

Shanyin Tong

200 S.W. Mudd, Mail Code: 4701, Columbia University, New York, NY 10027

✉ st3503@columbia.edu | 🏠 <https://columbia.edu/~st3503/> | 📺 TongShanyin

APPOINTMENT

Assistant Professor, Columbia University, New York, NY

July 2022 – present

EDUCATION

Ph.D. in Applied Mathematics, Courant Institute, New York University, New York, NY

August 2017 – May 2022

- Advisor: Prof. Georg Stadler and Prof. Eric Vanden-Eijnden
- Thesis: *Extreme event probability estimation and control using large deviation theory and PDE-constrained optimization*
- Outstanding dissertation prize at Courant Institute

B.S. in Computational Mathematics, Peking University, Beijing, China

September 2013 – June 2017

HONORS & AWARDS

SIAM Early Career Travel Award , SIAM Conference on Uncertainty Quantification (UQ24), Trieste, Italy	2024
AWM-NSF Travel Grant , Association for Women in Mathematics, US	2023
AMS-Simons Travel Grant , AMS & Simons Foundation, US	2023
Second Prize of the twenty-first IMA Leslie Fox Prize for Numerical Analysis , IMA, Glasgow, UK	2023
ICIAM 2023 Travel Award , 10th International Congress on Industrial and Applied Mathematics, Tokyo, Japan	2023
SIAM Early Career Travel Award , SIAM Conference on Optimization (OP23), Seattle, WA	2023
Kurt O. Friedrichs Prize , Outstanding Dissertation in Mathematics, NYU, New York, NY	2022
Finalist of Best Paper for Young Researchers Prize , ICCOPT, Bethlehem, PA	2022
Rising Star in Computational and Data Sciences , Academic Workshop for Women, Albuquerque, NM	2022
SIAM Student Travel Award , SIAM Conference on Uncertainty Quantification (UQ22), Atlanta, GA	2022
Selected Participant , Morgan Stanley Women's PhD Mentorship Program, New York, NY	2021
SIAM Student Travel Award , SIAM Conference on Computational Science and Engineering, TX (virtual)	2021
Bella Manel Prize , Excellence and Promise in Mathematics on the Graduate Level, NYU, New York, NY	2020
SIAM Student Travel Award , SIAM Conference on Uncertainty Quantification, Germany (COVID cancelled)	2020
Isaac Barkey and Ernesto Yhap Fellowship , Awarded to Outstanding Math PhD Student, NYU, New York, NY	2019
MacCracken Fellowship , Awarded to Outstanding NYU PhD Student, NYU, New York, NY	2017-2022
Meritorious Winner , The Interdisciplinary Contest in Modeling (ICM), Beijing, China	2016
WeTech Qualcomm Global Scholar Award , IIE and Qualcomm, Beijing, China	2015
First Prize , 7th National Mathematics Contest for College Students, Beijing, China	2015
Third Prize , 31st National Physics Contest for College Students, Beijing, China	2014
Yizheng Alumni Scholarship , Peking University, Beijing, China	2014

PUBLICATIONS

1. T. Schorlepp, S. Tong, T. Grafke and G. Stadler, *Scalable methods for computing sharp extreme event probabilities in infinite-dimensional stochastic systems*, Statistics and Computing (2023), [arXiv:2303.11919 | Stat. Comput. Link]
2. S. Tong and G. Stadler, *Large deviation theory-based adaptive importance sampling for rare events in high dimensions*, SIAM/ASA Journal on Uncertainty Quantification (JUQ) (2023), [arXiv:2209.06278 | JUQ Link]

3. S. Tong, E. Vanden-Eijnden and G. Stadler, *Estimating earthquake-induced tsunami height probabilities without sampling*, Pure and Applied Geophysics (2023), [arXiv:2111.14325 | PAG Link]
4. S. Tong, A. Subramanyam and V. Rao, *Optimization under rare chance constraints*, SIAM Journal on Optimization 32.2 (2022), [arXiv:2011.06052 | SIOPT Link]
5. S. Tong, E. Vanden-Eijnden and G. Stadler, *Extreme event probability estimation using PDE-constrained optimization and large deviation theory, with application to tsunamis*, Communications in Applied Mathematics and Computational Science 16-2 (2021), 181–225. DOI 10.2140/camcos.2021.16.181, [arXiv:2007.13930 | CAMCoS Link]
6. S. Tong, *Extreme event probability estimation and control using large deviation theory and PDE-constrained optimization*, Doctoral dissertation (2022), [ProQuest Link]
7. S. Tong, *Extreme event probability estimation with application to tsunamis*, featured on the homepage of SIAM News (2021), [SIAM News link]
8. A. Chowdhary, S. Tong, G. Stadler and A. Alexanderian, *Sensitivity Analysis of the Information Gain in Infinite-Dimensional Bayesian Linear Inverse Problems*, arXiv Preprint (2023), [arXiv:2310.16906]

