会)和财政部的持续资助，同时也得到了很多机构和个人的大力支持，例如：国家科技部、国家自然科学基金委员会、香港邵逸夫先生、香港王宽诚教育基金委员会、陈省身基金会等。

数学科学学院简介

南开大学数学科学学院的前身为南开大学数学系，是由现代数学在我国最早和最有成效的播种人之一的姜立夫先生于 1920 年创立的，是当时中国大学的第二个数学系（算学系）。抗日战争时期，与北京大学数学系、清华大学算学系合组西南联大算学系（数学系），1946 年复校返津。1952 年全国院校调整，原天津大学数学系合并到南开大学数学系。1960 年至 1963 年曾更名为数学力学系。1983 年自动控制专业和计算机软件从数学系调出，与其它相关专业合组成立计算机与系统科学系。1985 年，经教育部批准，由数学大师陈省身教授提议创办、并亲自担任所长的南开数学研究所（现陈省身数学研究所）成立。1997 年 5 月 7 日，数学科学学院成立。

数学系（院）建立 100 多年来，先后有一批杰出的数学家曾在数学系（院）任教，如：严志达、王梓坤、柯召、吴大任、胡国定、刘晋年、钱宝琮、申又枨、蒋硕民、孙本旺、邓汉英、周学光、曾鼎禾、杨宗磐等。培养了以陈省身、江泽涵、吴大任、刘晋年、申又枨、孙本旺等为杰出代表的大批优秀数学人才。

学院拥有基础数学、概率论与数理统计、应用数学三个二级学科国家重点学科。2007 年南开数学入选首批一级学科国家重点学科。在第四轮全国一级学科整体水

平学科评估中获评 A 学科，第五轮评估中获重大突破。2017 年，南开数学入选国家首批“双一流”建设学科，2021 年再次入选国家“双一流”建设学科。学院拥有数学一级学科博士学位授予权，在基础数学、计算数学、概率论与数理统计、应用数学、生物信息学和数理经济六个二级学科招收和培养研究生，并设有数学博士后流动站。

学院现设教学与研究机构：数学系、信息与数据科学系、概率统计系、应用数学系、科学与工程计算系、数理金融与精算科学系、高等数学教学部、计算实验室。2003 年 1 月成立的科学计算研究所挂靠数学科学学院。

数学科学学院（系）于 1993 年被国家教委批准为国家基础科学研究与教学人才培养基地，其前身为陈省身先生倡导的于 1986 年国家批准设立的数学试点班。该基地“培养基础性数学人才的实践”2001 年获国家级教学成果一等奖，并被评为天津市特等劳动模范集体，2002 年被授予“全国五一劳动奖状”，2009 年和 2019 年分别首批入选国家数学拔尖学生培养计划 1.0、2.0 基地，2022 年正式命名省身班。两个本科专业“数学与应用数学”与“信息与计算科学”均入选国家一流本科专业建设点。学院团队和教师 2007 年被授予“全国五一劳动奖状”，2007 年首批入选国家级教学团队，连续 5 届获国家级教学成果奖，2021 年入选首批全国教材建设先进个人。学院入选全国优秀教材、国家级规划教材 20 余本；教育部国家级精品慕课、国家级精品课程 10 余门。学科历来十分重视研究生的培养工作，研究生的培养质量不断得到提高，拥有全国百篇优秀博士论文奖获得者 5 人，全国百篇优秀博士论文提名奖获得者 4 人，中国数学会钟家庆数学奖获得者 10 人，国家级教学成果奖二等奖 1 项。截至 2023 年 10 月，数学学科在学学生人数 1080 人，其中本科生 643 人，硕士生 313 人，博士生 165 人。

南开大学数学学科现包括数学科学学院、陈省身数学研究所、组合数学中心，拥有核心数学与组合数学教育部重点实验室、南开大学数学交叉科学中心。学科师资力量雄厚，现有教师 114 人，教授 55 人、博士生导师 67 人、具有博士学位的 107 人。其中，中国科学院院士 4 人、发展中国家科学院院士 3 人、国家级高层次人才计划入选者 21 人次，国家级青年人才计划入选者 15 人次。

南开大学数学学科取得许多具有国际领先水平的研究成果。近年来，数学学科获得多项国际国内重要奖项，包括发展中国家科学院数学奖 4 项，国家自然科学奖二等奖 2 项，中国数学会华罗庚数学奖 1 项、陈省身数学奖 3 项，以及何梁何利科技进步奖、教育部高校科研成果自然科学奖一等奖、天津市自然科学奖一等奖等多项奖励；已有 3 人应邀在国际数学家大会上作 45 分钟报告，多人担任菲尔兹奖评委、国际数学联盟执委、国际数学家大会程序委员会委员、发展中国家科学院数学遴选委员会委员、中国数学会副理事长等。在国际顶尖数学期刊 Ann. Math.，Invent. Math.，Acta Math.等发表多篇论文，在包括 Duke Math. J.，Commun. Pur. Adivdivl. Math.，Adv. Math.，Math. Ann.，Mem. Am. Math. Soc.，PNAS 等的重要数学期刊发表科研成果。

