Midwest Numerical Analysis Day 2024

Department of Mathematics, University of Iowa, April 13–14, 2024

This conference is supported by NSF.

Details of the conference can be found at

`https://homepage.divms.uiowa.edu/~whan/mwnaday2024.html`

Schedule

Note: all the rooms are on the third floor of Iowa Memorial Union (IMU)

Saturday, April 13, 2024

- 8:00–8:30 am, registration, close to Room 348
- 8:30–8:40 am, Room 348. Opening remarks, Weimin Han
- 8:40–9:20 am, Room 348. Invited presentation, session chair: Weimin Han

  Chi-Wang Shu, Brown University

  Stability of time discretizations for semi-discrete high order schemes for time-dependent PDEs
- 9:20–9:50 am,

  group photo (in the area between IMU and Iowa River, weather permitting)

  break, refreshment in Room 335
- 9:50–11:10 am, 3 special sessions in parallel

  Room 343. SS on Quantum Computing, session chair: Palle Jorgensen

  1. 9:50–10:10 am. Muhammad Asaduzzaman, University of Iowa, Quantum Joule Experiment with Neutral Atom Quantum Computer
  2. 10:10–10:30 am. Weijie Du, Iowa State University, Nuclear many-body theories via quantum computing
  3. 10:30–10:50 am. Wayne Polyzou, University of Iowa, Discrete real time path integrals
  4. 10:50–11:10 am. Palle Jorgensen, University of Iowa, q-deformations of the algebras of quantum observables

Room 345. SS on Numerical PDEs (I), session chair: Xiaofan Li

1. 9:50–10:10 am. Dexuan Xie, University of Wisconsin–Milwaukee, An Efficient Finite Element Solver for a Nonuniform Size Modified Poisson-Nernst-Planck Ion Channel Model
2. 10:10–10:30 am. Songting Luo, Iowa State University, Efficient methods for time-harmonic wave propagation problems
3. 10:30–10:50 am. Yang Yang, Michigan Technological University, A reinterpreted discrete fracture model for Darcy-Forchheimer flow in fractured porous media
4. 10:50–11:10 am. Zhuoran Wang, University of Kansas, Full weak Galerkin FEMs for linear poroelasticity problems on quadrilateral meshes

Room 337. SS on Machine Learning (I), session chair: Xueyu Zhu

1. 9:50–10:10 am. H. S. Udaykumar, University of Iowa, Data-driven multi-scale models for materials-by-design of energetic materials
2. 10:10–10:30 am. Ziheng Guo, Illinois Institute of Technology, Learning Stochastic Dynamics from Data
3. 10:30–10:50 am. Ming Zhong, Illinois Institute of Technology, Learning Collective Behaviors from Observation
4. 10:50–11:10 am. Xueyu Zhu, University of Iowa, Efficient Uncertainty Quantification for Physics-Informed Neural Networks and Operator Learning via Ensemble Kalman Inversion

- 11:10–11:20 am, break
- 11:20 am–12:00 pm, Room 348. Invited presentation, session chair: Weimin Han

  Susanne C. Brenner, Louisiana State University

  DD-LOD
- 12:00–2:00 pm, lunch in Room 335
- 2:00–2:40 pm, Room 348. Invited presentation, session chair: Xueyu Zhu

  Qiang Du, Columbia University

  Asymptotically compatible discretization of parameterized nonlocal models
- 2:40–2:50 pm, break
- 2:50–3:50 pm, 3 special sessions in parallel

Room 343. SS on Numerical Time-integration (I), session chair: Laurent Jay

1. 2:50–3:10 pm. Xuping Tian, Iowa State University, Dynamic behavior for the AGEM algorithm
2. 3:10–3:30 pm. Sanah Suri, Washington Univeristy in St. Louis, Functional Equivariance and Modified Vector Fields
3. 3:30–3:50 pm. Laurent O. Jay, University of Iowa, Convergence of modified Newton iterations for implicit Runge-Kutta methods applied to stiff systems of differential equations

Room 345. SS on Numerical PDEs (II), session chair: Zhaosheng Feng

1. 2:50–3:10 pm. Xiangxiong Zhang, Purdue University, A Simple And Efficient Convex Optimization Based Bound-Preserving Limiter
2. 3:10–3:30 pm. Xiaoming He, Missouri University of Science and Technology, A decoupled, linear, and unconditionally energy stable finite element method for a two-phase ferrohydrodynamics model
3. 3:30–3:50 pm. John Peca-Medlin, University of Arizona, Global and local behavior of GEPP and GECP

Room 337. SS on Machine Learning (II), session chair: Xueyu Zhu

1. 2:50–3:10 pm. Jianlin Xia, Purdue University, Fast solvers for neural network least-squares approximations
2. 3:10–3:30 pm. Baoli Hao, Illinois Institute of Technology, A Novel Energy Guided PINN Approach for Solving Reversible Gray-Scott type PDE systems
3. 3:30–3:50 pm. Xiaokai Huo, Iowa State University, InfSupNet for solving high dimensional elliptic PDEs

- 3:50–4:20 pm, break, refreshment in Room 335
- 4:20–5:40 pm, 3 special sessions in parallel

Room 343. SS on Numerical Time-integration (II), session chair: Laurent Jay

1. 4:20–4:40 pm. Nikita Kapur, University of Iowa, Intrinsic Projection of Implicit Runge-Kutta Methods for DAEs
2. 4:40–5:00 pm. Joseph R. Small, University of Iowa, Starting Approximations for SIRK Methods Applied to Index 2 DAEs
3. 5:00–5:20 pm. Qifan Chen, Ohio State University, The Runge–Kutta discontinuous Galerkin method with stage-dependent polynomial spaces for hyperbolic conservation laws