PRESENTATIONS

2024 INFORMS Optimization Society Conference (IOS 2024), Houston, TX	March 2024
SIAM Conference on Uncertainty Quantification (UQ24), Trieste, Italy	February 2024
Mathematical Opportunities in Digital Twins Workshop, George Mason University, Fairfax, VA	December 2023
Mid-Atlantic Numerical Analysis Day, Temple University, Philadelphia, PA	November 2023
SIAM New York-New Jersey-Pennsylvania Annual Meeting, New Jersey Institute of Technology, NJ	October 2023
2023 INFORMS Annual Meeting, Phoenix, AZ	October 2023
10th International Congress on Industrial and Applied Mathematics (ICIAM 2023), Tokyo, Japan	August 2023
Applied Math Seminar, The Hong Kong Polytechnic University, HK	July 2023
IMA Leslie Fox Prize meeting, Glasgow, UK	June 2023
SIAM Conference on Optimization (OP23), Seattle, WA	May 2023
Joint Mathematics Meetings (JMM2023), Boston, MA	January 2023
Seminar in Applied Mathematics, Columbia University, New York, NY	September 2022
APAM Research Conference, Columbia University, New York, NY	September 2022
Best Paper Session at International Conference on Continuous Optimization (ICCOPT), Bethlehem, PA	July 2022
Rising Stars in Computational and Data Sciences, Albuquerque, NM	April 2022
SIAM Conference on Uncertainty Quantification (UQ22), Atlanta, GA	April 2022
Scientific Computing and Numerics (SCAN) Seminar, Cornell University, Ithaca, NY (virtual)	March 2022
CCB Seminar at Center for Computational Biology, Simons Foundation, New York, NY	January 2022
Applied Mathematical Colloquium at APAM, Columbia University, New York, NY (virtual)	January 2022
SIAM Conference on Computational Science and Engineering (CSE21), Fort Worth, Texas (virtual)	March 2021
2020 INFORMS Annual Meeting, National Harbor, MD (virtual)	November 2020
Summer Argonne Students Symposium (SASSy), Argonne National Lab, Lemont, IL (virtual)	August 2020
NSF Research Training Group (RTG) in Modeling & Simulation, CIMS, NYU, , New York, NY	February 2020
ICERM Workshop: Mathematical Optimization of Systems Impacted by Rare Events, Providence, RI	June 2019
Gene Golub SIAM Summer School: Inverse Problems, Models under Uncertainty, Breckenridge, CO	June 2018

TEACHING EXPERIENCES

2024 Spring	Instructor, APMA-E4306: Applied Stochastic Analysis	Columbia University
2023 Fall	Instructor, APMA-E2000-001: Multivariable Calculus	Columbia University
2023 Spring	Instructor, APMA-E4306: Applied Stochastic Analysis	Columbia University
2022 Fall	Instructor, APMA-E2000-001: Multivariable Calculus	Columbia University
2021 Fall	Recitation leader, MATH-UA.0253-002: Linear and Nonlinear Optimization	NYU
2021 Spring	Recitation leader, MATH-UA.0253-002: Linear and Nonlinear Optimization	NYU (virtual)
2021 Spring	Recitation leader, MATH-UA.0263-002: Partial Differential Equations	NYU (virtual)
2021 Spring	Instructor, Graduate written exam workshop: Linear Algebra	CIMS, NYU (virtual)
2020 Fall	Grader, MATH-GA.2010-001: Numerical Methods I	CIMS, NYU (virtual)
2019 Fall	Recitation leader, MATH-UA.0121-032 & -034: Calculus I	NYU
2019 Fall	Instructor, Graduate written exam workshop: Complex Variables	CIMS, NYU
2019 Fall	Instructor, Graduate written exam workshop: Linear Algebra	CIMS, NYU
2018 Fall	Instructor, Graduate written exam workshop: Linear algebra	CIMS, NYU
2018 Fall	Grader, MATH-GA.2043-001: Scientific Computing	CIMS, NYU

