

# Dr. Kunlun Qi

---

CONTACT INFORMATION	428 S Shaw Ln Michigan State University East Lansing, MI, 48824	Email: <a href="mailto:kunlunqi.math@gmail.com">kunlunqi.math@gmail.com</a> Homepage: <a href="https://kunlun-qi.github.io">kunlun-qi.github.io</a> Google Scholar: <a href="#">Kunlun Qi</a>
RESEARCH INTERESTS	<b>Multiscale modeling:</b> Kinetic limit of many-particle system, hydrodynamic limit of kinetic models, semi-classical limit of quantum system; <b>Theoretical analysis for kinetic equations:</b> Well-posedness and asymptotic behavior of Boltzmann equation and its related models via Fourier approach; <b>Numerical methods for kinetic equations:</b> Fourier-Spectral methods and fast algorithms for kinetic equations with stability/convergence analysis; <b>Data-driven and machine-learning based methods:</b> Data assimilation, uncertainty quantification (UQ) and machine-learning moments closure model.	
EMPLOYMENT	<b>Department of Computational Mathematics, Science and Engineering (CMSE) and Department of Mathematics, Michigan State University</b> Assistant Professor, December 2025 - present <b>Simons Laufer Mathematical Sciences Institute (former MSRI), Berkeley</b> SLMath Postdoc Fellowship, August 2025 - December 2025 <b>School of Mathematics, University of Minnesota – Twin Cities</b> Dunham Jackson Assistant Professor, August 2022 - August 2025 <ul style="list-style-type: none"><li>• Mentors: <a href="#">Prof. Li Wang</a>, <a href="#">Prof. Mitchell Luskin</a>, <a href="#">Prof. Alex Watson</a> (Math) <a href="#">Prof. Richard D. James</a> (Aerospace Engineering and Mechanics)</li></ul> <b>Department of Mathematics, The Chinese University of Hong Kong</b> Postdoctoral Fellow, July 2021 - July 2022 <ul style="list-style-type: none"><li>• Mentor: <a href="#">Prof. Renjun Duan</a></li></ul>	
EDUCATION	<b>Department of Mathematics, City University of Hong Kong</b> Ph.D. in Mathematics, September 2017 - July 2021 <ul style="list-style-type: none"><li>• Supervisor: <a href="#">Prof. Tong Yang</a></li></ul> <b>School of Mathematics, South China University of Technology</b> B.Sc. in Mathematics, September 2013 - July 2017 <ul style="list-style-type: none"><li>• GPA: 3.85/4.0, Rank: 2/64</li><li>• Minor certificate in Computer Science</li><li>• Advisors: <a href="#">Prof. Changjiang Zhu</a> and <a href="#">Prof. Huanyao Wen</a></li></ul>	
PREPRINTS	[19] The Semiclassical Limit of the 2D Dirac–Hartree Equation with Periodic Potentials, <i>submitted</i> , 2025. with <i>Jinyeop Lee</i> arXiv: <a href="https://arxiv.org/abs/2512.19362">2512.19362</a> .  [18] Hydrodynamic limit of the Vlasov-Poisson-Fokker-Planck system in low-field regime, <i>submitted</i> , 2025. with <i>Zhendong Fang</i> arXiv: <a href="https://arxiv.org/abs/2512.08346">2512.08346</a> .	

- [17] Solving the BGK model and Boltzmann equation by Fourier Neural Operator with conservative constraints, *submitted*, 2025.  
with *Boyan Hu*  
arXiv: [2510.13047](#).
- [16] A fast Fourier spectral method for wave kinetic equation, *submitted*, 2025.  
with *Lian Shen* and *Li Wang*  
arXiv: [2503.12805](#).
- [15] The small Deborah number limit for the fluid-particle flows II: compressible case, *submitted*, 2024.  
with *Zhendong Fang* and *Huanyao Wen*
- [14] Global existence and moment creation for the inelastic Boltzmann equation for hard potentials without angular cutoff, *submitted*, 2023.  
with *Jin Woo Jang*  
arXiv: [2206.09636v2](#).

