上海大学

Shanghai University

CRCDDE26

Chinese-Russian Conference on Differential and Difference Equations

2026

CONFERENCE HANDBOOK

November 1-5, 2026 | Shanghai, China



Baoshan Campus, Shanghai University

Hosted by Shanghai University

WELCOME

Conference Guidelines

Dear colleagues, scholars and students,

Welcome to Shanghai for the Chinese-Russian Conference on Differential and Difference Equations 2026 (CRCDDE26), hosted by Shanghai University.

This handbook provides the conference overview, organization, committee information and practical arrangements. Report times and speakers for November 2 and 3 are listed in the daily schedules. The ten plenary lectures and 32 parallel presentations on November 2 and 3 are listed in the programme. Available abstracts are included; entries awaiting submission are marked accordingly.

During the conference

Conference badge

Please wear your conference badge during the meeting and keep it with you.

Presentation slides

A 16:9 slide format is recommended. Please check your slides with the session staff before your presentation. For copies of presentation materials, please contact the speaker directly.

Courtesy and assistance

Please keep mobile phones on silent or vibration mode during sessions. Contact the conference staff if you need assistance.

We wish you a productive conference and a pleasant stay in Shanghai.

PRACTICAL INFORMATION

Venue and Contacts

Conference venue

New Lehu Building, Shanghai University Baoshan Campus
No. 99 Shangda Road, Baoshan District, Shanghai, China

Registration

November 1, 2026

Registration hours

Registration desk location

Contact persons

Wenqiang Dong
Email: dongwenqiangshu@163.com
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Mengjiang Yan
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Mobile: 18248675240

Destination card

Please take me to the New Lehu Building, Shanghai University Baoshan Campus, No. 99 Shangda Road, Baoshan District.

请送我到：上海市宝山区上大路99号
上海大学宝山校区新乐乎楼

CONFERENCE HANDBOOK

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ABOUT CRCDDE26

Introduction

The Chinese-Russian Conference on Differential and Difference Equations 2026 (CRCDDE26) will be held in Shanghai from November 1 to 5, 2026. Hosted by Shanghai University, the conference will take place at its Baoshan Campus.

The conference carries forward the academic legacy of the 2019 international conference commemorating the 90th birthday of Academician Godunov and the Chinese-Russian conference series held since 2023. CRCDDE26 is the fourth conference in this series.

Scientific scope

- Ordinary differential equations
- Partial differential equations
- Delay equations
- Difference equations
- Numerical methods for differential equations
- Control theory

Academic exchange

The conference provides a platform for presenting recent research and strengthening mathematical cooperation between China and Russia. It promotes regular academic exchange, the development of young researchers, joint research in theoretical mathematics, and connections between mathematics and applied sciences.

ABOUT CRCDDE26

Organization

Host

Shanghai University

Introduction

Shanghai University is a comprehensive research university jointly supported by the Ministry of Education and the Shanghai Municipal People's Government. It is part of China's Project 211 and Double First-Class initiative. The present university was formed through the merger of four institutions in May 1994, with the distinguished scientist and educator Qian Weichang serving as president. Its disciplines span the sciences, engineering, humanities, social sciences and the arts.

Organizer

Department of Mathematics, College of Sciences,
Shanghai University

Co-organizers

Novosibirsk State University

Shanghai Customs University

Dalian Maritime University

Shanghai Maritime University

Zhejiang Normal University

Shanghai Jian Qiao University

Supporting institution

Mathematical Center in Akademgorodok, Russian Federation.
Supported under agreement No. 075-15-2025-349 with the Ministry of Science and Higher Education of the Russian Federation.

ABOUT CRCDDE26

Committee

Conference Co-Chairs

Professor Yuhao Cong

Shanghai Customs University
Shanghai Jianqiao University
Shanghai University

Professor Gennadii Demidenko

Novosibirsk State University
Sobolev Institute of Mathematics

Program Committee Chairs

Professor Guang-Da Hu

Shanghai Jianqiao University
Shanghai University

Professor Inessa Matveeva

Novosibirsk State University
Sobolev Institute of Mathematics

ABOUT CRCDDE26

Organizing Committee

Chair

Professor Peicheng Zhu
Shanghai University

Members

Guang-Da Hu

Shanghai Jianqiao University and Shanghai University

Yi Gong; Wenqiang Dong

Shanghai Customs University

Chenyin Qian

Zhejiang Normal University

Shuguang Li

Dalian Maritime University

Yunhu Wang; Caifang Wang

Shanghai Maritime University

Li Ma

Henan Finance University

Nianxia Meng; Shiyi Liu; Mengmeng Hu; Mengjiang Yan; Yutong Jiang; Leyuan Han; Wei Jiang; Chencheng Su; I. Tabassum

Shanghai University

Xin Ma

Novosibirsk State University

CONFERENCE SCHEDULE

Agenda Overview

November 2, 2026

Time	Programme
09:00-09:45	Opening Ceremony
09:45-10:00	Tea Break
10:00-11:45	Plenary Lectures
11:45-13:00	Lunch
13:00-14:10	Plenary Lectures
14:30-15:45	Parallel Sessions
15:45-16:05	Tea Break
16:05-17:45	Parallel Sessions
18:00-20:00	Conference Banquet

CONFERENCE SCHEDULE

Agenda Overview

November 3, 2026

Time	Programme
08:45-09:55	Plenary Lectures
09:55-10:15	Tea Break
10:15-12:00	Plenary Lectures
12:00-13:30	Lunch
13:30-15:10	Parallel Sessions
15:10-15:30	Tea Break
15:30-17:35	Parallel Sessions

SESSION SCHEDULE

Plenary Lectures

November 2, 2026 | 10:00-14:10

Xuehai Hall

Time	Speaker	Presentation title	Chair
10:00-10:35	Gennadii Demidenko	On properties of a class of pseudohyperbolic equations	Yuhao Cong
10:35-11:10	Yuehong Qian	Lattice Boltzmann Method: differential vs difference schemes	
11:10-11:45	Ivan Finogenko	Sliding Modes in Systems with Aftereffect	
11:45-13:00	Lunch		
13:00-13:35	Alla Shcheglova	CONTROLLABILITY OF TIME-VARYING DESCRIPTOR SYSTEMS WITH DISCRETE TIME	Guang-Da Hu
13:35-14:10	Peicheng Zhu	A phase-field model for the motion of grain boundaries.	