ADDITIONAL TRAININGS

Measure Transport, Diffusion Processes and Sampling Workshop, Flatiron Institute, New York, NY	December 2023
PIMS-IFDS-NSF Summer School on Optimal Transport, University of Washington, Seattle, WA	June 2022
Challenges and Prospects of ML for the Physical Sciences Workshop, Flatiron Institute, New York, NY	June 2022
DFG-SPP 1962 Summer School on Optimization under Uncertainty, Germany (virtual)	September 2021
East Coast Optimization Meeting, George Mason University, Fairfax, VA (virtual)	April 2021
ICERM Workshop: Computational Statistics and Data-Driven Models, Providence, RI (virtual)	April 2020
ICERM Workshop: Mathematical Optimization of Systems Impacted by Rare, High-Impact Random Events, Providence, RI	June 2019
Gene Golub SIAM Summer School: Inverse Problems: Systematic Integration of Data with Models under Uncertainty, Breckenridge, CO	June 2018

INTERNSHIP EXPERIENCES

Research Scientist Intern, Amazon, Seattle, WA (virtual)	May 2021 - August 2021
Summer Research Intern (Givens associate), Argonne National Lab, Lemont, IL (virtual)	June 2020 - August 2020
Summer Research Intern, UCLA, Los Angeles, CA	June 2016 - September 2016

PROFESSIONAL SERVICE

Journal Referee SIAM Journal on Scientific Computing (SISC), Machine Learning: Science and Technology (MLST), Journal of Computational Science (JOCS), Journal of Optimization Theory and Applications (JOTA)

STUDENT ADVISING

Research Joonsoo Lee (undergrad at Columbia, awarded Bonomi Scholar for summer research)
Andrew Jin (undergrad at Columbia), Zhinan Han (master at Columbia, co-advised by Kui Ren)

Career Development Serena Yihe Yang, Joonsoo Lee (undergrad at Columbia)
Panagiotis Tsimpo (previous undergrad at Columbia, now PhD student at MIT)

CONFERENCE & SEMINAR ORGANIZING

Co-organizer , Engineering Mechanics Institute Conference and Probabilistic Mechanics & Reliability Conference (EMI/PMC 2024), Chicago, IL	May 2024
Co-organizer , Minisymposium at SIAM-NNP Annual Meeting, Seattle, WA	June 2023
Co-organizer , Minisymposium at SIAM Conference on Optimization, Seattle, WA	June 2023
Organizer , APAM Graduate Student Research Symposium, Columbia University, New York, NY	2023-present
Organizer , Discussion Panel for Women and Diversity in APAM, Columbia University, New York, NY	2022-present
Organizer , APAM Research Conference, Columbia University, New York, NY	2022-present

LEADERSHIP & COMMUNITY ACTIVITIES

Proposer , APAM Graduate Student Research Symposium, Columbia University, New York, NY	2023-present
Founder , Women and Diversity Association in APAM (WDAPAM), Columbia University, New York, NY	2022-present
Member , SEAS Faculty DEI Working Group, Columbia University, New York, NY	2022-present
Member , Association for Women in Mathematics, US	2022-present
Member , Association for Women in Mathematics at Courant, New York, NY	2021
Mentor , Student mentor for new incoming PhD students at Courant, New York, NY	2018
Member , Society for Industrial and Applied Mathematics, US	2017-present
Selected Participant , Women Enhancing Technology (WeTech) Program, Beijing, China	2015-2016
Member , School basketball team, Beijing, China	2013-2017
Leader , Mathematics modeling contest team, Beijing, China	2016
Selected Participant , Social research examined the volunteerism in Guangdong Province, China	2014
Guide , Campus tour of Peking University, Beijing, China	2014
Mentor , Free tutoring for middle school students from low-income families, Guangdong, China	2011

COMPUTING & SOFTWARE

Coding Languages	Python, Matlab, Julia, C, C++, Java, SQL, HTML, Linux, Latex
Tools & Software	PyTorch, Tensorflow, Pandas, Scikit-learn, Jupyter Notebook, Conda, Git, NumPy, SciPy, CUDA, OpenMP, MPI, FEniCS, hIPPYlib, MUQ, ParaView, Gurobi, Xpress, Matplotlib, TikZ
Implementations	High performance computing for the Biot-Savart law in 3D [Git Repo Link] Self-supervised learning for image classifications [Git Repo Link] Fast multipole method for computing electrostatic interactions in 2D [Git Repo Link] Online adaptive model reduction for shallow water equations [Git Repo Link]