#### PUBLICATIONS

- [13] Machine learning-based moment closure model for the linear Boltzmann equation with uncertainties, **Comput. Methods Appl. Mech. Engrg.(CMAME)**, 450:118569, 2026.  
with *Juntao Huang*, *Liu Liu* and *Jiayu Wan*  
DOI: [10.1016/j.cma.2025.118569](#).
- [12] From the Boltzmann equation for gas mixture to the two-fluid incompressible hydrodynamic system, **Kinet. Relat. Models**, 17, 2025.  
with *Zhendong Fang*  
DOI: [10.3934/krm.2025017](#).
- [11] Continuous data assimilation for hydrodynamics: consistent discretization and application to moment recovery, **J. Comput. Phys.**, 538: 114199, 2025.  
with *Jingcheng Lu*, *Li Wang* and *Jeff Calder*  
DOI: [10.1016/j.jcp.2025.114199](#).
- [10] Radiative transport in a periodic structure with band crossings, **SIAM J. Appl. Math.**, 85(1), 314-340, 2025.  
with *Li Wang* and *Alexander B. Watson*  
DOI: [10.1137/24M1638082](#).
- [9] On the kinetic description of the objective molecular dynamics, **SIAM Multiscale Model. Simul.**, 22(4), 1646-1682, 2024.  
with *Richard D. James* and *Li Wang*  
DOI: [10.1137/23M1596727](#).
- [8] The small Deborah number limit for the fluid-particle flows I: incompressible case, **Math. Models Methods Appl. Sci. (M3AS)**, 12(34), 2024.  
with *Zhendong Fang* and *Huanyao Wen*  
DOI: [10.1142/S0218202524500489](#).
- [7] Convergence of the Fourier-Galerkin spectral method for the Boltzmann equation with uncertainties, **Commun. Math. Sci.**, 22(7), 1897-1925, 2024.  
with *Liu Liu*  
DOI: [10.4310/CMS.240918035418](#).
- [6] Spectral convergence of a semi-discretized numerical system for the spatially homogeneous Boltzmann equation with uncertainties, **SIAM/ASA J. Uncertain. Quantif.**, 12(3), 812-841, 2024.

with *Liu Liu*  
DOI: [10.1137/24M1638483](https://doi.org/10.1137/24M1638483).

[5] Measure valued solution to the spatially homogeneous Boltzmann equation with inelastic long-range interactions, **J. Math. Phys.**, 63, 021503, 2022.  
DOI: [10.1063/5.0062859](https://doi.org/10.1063/5.0062859).

[4] A new stability and convergence proof of the Fourier-Galerkin spectral method for the spatially homogeneous Boltzmann equation, **SIAM J. Numer. Anal.**, 59(2), 613-633, 2021.

with *Jingwei Hu* and *Tong Yang*  
DOI: [10.1137/20M1351813](https://doi.org/10.1137/20M1351813).

[3] On the measure valued solution to the inelastic Boltzmann equation with soft potentials, **J. Stat. Phys.**, 183, 27, 2021.

DOI: [10.1007/s10955-021-02762-w](https://doi.org/10.1007/s10955-021-02762-w).

[2] A fast Fourier spectral method for the homogeneous Boltzmann equation with non-cutoff collision kernels, **J. Comput. Phys.**, 423:109806, 2020.

with *Jingwei Hu*

DOI: [10.1016/j.jcp.2020.109806](https://doi.org/10.1016/j.jcp.2020.109806).

CONFERENCE PROCEEDINGS [1] Measure-valued Solution to the inelastic Boltzmann equation for hard potentials without angular cutoff, **Proceedings of the 32nd International Symposium on Rarefied Gas Dynamics (RGD32)**, **AIP Conf. Proc.**, 2996, 040008, 2024.  
with *Jin Woo Jang*  
DOI: [10.1063/5.0187383](https://doi.org/10.1063/5.0187383).