SESSION SCHEDULE

Plenary Lectures

November 3, 2026 | 08:45-12:00

Xuehai Hall

Time	Speaker	Presentation title	Chair
08:45-09:20	Xuzhou Zhan	On the generalization of the Hurwitz stability criterion via Markov parameters to nonmonic matrix polynomials	Peicheng Zhu
09:20-09:55	Inessa Matveeva	Nonautonomous delay equations	
09:55-10:15	Tea Break		
10:15-10:50	Ge Xiong	An affirmative solution to the generalized Busemann–Petty problem with subspace dimensions 2 and 3	Liqun Zhou
10:50-11:25	Anna Rudometova	Spectral criterion of the panel flutter onset	
11:25-12:00	Xiaoxue Qin	A Threshold Dislocation Dynamics Method	
12:00-13:30	Lunch		

SESSION SCHEDULE

Parallel Sessions

November 2, 2026 | 14:30-17:45

Xuehai Hall

Numerical methods and scientific computing

Time	Speaker	Presentation title	Chair
14:30-14:55	Zhengang Zhao	PINNs in the conforming finite-element computation of space–time fractional advection–diffusion equations	Xiaoxue Qin
14:55-15:20	Vladislav Litvinov	Application of artificial intelligence methods to solve the problem of stochastic longitudinal vibrations of a viscoelastic cable with moving boundaries	
15:20-15:45	Liqun Zhou	Novel Halanay Inequality-Based Reachable Set Estimation for Complex-Valued Memristive Fuzzy Neural Networks With Proportional Delays	
15:45-16:05	Tea Break		
16:05-16:30	Ivan Svetov	On the complete reconstruction of elastic strain fields in isotropic media	Zhengang Zhao
16:30-16:55	Oleg Kravchenko	Compact finite difference approximations for a Ginzburg-Landau-type equation	
16:55-17:20	Xinyan Liu	A conservative finite difference scheme for the 2D SRLW equation with maximum-norm convergence estimates	
17:20-17:45	Dinglu Jiang	Numerical analysis of the conservative high-order compact scheme for 2D RLW equation in the maximum norm	

SESSION SCHEDULE

Parallel Sessions

November 2, 2026 | 14:30-17:45

Shangshan Hall

Differential equations, stability and control

Time	Speaker	Presentation title	Chair
14:30-14:55	Iuliia Cheshikhina	The Structure of Solutions to Nonlinear Equations of a Ring Resonator	Wenqiang Dong
14:55-15:20	Xin Ma	The Cauchy Problem for the Generalized Boussinesq Equation	
15:20-15:45	Aldar Khamkhanov	Linear differential equation of order n with singular coefficients	
15:45-16:05	Tea Break		
16:05-16:30	Mikayel Khachaturyan	Embedding theorems of different dimensions for multianisotropic Sobolev spaces	Shuguang Li
16:30-16:55	Kuralay Konisbayeva	Asymptotic analysis of a two-point boundary value problem for a singularly perturbed high-order integro-differential equation	
16:55-17:20	Wenqiang Dong	Observer-based stabilization for generalized quasi-one-sided Lipschitz nonlinear neutral systems with multiple delays	
17:20-17:45	Zheng Wang	Robust Stability for Second-Order Neutral Delay Systems with Uncertain Parameters	

SESSION SCHEDULE

Parallel Sessions

November 3, 2026 | 13:30-17:35

Xuehai Hall

Inverse problems, computation and control

Time	Speaker	Presentation title	Chair
13:30-13:55	Vladislav Khankhasaev	Mathematical Modeling of Certain Heat and Mass Transfer Processes Using Non-Classical Mathematical Methods of Physics	Kunlong Bao
13:55-14:20	Guolian Wang	Orthogonal Derivation and Deep Learning Pricing of High-Dimensional SVJDM	
14:20-14:45	Anna Polyakova	On generalization of the curl operator	
14:45-15:10	Yachen Hong	A Coupled FEM–MsFEM Approach for the Stokes–Darcy Model	
15:10-15:30	Tea Break		
15:30-15:55	Kunlong Bao	Robust stabilization of linear delay systems based on the argument principle	Zheng Wang
15:55-16:20	Chencheng Su	A Frequency-Domain Method for H_2 Control of Linear High-Order Systems	
16:20-16:45	Huifang Chen	Observer-Based H2 Control for Linear Delay Systems	
16:45-17:10	Jie Wang	Parameter Identification of PMSMs Based on Integral Weak Forms and Huber–IRLS	
17:10-17:35	Wei Jiang	An optimization algorithm for H∞ control of linear high-order systems	

SESSION SCHEDULE

Parallel Sessions

November 3, 2026 | 13:30-17:35

Xuesi Hall

Dynamical systems, stability and control

Time	Speaker	Presentation title	Chair
13:30-13:55	Yaobin Ou	The anelastic approximation for the compressible Navier–Stokes equations with ill-prepared data in bounded domains	Xiulin Hu
13:55-14:20	Mirzakulova Aziza	Asymptotic convergence of the initial value problem for singularly perturbed integro-differential equations with a piecewise constant argument of generalized type	
14:20-14:45	Sergei Timoshin	Global Optimization of Hybrid Dynamical Systems with Memory: Relaxation and Approximation in Economic Models	
14:45-15:10	I. Tabassum	Hemodynamic Blood Flow Simulation Based on Cardiac Output	
15:10-15:30	Tea Break		
15:30-15:55	Ivan Ilinykh	Properties of Sequences of Lyapunov Integrals and Functions Defined by a Class of High-Dimensional Systems of Differential Equations	Oleg Kravchenko
15:55-16:20	Vladislav Prokhorov	Asymptotic behavior of solutions of differential equations with almost periodic coefficients in linear terms at infinity	
16:20-16:45	Ivan Sidarenka	Multiple limit cycles and the accuracy of the predictive method for Liénard systems of type 2A+2S	
16:45-17:10	Zetao Ma	Multiscale Computational Method for the Landau-Lifshitz equation	
17:10-17:35	Shiyi Liu	Mathematical Analysis and Applications of Selected Models in Neuroscience	

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DETAIL INFORMATION OF AGENDA

Plenary Lecture

Gennadii Demidenko

Novosibirsk State University, Sobolev Institute of Mathematics

November 2, 2026 | 10:00-10:35

On properties of a class of pseudohyperbolic equations

Abstract

In [1], a classification of linear partial differential equations not solvable with respect to the highest-order derivative was introduced, and a wide class of boundary value problems was studied for them. Such equations are often called Sobolev-type equations, because Sobolev's studies [2] were the first deep investigations of such equations. At present, there is a large number of theoretical and applied works devoted to various problems for equations not solvable with respect to the highest-order derivative (see, for example, [1, 3] and the bibliography in these books). However, for the class of pseudohyperbolic equations introduced in [1], the theory of boundary value problems is still poorly studied.

We present our results on solvability of the Cauchy problem and initial-boundary value problems for the class of pseudohyperbolic equations.

The work is supported by the Mathematical Center in Akademgorodok under agreement No. 075-15-2025-349 with the Ministry of Science and Higher Education of the Russian Federation.

References

1. Demidenko G.V., Uspenskii S.V. Partial Differential Equations and Systems Not Solvable with Respect to the Highest-Order Derivative. Nauchnaya Kniga, Novosibirsk, 1998 (in Russian); Marcel Dekker, New York and Basel, 2003 (in English).

2. Sobolev S.L. Selected Works. Vol. 1. Filial “Geo” Sibirsk. Otdel. RAN, Novosibirsk, 2003 (in Russian).

3. Sveshnikov A.G., Alshin A.B., Korpusov M.O., Pletner Yu.D. Linear and Nonlinear Equations of Sobolev Type. Fizmatlit, Moscow, 2007 (in Russian).