Room 345. SS on Numerical PDEs (III), session chair: James Rossmanith

1. 4:20–4:40 pm. Yuan Yao, University of Iowa, Nonconforming FEM for a Stokes Hemivariational Inequality
2. 4:40–5:00 pm. Qingguo Hong, Missouri University of Science and Technology, Generalized Korn's inequalities for piecewise H^1 and H^2 vector fields

3. 5:00–5:20 pm. Qihao Ye, University of California, San Diego, An Efficient and Spectrally Accurate Numerical Approach for Solving the Fractional Fokker-Planck Equation Under the Dirac-Delta Initial Condition and Its Applications
4. 5:20–5:40 pm. Yifan Hu, Iowa State University, Bounds-preserving high order discontinuous Galerkin method for variable coefficient tracer transport

Room 337. SS on Machine Learning (III), session chair: Xueyu Zhu

1. 4:20–4:40 pm. Beste Basciftci, University of Iowa, Risk-Averse Contextual Generation Maintenance and Operations Scheduling under Wind Energy Uncertainty
2. 4:40–5:00 pm. Kenneth Czuprynski, The Pennsylvania State University, Computationally Efficient Structured Policy Representations in Partially Observable Markov Decision Processes
3. 5:00–5:20 pm. Ziqing Lu, University of Iowa, Camouflage Adversarial Attacks on Multiple Agent Systems

- 6:00 pm–8:00 pm, dinner in Room 335

Sunday, April 14, 2024

- 8:30–9:50 am, 3 special sessions in parallel

Room 346. SS on Bio-math, session chair: Bruce Ayati

1. 8:30–8:50 am. Bruce P. Ayati, University of Iowa, Modeling elements of the gut microbiota as a chemostat
2. 8:50–9:10 am. Zhaosheng Feng, University of Texas Rio Grande Valley, A Parabolic System of Aggregation Formation in Bacterial Colonies
3. 9:10–9:30 am. Liam Jemison, University of Wisconsin Milwaukee, Solvation free energy calculation by a Nonuniform Size Modified Poisson-Boltzmann Ion Channel Model
4. 9:30–9:50 am. Xuan Zhang, University of Iowa, Quantitative CT-based Cluster-informed Assessment of Airway Resistance and Particle Deposition in Asthma Patients

Room 345. SS on Numerical PDEs (IV), session chair: Dexuan Xie

1. 8:30–8:50 am. James Rossmanith, Iowa State University, Locally-implicit discontinuous Galerkin schemes for kinetic Boltzmann-BGK
2. 8:50–9:10 am. Ari Stern, Washington University in St. Louis, Finite Element Exterior Calculus for Hamiltonian PDEs
3. 9:10–9:30 am. Yukun Yue, University of Wisconsin, Madison, Control of Instability in a Vlasov-Poisson System
4. 9:30–9:50 am. Yubin Lu, Illinois Institute of Technology, Finite Difference Approximation with ADI Scheme for Two-dimensional Keller-Segel Equations

Room 337. SS on Machine Learning (IV), session chair: David Stewart

1. 8:30–8:50 am. David Stewart, University of Iowa, Ridge function machines
2. 8:50–9:10 am. Yiran Wang, Purdue University, An Extreme Learning Machine-Based Method for Computational PDEs in Higher Dimensions
3. 9:10–9:30 am. Pawan Singh Negi, Illinois Institute of Technology, An improved training methodology to learn Green's function of variable coefficient elliptic PDEs
4. 9:30–9:50 am. Aleksei Sorokin, Illinois Institute of Technology, Fast Gaussian Process Regression with Derivative Information

- 9:50–10:20 am, break, refreshment in Room 335
- 10:20–11:40 am, 3 special session in parallel

Room 346. SS on Numerical LA, session chair: Dexuan Xie

1. 10:20–10:40 am. Lei Wang, University of Wisconsin, Milwaukee, Numerical experiments using the barycentric Lagrange treecode
2. 10:40–11:00 am. Chenyang Cao, Purdue University, An improved stable algorithm for some kernel matrix-vector multiplications

Room 345. SS on Numerical PDEs (V), session chair: Jue Yan

1. 10:20–10:40 am. Preeti Sar, Iowa State University, Asymptotic-Preserving Scheme for the Kinetic Boltzmann-BGK Equation
2. 10:40–11:00 am. Dauda Gambo, Iowa State University, Circumferentially pressure-driven flow in a two-layer system: a Riemann-sum approximation
3. 11:00–11:20 am. Ian Morgan, Iowa State University, High order methods for wave propagation problems
4. 11:20–11:40 am. Jiajia Guo, University of Michigan, Median Filter Method for Wetting and Dewetting Dynamics with Anisotropic Surface Tension

Room 337. SS on Machine Learning (V), session chair: David Stewart

1. 10:20–10:40 am. Xiaosong Du, Missouri University of Science and Technology, Generative Artificial Intelligence in Aerospace Engineering Applications
2. 10:40–11:00 am. Tyler Kroells, Iowa State University, Training data studies for the cell-average-based neural network method for linear hyperbolic and parabolic equations

- 11:45 am–1:45 pm, lunch in Room 335
- In the afternoon, free discussions.