Zhichao Peng

CONTACT INFORMATION

Department of Mathematics
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https://zhichaopengmath.github.io

PROFESSIONAL EXPERIENCE

Assistant Professor, Department of Mathematics, The Hong Kong University of Science and Technology, Aug. 2023 – now

Visiting Assistant Professor, Department of Mathematics, Michigan State University, Aug. 2020 – Jul. 2023

Mentors: Prof. Daniel Appelö and Prof. Yingda Cheng

Research intern, Los Alamos National Laboratory, May 2019 – Aug. 2019

Mentor: Dr. Xianzhu Tang

EDUCATION

Ph.D. in Applied Mathematics, Rensselaer Polytechnic Institute, Aug. 2020

Advisor: Prof. Fengyan Li

B.S. in Mathematics, Peking University, July 2015

RESEARCH INTERESTS

- Efficient numerical methods for kinetic equations, acoustic and electromagnetic wave equations in the time and frequency domain
- Data-driven and projection based reduced order modeling, especially for kinetic equations and transport problems
- Structure preserving numerical methods: asymptotic preserving, positivity preserving, energy stable

PUBLICATIONS

- Refereed journal papers:
  1. L. Ji, Z. Peng, Y. Chen, *AAROC: Reduced Over-Collocation Method With Adaptive Time Partitioning and Adaptive Enrichment for Parametric Time-Dependent Equations*, 2025, Vol. 41, Issue 5, Numerical Methods for Partial Differential Equations,
  2. Z. Peng, *A Flexible GMRES Solver with Reduced Order Model Enhanced Synthetic Acceleration Preconditioenr for Parametric Radiative Transfer Equation*, Journal of Computational Physics, Vol. 534, 114004, 2025
  3. Z. Peng, *Reduced Order Model Enhanced Source Iteration with Synthetic Acceleration for Parametric Radiative Transfer Equation*, Journal of Computational Physics, 2024, Vol. 517, 1133034
  4. Z. Peng, Y. Chen, Y. Cheng, F. Li, *A Micro-Macro Decomposed Reduced Basis Method for the Time Dependent Radiative Transfer Equation*, Multiscale Modeling and Simulation, Vol. 22, Issue 1, 2024
  5. Z. Peng, D. Appelö, S. Liu, *Universal AMG Accelerated Embedded Boundary Method without Small Cell Stiffness*, Journal of Scientific Computing, vol. 97, 40, 2023
  6. L. Martinez, Z. Peng, D. Appelö, D. Tennant, A. Petersson, J. DuBois, Y. Rosen, *Noise-Specific Beats in the Higher-Level Ramsey Curves of a Transmon Qubit*, Applied Physics Letters,122, 114002, 2023

7. Z. Peng, M. Wang, F. Li, *A Learning-Based Projection Method for Model Order Reduction of Transport Problems*, Journal of Computational and Applied Mathematics, Vol. 418, 114560, 2023
8. H. Zhang, Z. Peng, *Total Generalized Variation for Triangulated Surface Data*, Journal of Scientific Computing, Vol. 93, 87, 2022
9. Z. Peng, D. Appelö, *EM-WaveHoltz: A Flexible Frequency-Domain Method Built from Time-Domain Solvers*, IEEE Transactions on Antennas and Propagation, Vol. 70, Issue 7, 2022
10. Z. Peng, Y. Chen, Y. Cheng, F. Li, *A Reduced Basis Method for Radiative Transfer Equation*, Journal of Scientific Computing, Vol. 91, 5, 2022
11. Z. Peng, F. Li, *Asymptotic Preserving IMEX-DG-S schemes for Linear Kinetic Transport Equations based on Schur Complement*, SIAM Journal on Scientific Computing, Vol. 43, No. 2, pp. A1194-A1220, 2021,
12. Z. Peng, Y. Cheng, J.-M. Qiu, F. Li, *Stability-enhanced AP IMEX1-LDG Method: Energy-Based Stability and Rigorous AP property*, SIAM Journal on Numerical Analysis, Vol. 59, No. 2, pp. 925-954, 2021
13. Z. Peng, Q. Tang, X.-Z. Tang, *An Adaptive Discontinuous Petrov-Galerkin Method for the Grad-Shafranov Equation*, SIAM Journal on Scientific Computing, Vol. 42, No. 5, pp. B1227-B1249, 2020
14. Z. Peng, Y. Cheng, J.-M. Qiu, F. Li, *Stability-Enhanced AP IMEX-LDG Schemes for Linear Kinetic Transport Equations under a Diffusive Scaling*, Journal of Computational Physics Vol. 415, 109485, 2020
15. Z. Peng, V. A. Bokil, Y. Cheng, F. Li, *Asymptotic and Positivity Preserving Methods for Kerr-Debye Model with Lorentz Dispersion in One Dimension*, Journal of Computational Physics, Vol. 402, 109101, 2020