DETAIL INFORMATION OF AGENDA

Plenary Lecture

Yuehong Qian

Soochow University

November 2, 2026 | 10:35-11:10

Lattice Boltzmann Method: differential vs difference schemes

Abstract

We present the LBM approach for the fluid dynamics equations. Based-on physical conservation laws, we introduce the simplified Boltzmann equation and outline the derivation of hydrodynamical equations. Applications will be shown to illustrate the validation of the approach.

DETAIL INFORMATION OF AGENDA

Plenary Lecture

Ivan Finogenko

V.M. Matrosov's Institute of System Dynamics and Control Theory of SB RAS

November 2, 2026 | 11:10-11:45

Sliding Modes in Systems with Aftereffect

Abstract

Nonlinear control systems presented in the form of functional-differential inclusions with pulse or discontinuous positional controls are investigated. The formalization of the pulse-sliding mode is carried out. The method of equivalent control for differential inclusion with discontinuous positional controls
is used to solve the question of the existence of a discontinuous system for which the ideal pulse-sliding mode is the usual sliding mode. The possibility of the combined use of the pulse-sliding and sliding modes as control actions in those situations when there are not enough control resources for the latter is discussed.

DETAIL INFORMATION OF AGENDA

Plenary Lecture

Alla Shcheglova

Matrosov Institute for System Dynamics and Control Theory SB RAS

November 2, 2026 | 13:00-13:35

CONTROLLABILITY OF TIME-VARYING DESCRIPTOR SYSTEMS WITH DISCRETE TIME

Abstract

Non-stationary linear and nonlinear descriptor systems with discrete time are considered. In the linear case, criteria for state and output controllability on a finite horizon are obtained, and robust controllability conditions are found. For nonlinear systems, a theorem on local state controllability is proved using the properties of linear approximation.

DETAIL INFORMATION OF AGENDA

Plenary Lecture

Peicheng Zhu

Shanghai University

November 2, 2026 | 13:35-14:10

A phase-field model for the motion of grain boundaries.

Abstract

We present mathematical results for a model for the motion of grain boundaries, driven by configurational forces. This model differs from the Cahn-Hilliard model by a non-smooth gradient term. A key a priori estimate is derived by employing a technique quite differerent from a normal one.

DETAIL INFORMATION OF AGENDA

Plenary Lecture

Xuzhou Zhan

Beijing Normal University at Zhuhai

November 3, 2026 | 08:45-09:20

On the generalization of the Hurwitz stability criterion via Markov parameters to nonmonic matrix polynomials

Abstract

The Hurwitz stability criterion via Markov parameters, developed by Gantmacher for classical real polynomials, has been extended to monic matrix polynomials. In this talk, we present two generalizations for the nonmonic case, with application to the stability analysis of differential-algebraic systems. The first approach starts by redefining the associated Markov parameters through a column-wise splitting method. Two structured matrices are constructed whose rectangular Hankel blocks are extracted from these parameters. Via column reduction, the Hurwitz stability of matrix polynomials is characterized by the Hermitian positive definiteness of these matrices. The second framework employs the Taylor coefficients of the rational matrix-valued function arising from the Liénard-Chipart splitting to replace the associated Markov parameters. The correspondence is established between the Hurwitz stability of matrix polynomials and the positive semidefiniteness of two block Hankel matrices built from these Taylor coefficients.

DETAIL INFORMATION OF AGENDA

Plenary Lecture

Inessa Matveeva

Novosibirsk State University, Sobolev Institute of Mathematics

November 3, 2026 | 09:20-09:55

Nonautonomous delay equations

Abstract

Some classes of systems of nonautonomous delay equations are considered. Equations of such type arise in many applied problems in the study of processes whose rates are determined not only by the present but also by the preceding states. In particular, delay equations arise in control problems, biology, medicine, economics, etc. One of the important problems is the study of the stability of solutions to such equations. At present, a large number of works have been devoted to this problem. Researchers use various approaches: spectral methods, the method of D-decompositions, the method of Razumikhin functions, the method of Lyapunov-Krasovskii functionals, the comparison method,
the test method, etc. Authors of most works consider autonomous delay equations. The study of asymptotic properties of solutions to nonautonomous delay equations is a much more difficult problem.

The present work continues our investigations of the stability of solutions to nonautonomous nonlinear delay equations. Using special Lyapunov-Krasovskii functionals, for the classes of delay systems under consideration, we establish conditions for the stability of the zero solution, give estimates for stabilization rates of solutions at infinity, and obtain estimates for attraction sets.

The work is supported by the Mathematical Center in Akademgorodok under agreement No. 075-15-2025-349 with the Ministry of Science and Higher Education of the Russian Federation.

DETAIL INFORMATION OF AGENDA

Plenary Lecture

Ge Xiong

Tongji University

November 3, 2026 | 10:15-10:50

An affirmative solution to the generalized Busemann–Petty problem with subspace dimensions 2 and 3

Abstract

Mathematical expressions are missing from the submitted abstract and require confirmation.

The generalized Busemann-Petty problem asks whether origin-symmetric convex bodies with larger volumes of all [expression missing]-dimensional central sections necessarily have larger volume. The answer is trivially affirmative for [expression missing] and is known to be negative for [expression missing], while the cases [expression missing] have remained open since the 1990s. We prove that the answer is affirmative in both remaining cases, thereby completing the classification of the generalized Busemann-Petty problem.

DETAIL INFORMATION OF AGENDA

Plenary Lecture

Anna Rudometova

Novosibirsk State University

November 3, 2026 | 10:50-11:25

Spectral criterion of the panel flutter onset

Abstract

Flutter refers to the oscillations of engineering structures, aircraft components, and thin-walled structural elements upon interaction with a gas flow. There are three main types of such oscillations: classical flutter - oscillations of aircraft wings and empennage; stall flutter - oscillations of suspension bridges and tall chimneys; panel flutter - oscillations of skin elements, such as plates and shallow shells.

In the report, the problems of panel flutter in plates of various shapes with different edge constraints are reduced to spectral problems for linear operators using appropriate discretization of differential operators. The matrix spectrum dichotomy method is applied to determine the critical gas flow velocities at which the plate oscillations lose stability.

References
1. A. A. Il'yushin, I. A. Kiiko. A new statement of the flutter problem for shallow shell. Prikl. Mat. Mekh. 58 (3), 167-171 (1994).
2. E.A. Biberdorf, A.S. Rudometova, Wang Li, A.D. Jumbaev. A Method for Separating the Matrix Spectrum by a Straight Line and an Infinite Strip Flutter Problem. Comput. Math. and Math. Phys. 64, 1704-1714 (2024).

DETAIL INFORMATION OF AGENDA

Plenary Lecture

Xiaoxue Qin

November 3, 2026 | 11:25-12:00

A Threshold Dislocation Dynamics Method

Abstract

This talk presents a threshold dislocation dynamics method based on the Peierls-Nabarro model, alternating convolution with an anisotropic nonlocal kernel and thresholding to simulate dislocation evolution in a slip plane. Asymptotic analysis shows that, when the time step is matched to the dislocation core size, the method correctly captures the two leading orders of the dislocation driving force: the logarithmic-order local curvature contribution and the order-one contributions from long-range interactions and applied stress. A spatial variable stretching approach is further introduced to correct the orientation-dependent mobility induced by the kernel and to rescale the velocity, reducing grid pinning and improving numerical accuracy and efficiency. Numerical examples, including straight dislocation motion, shrinking and interacting dislocation loops, particle bypassing, and Frank-Read source operation, demonstrate the effectiveness of the method and its ability to handle topological changes.