HONORS AND AWARDS	2025-2027	<b>AMS-Simons Travel Award</b> American Mathematical Society (AMS) and Simons Foundation
	2025	<b>AMS Travel Award for MCA25</b> American Mathematical Society (AMS)
	2023	<b>SIAM Early Career Travel Award</b> Society for Industrial and Applied Mathematics (SIAM) and National Science Foundation (NSF)
	2023-2024	<b>UMN Postdoc Award (Honorable Mention)</b> for Impactful Research University of Minnesota
	2022	<b>Hong Kong Mathematical Society Best Thesis Award</b> Hong Kong Mathematical Society
	2019	<b>Outstanding Teaching Award</b> for Teaching Assistants City University of Hong Kong
	2017-2021	<b>UGC-funded Postgraduate Scholarship</b> The University Grants Committee of Hong Kong
	2016	<b>Top 10 Outstanding Student at SCUT (Highest Student Award)</b> South China University of Technology
	2016	<b>National Scholarship</b> Ministry of Education of China
	2016	<b>First Prize in the Chinese Undergraduate Mathematics Competition (Guangdong Division)</b> Chinese Mathematical Society
	2015	<b>Samsung Scholarship</b> Samsung China HQ

## SERVICES

Reviewer for Academic Journals: *Journal of Computational Physics (JCP)*, *SIAM Multi-scale Modeling Simulation (MMS)*, *Kinetic and Related Models (KRM)*, *Communications in Computational Physics (CiCP)*.

Conferences Organization: organizer of mini-symposium “*On the Interplay between Kinetic Theory and Quantum Dynamics*” at 10th International Congress on Industrial and Applied Mathematics (ICIAM2023).

Seminars and Workshops Organization: assistant organizer of weekly “*Applied and Computational Mathematics Seminar*” and “*New Trends in Kinetic and Optimal Transport Workshop*” at University of Minnesota.

Mini-course and Summer School Organization: lecturer and assistant organizer of “*MATH-IMS mini-course in Boltzmann Equation*” at The Chinese University of Hong Kong.

## ACADEMIC VISITS

*The Chinese University of Hong Kong*, Hong Kong, May 20 - June 24, 2024.

*University of Washington*, Seattle, USA, May 16 - 19, 2024.

*Tsinghua University*, Beijing, China, August 2 - 5, 2023.

*South China University of Technology*, Guangzhou, China, July 30 - August 2, 2023.

*The Chinese University of Hong Kong*, Hong Kong, July 23 - 28, 2023.

*University of Oslo*, Oslo, Norway, March 5 - 9, 2023.

*TU Delft*, Delft, The Netherlands, March 1 - 3, 2023.

*RWTH Aachen University*, Aachen, Germany, February 21 - 26, 2023.

## INVITED AND CONTRIBUTED TALKS

*Seminar*, September 2025, Simons Laufer Mathematical Sciences Institute, Berkeley, California, US.

*Mini-symposium*, July 2025, HKSIAM Biennial conference , Hong Kong.

*Colloquium*, February 2025, Illinois Institute of Technology, Chicago, Illinois, US.

*Colloquium*, January 2025, Florida State University, Tallahassee, Florida, US.

*CMSE and Math Colloquium*, January 2025, Michigan State University, East Lansing, Michigan, US.

*NUS-IMS Young Applied Mathematicians Forum 2025*, January 2025, National University of Singapore, Singapore.

*UMTC-UMD Postdoc Seminar*, November 2024, University of Minnesota, Duluth, Minnesota, US.

*2024 Global Young Scholars' Forum at CUHK-Shenzhen*, October 2024, The Chinese University of Hong Kong, Shenzhen. (Virtual).

*Webinar Kinetic and fluid equations for collective behavior*, December 2023, French-Korean IRL in Mathematics International Research Laboratory. (Virtual).

*6th Annual Meeting of the SIAM Texas-Louisiana Section*, November 2023, University of Louisiana at Lafayette, Lafayette, Louisiana, US.