南开数学百余年来弦歌不辍、名家云集、大师辈出，是我国专业门类齐全、综合实力雄厚的人才培养和自主研究基地。学科将坚持立德树人根本任务，以陈省身先生“立足南开、面向全国、放眼世界”为宗旨，为我国成为世界数学大国做出贡献。

服务指南

交通信息

- **天津滨海国际机场：**

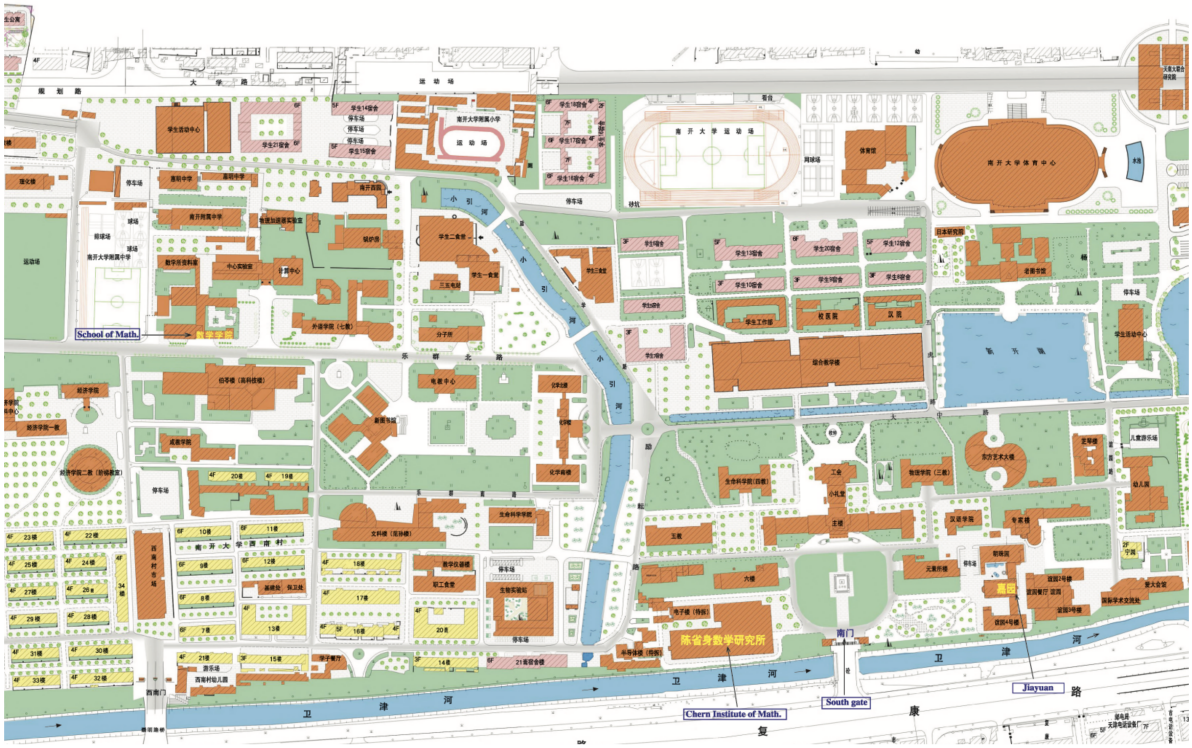
  到达南开大学八里台校区（卫津路 94 号）乘车时间大约 45-60 分钟。

- **天津站、天津西站、天津南站：**

  到达南开大学八里台校区（卫津路 94 号）乘车时间大约 30-40 分钟。

校内地图（八里台校区）

南 开 大 学 校 园 图



参会人员（姓氏首字母排序）

姓名	工作单位
包刚	浙江大学
常慧宾	天津师范大学
陈冲	中国科学院数学与系统科学研究院
陈发来	中国科学技术大学
程晋	复旦大学
董彬	北京大学
董国志	中南大学
段玉萍	北京师范大学
高冰	南开大学
高益铭	南京航空航天大学
郭红霞	天津师范大学
郭雪燕	河北师范大学
郭玉坤	哈尔滨工业大学
胡广辉	南开大学
金其余	内蒙古大学
金正猛	南京邮电大学
赖俊	浙江大学
乐航睿	南开大学
李培军	中国科学院数学与系统科学研究院
李松	浙江大学
刘继军	东南大学
刘晓东	中国科学院数学与系统科学研究院
刘晓莉	北京航空航天大学
刘志方	天津师范大学
陆帅	复旦大学
马冠球	四川师范大学
马坚伟	哈尔滨工业大学
庞彤瑶	清华大学
沈佐伟(Zuowei Shen)	新加坡国立大学
宋义壮	山东师范大学
孙文昌	南开大学
孙瑶	中国民航大学
田文义	天津大学
王彦飞	中国科学院地质与地球物理研究所
魏婷	兰州大学
吴勃英	哈尔滨工业大学

吴春林	南开大学
吴国宝(Michael Ng)	香港浸会大学
徐翔	浙江大学
徐小绪	西安交通大学
许志强	中国科学院数学与系统科学研究院
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杨晓琪	香港理工大学
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