REPORT ABSTRACTS

Parallel Presentations

Zhengang Zhao

Shanghai Customs University

November 2, 2026 | 14:30-14:55 | Xuehai Hall

PINNs in the conforming finite-element computation of space-time fractional advection-diffusion equations

This talk presents a method that embeds physics-informed neural networks into conforming finite-element computation for space-time fractional advection-diffusion equations. The time derivative is of Caputo type and the spatial derivative is of Riesz type. The neural network and the finite-element bilinear form share a common residual interface. The spatial discretisation uses the piecewise-linear Ervin-Roop formulation and is compared with the shifted Grünwald-Letnikov scheme. Results show that the finite-element solve is effective when the residual is explicitly prescribed, while the network can serve as a residual representation and interface when certain terms are omitted from the assembly.

Vladislav Litvinov

СФ СамГТУ, зав.каф. Высшей математики

November 2, 2026 | 14:55-15:20 | Xuehai Hall

Application of artificial intelligence methods to solve the problem of stochastic longitudinal vibrations of a viscoelastic cable with moving boundaries

This paper considers the problem of modeling stochastic longitudinal vibrations of a viscoelastic rope with moving boundary conditions. The focus is on the use of artificial intelligence (AI), in particular deep neural networks (DNNs) and machine learning (ML), to analyze resonance phenomena, predict optimal system parameters, and ultimately prevent resonance. A new computational method for solving integro- differential equations, adaptable to a wide range of problems with moving boundaries, is proposed. The problem is formulated as a system of stochastic integro-differential equations, taking into account damping effects, which is subsequently reduced to a system of stochastic differential equations with random initial conditions. The integration of deep neural networks, the use of Monte Carlo methods, and adaptive control strategies demonstrates a significant improvement in the prediction accuracy and control efficiency of the system. The neural network is trained on an extensive dataset of the system's behavior at various frequencies and parameters, which allows it to accurately predict resonant frequencies and recommend

REPORT ABSTRACTS

Parallel Presentations

optimal parameter configurations. The Ai-generated solutions were tested using a mathematical model, and calculations confirmed that the parameters proposed by the AI effectively reduce the likelihood of resonance.

Systems, the boundaries of which are moving, are widespread in technology (ropes of hoisting installations [1-5, 7, 8], flexible transmission links [6], etc.). The presence of moving boundaries causes significant difficulties in describing such systems. Exact solution methods are limited by the wave equation and relatively simple boundary conditions [9]. Of the approximate methods, the most effective is the method for constructing solutions of integro-differential equations described in [7, 11,21, 22], as well as the Kantorovich - Galerkin method [8-10, 14]. The method is extended to a wider class of model boundary value problems that take into account bending rigidity, resistance of the external environment and the rigidity of the base of the oscillating object.

The solution is implemented in dimensionless variables using the TB-Analysis 7 software package developed in the Matlab, Python environment (libraries: TensorFlow, PyTorch, Scikit-leam), which allows using the obtained results to calculate a wide range of technical objects. The TB-Analysis 7 software package contains a module - resonance phenomena management. The "Resonance phenomena management" command is designed to determine the resonance region and identify resonance prevention conditions imposed on the model parameters using AI.

In addition, it is recognized that deterministic modeling of systems cannot be adequate for some types of problems, so it is necessary to move on to probabilistic-statistical, where random variables and stochastic oscillations are present.

The study of viscoelasticity includes the analysis of the stochastic stability of stochas

The submitted abstract ends here; the final sentence is incomplete.

REPORT ABSTRACTS

Parallel Presentations

Liqun Zhou

Tianjin Normal University

November 2, 2026 | 15:20-15:45 | Xuehai Hall

Novel Halanay Inequality-Based Reachable Set Estimation for Complex-Valued Memristive Fuzzy Neural Networks With Proportional Delays

For a class of uncertain complex valued memristive Takagi-Sugeno fuzzy neural networks with proportional delays, the reachable set estimation problem with unbounded delay neural networks was studied for the first time. By utilizing the properties of proportional delay and polynomial functions, a novel Halanay inequality applicable to proportional delay differential systems is established, and it is applied to the reachable set estimation of proportional delay complex valued memristive fuzzy neural networks, obtaining corresponding judgment criteria. In addition, numerical examples under zero and non-zero initial conditions validated the effectiveness of the proposed method, and a more rigorous approximation of the reachable set is achieved through quantum particle swarm optimization.

Ivan Svetov

Sobolev Institute of Mathematics

November 2, 2026 | 16:05-16:30 | Xuehai Hall

On the complete reconstruction of elastic strain fields in isotropic media

The problem of Bragg-edge imaging of elastic strains based on visualization of neutron transmission with energy resolution was investigated. The essence of the method is to measure the distances between atomic lattices inside a sample based on sudden changes in the neutron transit velocity depending on the wavelength. Measurements of this type of strain relate exclusively to the elastic component of the strain. This physical measurement naturally corresponds to a longitudinal ray transform, the kernel of which contains potential fields.

The first part of the report presents a new approach for two-dimensional systems of plane stress and plane strain in isotropic media, in which elastic strain can be reconstructed from the values of the longitudinal ray transform [1]. The decomposition of a symmetric 2-tensor field plays an important role in this case. The solenoidal part of the field is reconstructed

REPORT ABSTRACTS

Parallel Presentations

using the inverse formula, whereas the potential part can be reconstructed using Hooke's law or by solving the Poisson equation.

This approach is common for the three-dimensional case [2]. Moreover, it is assumed that the samples can be subjected to external loads in addition to internal residual stress. It is established that the potential part of the elastic strain field is determined by one potential. As a result, the relationship between the solenoidal part of the elastic strain field and the stress tensor has been established.

The work was performed within the framework of the state assignment of the Sobolev Institute of Mathematics SB RAS. (project FWNF-2026-0029).

REFERENCES

[1] C.M. Wensrich, S. Holman, M. Courdurier, W.R.B. Lionheart, A. Polyakova, I. Svetov. Direct inversion of the Longitudinal Ray Transform for 2D residual elastic strain fields. // Inverse Problems. - 2024. - Vol. 40, No 7. -

075011.

[2] C.M. Wensrich, S. Holman, W.R.B. Lionheart, M. Courdurier, A. Polyakova, I. Svetov, T. Doubikin. General Reconstruction of Elastic Strain Fields from their Longitudinal Ray Transform. // SIAM Journal on Applied Mathematics. - 2025. - Vol. 85, No 2. - P. 945-960.