*New Trends in Kinetic and Optimal Transport Workshop*, October 2023, University of Minnesota – Twin Cities, Minneapolis, Minnesota, US.

*The 8th Annual Meeting of SIAM Central States Section*, October 2023, University of Nebraska – Lincoln, Lincoln, Nebraska, US.

*PDE Seminar*, September 2023, University of Minnesota – Twin Cities, Minneapolis, Min-

nesota, US.

*Mini-symposium at the second HKSIAM Biennial conference, August-September 2023,  
The Chinese University of Hong Kong, Hong Kong.*

*Mini-symposium at 10th International Congress on Industrial and Applied Mathematics (ICIAM2023), August 2023, Waseda University, Tokyo, Japan.*

*Midwest Numerical Analysis Day*, April 2023, Iowa State University, Ames, Iowa, US.

*Seminar on Computational Mathematics*, March 2023, University of Oslo - Department of Mathematics, Oslo, Norway.

*Seminar in PDE and Applications*, March 2023, TU Delft - Delft Institute of Applied Mathematics, Delft, The Netherlands.

*Weekly Seminar of DFG Energy, Entropy, and Dissipative Dynamics Group, February 2023, RWTH Aachen University, Aachen, Germany.*

The 6th Conference on Nonlinear Partial Differential Equation from Fluid Dynamic, November 2022, Ningbo University, Ningbo, China. (Virtual)

*Modeling and Numerical Simulation of Non-Equilibrium Processes Workshop*, January 2022, Institute for Mathematical Sciences, NUS, Singapore. (Virtual)

*PDE and Scientific Computing Seminar*, October 2021, National University of Singapore, Singapore. (Virtual)

*The Pre-32nd International Symposium on Rarefied Gas Dynamics (Pre-RGD32) online Workshop, July 2021, Seoul, South Korea. (Virtual)*

The 5th Conference on Nonlinear Partial Differential Equation from Fluid Dynamic, May 2021, Central China Normal University, Wuhan, China. (Virtual)

## TEACHING EXPERIENCE

Instructor at the Michigan State University, 2025 - present:

2026 Spring CMSE 201 Computational Modeling and Data Analysis

Instructor at the University of Minnesota–Twin Cities, 2022 - 2025:

2025 Spring	<i>MATH 2263 Multivariable Calculus</i>
2025 Spring	<i>MATH 5485 Numerical Methods II</i>
2024 Fall	<i>MATH 5485 Numerical Methods I</i>
2024 Spring	<i>MATH 4428 Mathematical Modeling - Section 001 and 002</i>
2023 Fall	<i>MATH 5485 Numerical Methods I</i>
2023 Spring	<i>MATH 5486 Numerical Methods II</i>
2022 Fall	<i>MATH 5485 Numerical Methods I – Section 001 and 002</i>

Lecturer at The Chinese University of Hong Kong, 2021 - 2022:

2021/22 Term 1 *MATH-IMS Mini-Course in Boltzmann Equation*  
 2021/22 Term 2 *MATH6042 Topics in Differential Equations II*

Tutor at City University of Hong Kong, 2018 - 2021:

2018/19 Semester A	<i>MA1200 Calculus and Basic Linear Algebra I</i>
2018/19 Semester B	<i>MA1201 Calculus and Basic Linear Algebra II</i>
2019/20 Semester A	<i>MA2172 Applied Statistics for Sciences and Engineering</i>
2019/20 Semester B	<i>MA0101 Basic Engineering Mathematics I</i>
2020/21 Semester A	<i>MA1300 Enhanced Calculus and Linear Algebra I</i>

Teaching Assistant at City University of Hong Kong, 2018 - 2021:  
2019/20 Semester A      *MA8006 Functional Analysis and Applications*  
2019/20 Semester B      *MA3511 Ordinary Differential Equations*  
2020/21 Semester A      *MA8006 Functional Analysis and Applications*