- Submitted:

1. N. Tang, Z. Peng, *A Trajectory-Aware Reduced Order Model for Fast Solving of Parametric Radiative Transfer Equations*, 2025
2. W. Guo, Z. Peng, *An Inexact Low-Rank Source Iteration for Steady State Radiative Transfer Equation with Diffusion Synthetic Acceleration*, 2025
3. A. Galindo-Olarte, Z. Peng, J. Ryan, *Superconvergence Extraction of Upwind Discontinuous Galerkin Method Solving Radiative Transfer Equation*, 2025
4. T. Jin, Z. Peng, Y. Xiang, *Adaptive and Hybrid Reduced Order Models to Mitigate Kolmogorov Barrier in a Multiscale Kinetic Transport Equation*, 2025
5. Y-M. Law, Z. Peng, D. Appelö, T. Hagstrom, *A P-Adaptive Hermite Method for Nonlinear Dispersive Maxwell's Equations*, 2025

- Technical report

1. Z. Peng, D. Appelö, A. Petersson, F. Garcia, Y. Cho, *Mathematical Approaches for Characterization, Control, Calibration and Validation of a Quantum Computing Device*
2. Z. Peng, D Appelö, A. Petersson, M. Motamed, F. Garcia, Y. Cho, *Deterministic and Bayesian Characterization of Quantum Computing Devices*

Research students

- Meng Li (co-supervised with Prof. Yang Xiang, 2023-), Ning Tang (2024-), An Ping (2025-), Chenxi Han (2025-)

Postdocs

- Ningxin Liu

Projects and Grants

1. GRF 16306825, Reduced Order Model Enhanced Preconditioners for Parametric and Time Dependent Radiative Transfer Equation, 2026-2028, PI, 850362 HKD
2. HKUST-KTH Global Knowledge Network Awards 2024, 40000HKD, CO-PI, 2024-2025
3. ECS 26302724, Conquer The Kolmogorov Barrier for Reduced Order Model of The Boltzmann Transport Equation, 2025-2027, PI, 831657 HKD

Service

1. Co-organize "2024 Workshop on Mathematical Theories and Algorithms for AI for Science" at HKUST, Hong Kong, Sep. 2024
2. Co-organize "Algorithms and Theories for the Dimensionality Reduction of Parametric Differential Equations" at The 13th China Mathematical Society Computational Mathematics Annual Conference, Changsha, Hunan, Aug. 2025
3. Co-organize "Recent Developments of Numerical Methods and Modeling for Kinetic and Related Equations" at the Thrid HKSIAM Biennial Conference, CUHK, Hong Kong, Jul. 2025
4. Co-organize "Recent Developments in Numerical Methods for Kinetic Equations", at SIAM CSE 2025, Fortworth, TX, USA, Mar. 2025

Invited Talks at International and Regional Conferences

1. Hong Kong Joint Universities Conference on Structured Matrices and Scientific Computing, Sep. 20205
2. 21st NSNMF, Yining, China, Aug. 2025
3. The Third HKSIAM Biennial Conference, CUHK, Hong Kong, Jul. 2025
4. Advanced Computational Mathematics Workshop, Shanghai Jiaotong University, Shanghai, China, May 2025
5. Efficient Numerical Methods, Beijing Normal University, Zhuhai Campus, Zhuhai, China, May 2025
6. HKUST-KAIST-NUS Joint Workshop on Partial Differential Equations and Scientific Computing, National University of Singapore, Singapore, Apr. 2025
7. Numerical Linear Algebra and Fast Algorithms Youth Forum, Xiangtang, Hunan, China, Jan. 2025
8. Computational Learning for Model Reduction, ICERM, Providence, RI, USA, Jan. 2025
9. First HKMS-HKSIAM Joint Young Scholars Symposium, HKU, Hong Kong, China, Dec. 2024
10. 2024 Workshop on Mathematical Theories and Algorithms for AI for Science, HKUST, Hong Kong, Sep. 2024
11. International Conference on Scientific Computation and Differential Equations, Singapore, July 2024
12. 2024 East Asia Section of SIAM Annual Meeting, Macau, China, June-July 2024
13. 2023 CSIAM Annual Conference, Kunming, China, Oct. 2023
14. 2023 ICIAM, Tokyo, Japan, Aug. 2023