Oleg Kravchenko

FRC CSC RAS

November 2, 2026 | 16:30-16:55 | Xuehai Hall

Compact finite difference approximations for a Ginzburg-Landau-type equation

Compact finite difference approximations are considered for a complex-valued Ginzburg-Landau-type equation motivated by spin-wave dynamics. The equation incorporates transport, dispersion, dissipative effects, and nonlinear interactions. The numerical approach employs Hermite interpolation, using solution values and spatial derivatives to construct high-order approximations on compact stencils. Both scalar and coupled formulations are addressed. The accuracy and stability properties of the resulting schemes are examined through selected numerical tests. Computational results illustrate their performance in resolving evolving wave profiles and interactions between coupled channels.

REPORT ABSTRACTS

Parallel Presentations

Xinyan Liu

Dalian Maritime University

November 2, 2026 | 16:55-17:20 | Xuehai Hall

A conservative finite difference scheme for the 2D SRLW equation with maximum-norm convergence estimates

This paper presents a linear three-level finite difference scheme for the two-dimensional symmetric regularized long-wave (2D SRLW) equation. The scheme employs second-order central differences in time and central difference operators in space, while the nonlinear term is linearized through averaging over three consecutive time levels. Using the discrete energy method, we prove that the scheme preserves both discrete energy conservation and mass conservation, establish priori estimates of the numerical solution in the maximum norm, and demonstrate its unique solvability. Convergence analysis shows that the numerical solution u converges with second-order accuracy in both time and space in the maximum norm, while ρ converges with second-order accuracy in the L2 norm. Numerical experiments confirm the conservation properties and convergence of the scheme.

Dinglu Jiang

Dalian Maritime University

November 2, 2026 | 17:20-17:45 | Xuehai Hall

Numerical analysis of the conservative high-order compact scheme for 2D RLW equation in the maximum norm

In this paper, a compact finite difference scheme is constructed for the two-dimensional regularized long-wave (2D RLW) equation. The fourth-order compact method is adopted in the spatial direction, and the Crank-Nicolson scheme is employed in the temporal direction. The discrete energy and mass conservation properties of the proposed scheme are verified via the discrete energy method. A priori estimates of the numerical solutions are derived under the maximum norm. Based on the fixed-point theorem, the existence and uniqueness of the solutions to the proposed scheme are proven. Furthermore, the convergence and stability of the scheme are demonstrated in the sense of the maximum norm, with a second-order temporal accuracy and a fourth-order spatial accuracy. Numerical examples validate the computational accuracy and efficiency of the constructed compact scheme.

REPORT ABSTRACTS

Parallel Presentations

Iuliia Cheshikhina

Physics and Technology Institute V.I. Vernadsky Crimean Federal University

November 2, 2026 | 14:30-14:55 | Shangshan Hall

The Structure of Solutions to Nonlinear Equations of a Ring Resonator

A mathematical model of a ring resonator described by nonlinear partial differential equations is considered. Stationary solutions of the model are obtained. The corresponding linearized initial-boundary value problems are analyzed for both a general domain and a circular domain. It is shown that the original model can be reduced to a nonlinear integral equation.

Xin Ma

Novosibirsk State University

November 2, 2026 | 14:55-15:20 | Shangshan Hall

The Cauchy Problem for the Generalized Boussinesq Equation

In this work , we consider the Cauchy problem for a class of differential equations with variable coefficients that are not solvable with respect to the highest-order time derivative. This class includes the sixth-order generalized Boussinesq equation, which arises in the modeling of waves in hydrodynamics when surface tension is taken into account.

Energy inequalities are obtained for the generalized Boussinesq differential operator. These estimates imply the existence and uniqueness of a generalized solution to the Cauchy problem; moreover, a regularity theorem is proved. Based on these results, the unique solvability of the Cauchy problem in weighted Sobolev spaces is established.

The work is supported by the Mathematical Center in Akademgorodok under agreement No. 075-15-2025-349 with the Ministry of Science and Higher Education of the Russian Federation.

REPORT ABSTRACTS

Parallel Presentations

Aldar Khamkhanov

East Siberia State University of Technology and Management

November 2, 2026 | 15:20-15:45 | Shangshan Hall

Linear differential equation of order n with singular coefficients

The study addresses the Cauchy problem for an n-th order linear differential equation with singular coefficients depending on the Dirac delta functions. Interest in analyzing such differential equations arises from the investigation of hybrid systems that combine ordinary differential equations and partial differential equations. To properly handle the singularities and ensure a rigorous mathematical treatment, the framework of the theory of generalized functions (distributions) is applied.

Mikayel Khachaturyan

Russian-Armenian University

November 2, 2026 | 16:05-16:30 | Shangshan Hall

Embedding theorems of different dimensions for multianisotropic Sobolev spaces

For the anisotropic Sobolev spaces $W_2^{(l_1,\ \dots,\ l_n)}(\mathbb{R}^n)$ the theory of embedding theorems of different dimensions (trace theorems) is classical [1,2]. Their multianisotropic counterparts $W_2^{\mathfrak{N}}(\mathbb{R}^n)$, generated by a completely regular polyhedron $\mathfrak{N}$, arise in the study of Hormander's hypoelliptic equations and are governed by the Newton polyhedron of the operator [3]; for them the embedding theory of the same dimension was developed by G. A. Karapetyan and coauthors [4], while results of different dimensions were obtained by the author, first for pyramidal polyhedra [5] and then for a two-parameter family of polyhedra [6]. In both cases the polyhedra are of a special shape, and the resulting space of traces is generated by a polyhedron similar to the section of $\mathfrak{N}$ at the corresponding layer. The present work removes the restriction on the shape of $\mathfrak{N}$ and the trace space is generated by a weight built directly from two consecutive sections $\mathfrak{N}_s$, $\mathfrak{N}_{s+1}$ of $\mathfrak{N}$:
$Q_s(\xi') : = (1 + |\xi'|_{\partial\mathfrak{N}_s})^{1/2}(1 + |\xi'|_{\partial\mathfrak{N}_{s+1}})^{1/2}, \qquad \xi' \in \mathbb{R}^{n-1}.$
We present a direct trace theorem valid for an arbitrary completely regular polyhedron $\mathfrak{N}$. For every integer s, $0 \le s < l$, and every $a \in \mathbb{R}$ the trace operator $f \mapsto D_{x_n}^s f|_{x_n = a}$ acts boundedly from $W_2^{\mathfrak{N}}(\mathbb{R}^n)$ into $W_2^{Q_s}(\mathbb{R}^{n-1})$. We also present a matching inverse (extension)

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theorem in dimension $n = 2$. Whether such an inverse theorem can be obtained in dimensions $n \geq 3$ remains open.

Kuralay Konisbayeva

Al-Farabi KazNU

November 2, 2026 | 16:30-16:55 | Shangshan Hall

Asymptotic analysis of a two-point boundary value problem for a singularly perturbed high-order integro-differential equation

A two-point boundary value problem is considered for a linear singularly perturbed integro-differential equation of order n+m, involving small parameters multiplying the m highest-order derivatives and an auxiliary characteristic equation with negative roots. A fundamental system of solutions, a Cauchy function, and boundary functions for the corresponding homogeneous differential equation are constructed, and their asymptotic estimates are derived. An analytical formula for the solution to the boundary value problem is obtained, and its asymptotic estimate is established. A modified unperturbed problem is constructed taking into account the initial jumps and the integral term, and a theorem on limit transition is proved.

