

# Shanyin Tong

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## APPOINTMENT

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**Assistant Professor, Columbia University**, New York, NY

July 2022 – present

## EDUCATION

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

August 2017 – June 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 – July 2017

## HONORS & AWARDS

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<b>Finalist of the twenty-first IMA Leslie Fox Prize for Numerical Analysis</b> , IMA, Glasgow, UK	2023
<b>SIAM Early Career Travel Award</b> , SIAM Conference on Optimization (OP23), Seattle, WA	2023
<b>Kurt O. Friedrichs Prize</b> , Outstanding dissertation in mathematics, NYU, New York, NY	2022
<b>Finalist of Best Paper for Young Researchers Prize</b> , ICCOPT, Bethlehem, PA	2022
<b>Rising Star in Computational and Data Sciences</b> , Academic Workshop for Women, Albuquerque, NM	2022
<b>SIAM Student Travel Award</b> , SIAM Conference on Uncertainty Quantification (UQ22), Atlanta, GA	2022
<b>Selected Participant</b> , Morgan Stanley Women's PhD Mentorship Program, New York, NY	2021
<b>SIAM Student Travel Award</b> , SIAM Conference on Computational Science and Engineering, TX (virtual)	2021
<b>Bella Manel Prize</b> , Excellence and promise in mathematics on the graduate level, NYU, New York, NY	2020
<b>SIAM Student Travel Award</b> , SIAM Conference on Uncertainty Quantification, Germany (COVID cancelled)	2020
<b>Isaac Barkey and Ernesto Yhap Fellowship</b> , Awarded to outstanding Math PhD student, NYU, New York, NY	2019
<b>MacCracken Fellowship</b> , Awarded to outstanding NYU PhD student, NYU, New York, NY	2017-2022
<b>Meritorious Winner</b> , The Interdisciplinary Contest In Modeling (ICM), Beijing, China	2016
<b>WeTech Qualcomm Global Scholar Award</b> , IIE and Qualcomm, Beijing, China	2015
<b>First Prize</b> , 7th National Mathematics Contest for College Students, Beijing, China	2015
<b>Third Prize</b> , 31st National Physics Contest for College Students, Beijing, China	2014
<b>Yizheng Alumni Scholarship</b> , Peking University, Beijing, China	2014

## PUBLICATIONS

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1. S. Tong and G. Stadler, *Large deviation theory-based adaptive importance sampling for rare events in high dimensions*, accepted by SIAM/ASA Journal on Uncertainty Quantification (JUQ) (2023), [arXiv:2209.06278]
2. 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]
3. S. Tong, A. Subramanyam and V. Rao, *Optimization under rare chance constraints*, SIAM Journal on Optimization 32.2 (2022), [arXiv:2011.06052 | SIOPT Link]
4. 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]

5. S. Tong, *Extreme event probability estimation and control using large deviation theory and PDE-constrained optimization*, Doctoral dissertation (2022), [ProQuest Link]
6. T. Schorlepp, S. Tong, T. Grafke and G. Stadler, *Scalable methods for computing sharp extreme event probabilities in infinite-dimensional stochastic systems*, submitted (2023), [arXiv:2303.11919]
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*, in preparation

## PRESENTATIONS

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2023 INFORMS Annual Meeting, Phoenix, AZ	October 2023
10th International Congress on Industrial and Applied Mathematics (ICIAM 2023), Tokyo, Japan	August 2023
2023 XVI International Conference Stochastic Programming, Davis, CA	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	Jan 2022
Applied Mathematical Colloquium at APAM, Columbia University, New York, NY (virtual)	Jan 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

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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

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PIMS-IFDS-NSF Summer School on Optimal Transport, University of Washington, Seattle, WA	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

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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

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

## STUDENT ADVISING

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**Research** Joonsoo Lee, Andrew Jin (undergrad at Columbia)

**Career Development** Serena Yihe Yang, Panagiotis Tsimpo, Joonsoo Lee (undergrad at Columbia)

## CONFERENCE & SEMINAR ORGANIZING

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<b>Co-organizer</b> , Minisymposium at SIAM Conference on Optimization, Seattle, WA	June 2023
<b>Organizer</b> , APAM Graduate Student Research Symposium, Columbia University, New York, NY	2023-present
<b>Organizer</b> , Discussion Panel for Women and Diversity in APAM, Columbia University, New York, NY	2022-present
<b>Organizer</b> , APAM Research Conference, Columbia University, New York, NY	2022-present

## LEADERSHIP & COMMUNITY ACTIVITIES

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

## COMPUTING & SOFTWARE

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