Wenqiang Dong

Shanghai Customs University

November 2, 2026 | 16:55-17:20 | Shangshan Hall

Observer-based stabilization for generalized quasi-one-sided Lipschitz nonlinear neutral systems with multiple delays

In this article, the generalized quasi-one-sided Lipschitz condition and generalized weak quasi-one-sided Lipschitz condition are introduced to investigate the problem of observer-based stabilization for a class of nonlinear neutral systems with multiple delays. The stabilization for nonlinear neutral systems with multiple delays based on full-order observer and reduced-order observer are investigated, respectively. Subsequently, the separation principle is established when the nonlinear neutral systems with multiple delays execute the control based on full-order observer and reduced-order observer. The obtained results hold true even if systems parameters (A0, C) is not detectable and (A0, B) is not

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stabilizable. Finally, a numerical example is proposed to illustrate the feasibility and effectiveness of obtained results.

Zheng Wang

Shanghai Customs University

November 2, 2026 | 17:20-17:45 | Shangshan Hall

Robust Stability for Second-Order Neutral Delay Systems with Uncertain Parameters

This study investigates robust stability for a class of second-order neutral-type delay differential systems with unknown parameter matrices. An explicit upper bound on the unstable eigenvalues of the perturbed systems is determined. Using the argument principle, we establish sufficient robust stability conditions ensuring that the perturbed system retains asymptotic stability when the nominal system is stable, or preserves the same number of unstable characteristic roots when the nominal system is unstable. Finally, numerical simulations are provided to demonstrate the validity of the theoretical results.

Vladislav Khankhasaev

East-Siberian state university of technology and managing

November 3, 2026 | 13:30-13:55 | Xuehai Hall

Mathematical Modeling of Certain Heat and Mass Transfer Processes Using Non-Classical Mathematical Methods of Physics

The series of mathematical models describing heat and mass transfer processes is investigated; these models employ a second-order mixed-type heat conduction equation, and numerical solutions are obtained for both linear and certain model nonlinear cases in one-, two-, and three-dimensional spaces. Theorems regarding the existence and uniqueness of solutions in Sobolev spaces are proved for the boundary value problems under consideration-involving linear and certain nonlinear hyperbolic-parabolic heat conduction equations-using various methods of functional analysis, specifically the method of a priori estimates.

The paper presents also the theorems regarding the solvability-in classes of generalized functions-of various boundary value problems for fourth-order stationary and non-stationary

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nonlinear mixed-type differential equations using the Galerkin method, as well as analogous problems for sixth-order equations. It addresses the convergence of the obtained approximate numerical solutions for second-order mixed-type equations to the exact solutions.

Guolian Wang

Tongji University

November 3, 2026 | 13:55-14:20 | Xuehai Hall

Orthogonal Derivation and Deep Learning Pricing of High-Dimensional SVJDM

To address the computational challenges of high-dimensional Stochastic Volatility Jump-Diffusion Models in exotic option pricing, this paper proposes a structure-preserving, mesh-free deep learning framework. Numerical experiments demonstrate that the proposed algorithm achieves rapid and stable convergence alongside high accuracy in pricing tasks with up to 200 dimensions, with computational complexity scaling quadratically with the dimensio

The submitted abstract ends here; the final sentence is incomplete.

Anna Polyakova

Sobolev Institute of Mathematics

November 3, 2026 | 14:20-14:45 | Xuehai Hall

On generalization of the curl operator

We introduce new differential operators that generalize the curl operator and act on three-dimensional symmetric m-tensor fields [1,2]. We study the properties of these operators and obtain new detailed decompositions of symmetric m-tensor fields in R^3. In particular, we show that the fields involved in the decomposition of any symmetric m-tensor field can be constructed using three operators: the inner differentiation operator d and two operators that generalize the curl operator. In this case, the number of potentials involved in the decomposition coincides with the number of distinct components of the symmetric m-tensor field.

The results obtained in this report are of both fundamental and applied interest, in particular, for further studying the properties of the generalized Radon transforms acting on

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three-dimensional symmetric m-tensor fields [2,3] and for developing algorithms for numerically solving problems of inverting these operators.

The work was performed within the framework of the state assignment of the Sobolev Institute of Mathematics SB RAS. (project FWNF-2026-0029).

REFERENCES

[1] I.E. Svetov, A.P. Polyakova. Decomposition of Symmetric Tensor Fields in R^3. // Journal of Applied and Industrial Mathematics. - 2023. - Vol. 17, No 1. - P. 199-212.

[2] I.E. Svetov, A.P. Polyakova. Inversion of generalized Radon transforms acting on 3D vector and symmetric tensor fields. // Inverse Problems. - 2024. - Vol. 40, No 1. - 015009.

[3] I.E. Svetov, A.P. Polyakova. Reconstruction of Three-Dimensional Vector Fields Based on Values of Normal, Longitudinal, and Weighted Radon Transforms. // Journal of Applied and Industrial Mathematics. - 2023. - Vol. 17, No 4. - P. 842-858.

Yachen Hong

Shanghai Jiao Tong University

November 3, 2026 | 14:45-15:10 | Xuehai Hall

A Coupled FEM-MsFEM Approach for the Stokes-Darcy Model

This talk presents an MsFEM approach for steady and non-stationary Stokes-Darcy problems with BJS interface conditions in highly heterogeneous porous media. Permeability-dependent multiscale bases are constructed in parallel during the offline phase. In the online phase, FEM-MsFEM coupling is achieved using a Robin-Robin algorithm for the steady problem and a partitioned time-stepping scheme for the non-stationary problem. Error estimates in the L^2 and H^1 norms are established and validated through extensive numerical experiments.

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Kunlong Bao

Wuhu Vocational Technical University

November 3, 2026 | 15:30-15:55 | Xuehai Hall

Robust stabilization of linear delay systems based on the argument principle

In this report, the robust stabilization problem of linear delay systems is investigated based on the argument principle. First, a robust stability criterion for linear delay systems is proposed by means of the argument principle. Compared with existing methods that require stability verification along a semicircular boundary enclosing the unstable roots, the proposed criterion only needs to be checked over a finite segment of the imaginary axis, which significantly reduces the computational burden. Then, based on the proposed criterion, the robust stabilization problem is transformed into an optimization problem and the feedback gain matrices can be obtained by solving this problem.

Chencheng Su

Shanghai University

November 3, 2026 | 15:55-16:20 | Xuehai Hall

A Frequency-Domain Method for H_2 Control of Linear High-Order Systems

For linear high-order systems subject to exogenous disturbances, a frequency-domain method based on an \(H_2\) performance index is developed for feedback controller design. The controller parameters are computed using a numerical optimization algorithm, in which the principal frequency-domain calculations are performed with matrices of the original state dimension. Furthermore, the proposed approach ensures the asymptotic stability of the resulting closed-loop system while reducing the \(H_2\) norm of the transfer function from the exogenous disturbance to the controlled output. Numerical examples are presented to illustrate the effectiveness of the proposed method.

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Huifang Chen

Shanghai university

November 3, 2026 | 16:20-16:45 | Xuehai Hall

Observer-Based H2 Control for Linear Delay Systems

This paper investigates observer-based H2 control for linear systems with multiple delays and exogenous disturbances. An observer-based state-feedback controller is constructed, and the closed-loop system are derived. Based on the H2 norm, a unified optimization framework is established for the joint design of the controller and the observer, and an optimization problem is formulated to attenuate exogenous disturbances in linear delay systems. Compared with the H2 output-feedback control method, the proposed approach can still achieve stabilization via observer-based state feedback when output feedback fails. Numerical examples illustrate the effectiveness of the proposed method.

Jie Wang

Shanghai University

November 3, 2026 | 16:45-17:10 | Xuehai Hall

Parameter Identification of PMSMs Based on Integral Weak Forms and Huber-IRLS

To address the challenges in parameter identification of surface-mounted permanent-magnet synchronous motors (SPMSMs), including noise amplification caused by direct differentiation, the sensitivity of parameter estimates to anomalous measurements, and possible violations of physical constraints, this study proposes a parameter identification method based on an integral weak formulation and Huber-IRLS. Assuming i_d=0, constant motor parameters, and a known load torque, two-stage linear regression models for the electrical and mechanical parameters are established by integrating the governing equations over time windows and applying integration by parts. This procedure shifts the differentiation from the measured state variables to smooth test functions. Huber-IRLS is employed to reduce the influence of anomalous windows, while physical constraints are incorporated into the estimation process. The proposed method provides a well-structured and readily implementable numerical approach for parameter identification of SPMSMs in the presence of anomalous measurements.

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Wei Jiang

Shanghai University

November 3, 2026 | 17:10-17:35 | Xuehai Hall

An optimization algorithm for H∞ control of linear high-order systems

In this paper, the H∞ control problem for linear high-order systems is considered. We first establish an H∞ performance condition under the asymptotic stability of linear high-order systems. Then, using the matrix polynomial representation and the H∞ norm, the control problem is reformulated as a nonsmooth numerical optimization problem. Furthermore, a computational algorithm based on the gradient sampling method is developed to solve the resulting problem. The proposed method can simultaneously ensure closed-loop stability and improve disturbance attenuation performance. We emphasize that the proposed framework preserves the high-order system structure and requires only lower-dimensional matrix computations, thereby avoiding the construction of an augmented first-order realization. Finally, numerical examples are presented to demonstrate the effectiveness of the proposed method.

Yaobin Ou

Renmin University of China

November 3, 2026 | 13:30-13:55 | Xuesi Hall

The anelastic approximation for the compressible Navier-Stokes equations with ill-prepared data in bounded domains

We justify the anelastic approximation for local strong solutions to the isentropic compressible Navier-Stokes equations in a three-dimensional bounded domain, subject to vorticity-slip boundary conditions and ill-prepared initial data. In the scaling where the Mach and Froude numbers vanish at the same rate ϵ, the limiting dynamics are governed by the anelastic system associated with a nonconstant hydrostatic density profile. Compared with the classical incompressible limit, the balance between the singular pressure force and gravity leads to a weighted singular differential operator, for which the usual acoustic pressure gradient and divergence constraint are both modified by the nonconstant hydrostatic density. This weighted structure destroys the standard constant-coefficient cancellations used in the incompressible limit and produces singular terms in the vorticity estimates and variable-coefficient commutators in the higher-order estimates. To overcome

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these difficulties, we introduce a pressure perturbation adapted to the hydrostatic balance and establish weighted acoustic and vorticity estimates compatible with the stratified profile, yielding uniform-in-ϵ estimates. We then use a weighted Helmholtz decomposition to prove the strong convergence of the solenoidal component of the momentum and to identify the anelastic limit. Our analysis reveals a weighted cancellation mechanism that applies to singular limits around a class of nonconstant equilibria.

Mirzakulova Aziza

Farabi University

November 3, 2026 | 13:55-14:20 | Xuesi Hall

Asymptotic convergence of the initial value problem for singularly perturbed integro-differential equations with a piecewise constant argument of generalized type

The research work is devoted to study of the initial value problem for singularly perturbed integro-differential equation with a piecewise constant argument of generalized type. The aim of this study is to investigate the asymptotic behavior, existence and uniqueness of solution for singularly perturbed integro-differential equations with piecewise constant argument. Using the reduction method, we get the solution of this problem. The unperturbed initial problem is constructed. An estimate difference of solution for singularly perturbed and unperturbed initial value problem is obtained. The convergence of solution for singularly perturbed initial value problem to solution of unperturbed initial value problem is proved.

Sergei Timoshin

Xi'an Jiaotong-Liverpool University

November 3, 2026 | 14:20-14:45 | Xuesi Hall

Global Optimization of Hybrid Dynamical Systems with Memory: Relaxation and Approximation in Economic Models

In this talk, we study a class of optimal control problems governed by coupled differential equation and inclusion featuring both time-varying delays and hysteresis effects of the generalized play type. The system is driven by compound control inputs: a convex-valued

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control representing continuous adjustments and a nonconvex-valued control modeling discrete decision modes. Such hybrid structures arise naturally in economic modeling, particularly in supply chains where prices exhibit sticky behavior (hysteresis) and production involves lag times (delay). To address the ill-posedness caused by the nonconvex control constraints, we formulate a relaxed problem governed by convexified dynamics. We establish the existence of optimal solutions for the relaxed problem and prove a relaxation-approximation theorem. Namely, we show that any optimal trajectory of the relaxed system can be uniformly approximated by trajectories of the original system generated by admissible control sequences. Finally, we apply this framework to a novel economic model of inventory management with sticky prices, demonstrating that discrete production modes can be mathematically relaxed to continuous capacity utilization rates without loss of optimality.

I. Tabassum

November 3, 2026 | 14:45-15:10 | Xuesi Hall

Hemodynamic Blood Flow Simulation Based on Cardiac Output

This thesis proposal presents a framework for verified, patient-specific haemodynamic simulation of the Abdominal Aortic Aneurysm (AAA) based on the Cardiac Output (CO). The CO sets the blood flow throughout the arterial system, but only about one sixth of it reaches the infrarenal aorta, where the AAA develops; the operating point of the simulation must therefore be derived from the CO and the physiological flow of this segment. Wall Shear Stress (WSS) maps obtained by Computational Fluid Dynamics (CFD), and the indicators derived from them, namely the Time-Averaged WSS (TAWSS), the Oscillatory Shear Index (OSI) and the Relative Residence Time (RRT), are increasingly used to assess the risk of thrombus formation and rupture, yet they are reported without a known local error. The proposed research addresses this problem in four steps. First, the forward model is corrected: the inflow is derived from the CO, the inlet velocity follows the Womersley profile, the near-wall mesh is designed from the exact solution, and the outlet Windkessel parameters are identified from pressure and flow targets as a Partial Differential Equation-Ordinary Differential Equation (PDE-ODE) constrained problem. Second, the indicator maps are verified against the exact Womersley solution and by a grid convergence study at every wall point. Third, the robustness of the risk regions is assessed across repeated segmentations by means of risk-probability maps. Fourth, the remaining numerical noise is removed by a well-posed variational problem on the vessel wall, whose

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existence, uniqueness and maximum principle will be proven and which is solved by surface finite elements. Preliminary simulations show that the operating point alone changes the wall-averaged WSS by more than an order of magnitude. The expected result is a risk map in which every region carries a known local error and a measured reliability.

Ivan Ilinykh

Novosibirsk National Research State University

November 3, 2026 | 15:30-15:55 | Xuesi Hall

Properties of Sequences of Lyapunov Integrals and Functions Defined by a Class of High-Dimensional Systems of Differential Equations

The report considers a delay differential equation and a sequence of high-dimensional systems of ordinary differential equations. The limit of the sequence of Lyapunov functions is studied, and estimates are proved for the rate of convergence to zero at infinity for the solutions of the problem for the delay differential equation.

The work is supported by the Mathematical Center in Akademgorodok under Agreement No. 075-15-2025-349 with the Ministry of Science and Higher Education of the Russian Federation.

Vladislav Prokhorov

Novosibirsk State University

November 3, 2026 | 15:55-16:20 | Xuesi Hall

Asymptotic behavior of solutions of differential equations with almost periodic coefficients in linear terms at infinity

We study the asymptotic stability of solutions to differential equations with almost periodic coefficients in linear terms. Using a solution to the Lyapunov differential matrix equation, estimates for stabilization rates of stationary solutions to the differential equations at infinity and estimates for attraction domains are established. The robust stability for these equations is studied as well.

The work is supported by the Mathematical Center in Akademgorodok under Agreement No. 075-15-2025-349 with the Ministry of Science and Higher Education of the Russian Federation.

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Parallel Presentations

Ivan Sidarenka

Mogilev State A. Kuleshov University

November 3, 2026 | 16:20-16:45 | Xuesi Hall

Multiple limit cycles and the accuracy of the predictive method for Liénard systems of type 2A+2S

We consider generalized Liénard systems x' = y, y' = -g(x) - e f(x) y whose restoring force has four simple equilibria in the configuration 2A+2S (two antisaddles and two saddles), and we describe limit cycles by their distribution ((n1,n2),n3): the number of cycles around each antisaddle and around the group of the three inner equilibria.

The main tool is the predictive method of L. A. Cherkas, in which the location of limit cycles is forecast from the algebraic system F(eta) = F(mu), G(eta) = G(mu) on the turning points of the ovals of the unperturbed Hamiltonian. Its advantage is that the predictive function D(h) = F(mu) - F(eta) is algebraic in the turning points: it requires no quadratures, is linear in the coefficients of f, and its derivatives in h are available in closed form.

Three groups of results are reported. First, a reduction of D modulo the restoring polynomial g: the effective dimension of the space of predictive functions equals n+1 for deg f <= 3 and n for 4 <= deg f <= 8, so that deg f = 4 produces no distribution that is not already realized at deg f = 3, whereas degrees 5 and 6 give new mixed distributions such as ((2,1),1) and ((2,2),1). Second, curves LC_m of multiple limit cycles: the maximal multiplicity equals d(n) - 1, cycles of multiplicity up to five are constructed explicitly, and their unfoldings yield distributions with five and six cycles. Third, a quantitative measurement of how accurate the forecast actually is. Comparing D with the Melnikov function over the parameter plane, the predicted and the true distributions coincide on 89-94% of the grid, with a one-sided shift of the cycle levels (median 17-20%). The discrepancies are systematic: they are almost entirely confined to the family of large cycles and are always over-estimates; in extreme cases a predicted ((0,0),3) or ((0,0),5) corresponds to a single true cycle.

All distributions reported are justified rigorously by the Pontryagin-Andronov theorem. The computations were carried out in Mathematica.

REPORT ABSTRACTS

Parallel Presentations

Zetao Ma

School of Mathematical Sciences, Shanghai Jiao Tong University

November 3, 2026 | 16:45-17:10 | Xuesi Hall

Multiscale Computational Method for the Landau-Lifshitz equation

In this work, we develop a numerical homogenization approach for the fully nonlinear Landau-Lifshitz equation with rough coefficients, including non-periodicity and nonseparable scales. Direct fine-mesh resolution of such multiscale problems incurs prohibitive computational costs. To address this, we propose an efficient coarse-scale approximation using localized basis functions derived from energy minimization within the GRPS/LOD framework. These basis functions preserve critical multiscale features on a tractable coarse mesh. The nonlinear, vectorial, non-symmetric nature of the Landau-Lifshitz equation necessitates careful design of variational formulations for basis construction. We introduce several such formulations, each tailored to specific structural aspects. Systematic numerical experiments demonstrate that our approach achieves significant computational savings without compromising accuracy, offering a robust framework for simulating multiscale magnetic systems with complex microstructures. The theoretical foundation is established via systematic error analysis, decomposing the total error into temporal and spatial components. The spatial error analysis is conducted by formulating the LL equation within the LOD framework.

Shiyi Liu

Shanghai University

November 3, 2026 | 17:10-17:35 | Xuesi Hall

Mathematical Analysis and Applications of Selected Models in Neuroscience

The generation and propagation of neural electrical activity and the pupillary response to light can both be described using nonlinear differential equations, providing concrete problems at the intersection of mathematics and neuroscience. This talk considers the cable-Hodgkin-Huxley model of neural electrical activity and a dynamical model of the pupillary light reflex. It introduces the physiological background and associated mathematical questions, focusing on the existence and uniqueness of solutions, the effects of changes in initial states and external stimuli on system responses, and the relationships between model outputs and observable physiological measures.

APPENDIX

Notes

APPENDIX

About Shanghai

Shanghai is located on China's east coast at the mouth of the Yangtze River. The city combines a long history of international exchange with modern urban development.

The conference in Shanghai

CRCDDE26 takes place at Shanghai University's Baoshan Campus in Baoshan District. The conference venue is the New Lehu Building at No. 99 Shangda Road.

City landmarks

The Bund

The Huangpu River waterfront is known for its historic architecture and views across the river.

Lujiazui

Across the Huangpu River from the Bund, Lujiazui is known for its modern high-rise skyline.

Yu Garden

A classical Chinese garden in the old city area, Yu Garden reflects traditional garden design.

APPENDIX

Accommodation and Fees

Recommended accommodation

New Lehu Building
Shanghai University Baoshan Campus
No. 99 Shangda Road, Baoshan District, Shanghai

Atour Hotel
Shangda Road Branch

Conference registration fees

Participant category	Registration fee
Faculty member	RMB 1,000
Student	RMB 800

Participants cover their own transportation, meals and accommodation expenses.

Conference information

Department of Mathematics, College of Sciences
Shanghai University

Dates, venue, committee, accommodation, fees and contacts follow the CRCDDE26 First Circular dated August 20, 2026. The co-organizer list has been updated to include Shanghai Maritime University and Shanghai Jian Qiao University. Available titles and abstracts for the scheduled plenary and parallel presentations are included. Missing or incomplete submitted material is marked in the abstract section.