Sky Cao

CONTACT INFORMATION

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RESEARCH INTERESTS

Probability and analysis – in particular, Yang–Mills, random surfaces, singular SPDE.

EMPLOYMENT

Massachusetts Institute of Technology

NSF Postdoctoral Fellow and C.L.E. Moore Instructor, July 2023 - current

Institute for Advanced Study

Member, School of Mathematics, September 2022 - June 2023

EDUCATION

Stanford University

Ph.D. in Statistics, June 2022
- Advisor: Sourav Chatterjee

University of California, Berkeley

B.A. in Mathematics, Computer Science, May 2017
- Highest honors in mathematics, highest distinction in general scholarship

PUBLICATIONS

Surface sums for lattice Yang–Mills in the large-N limit. (with Jacopo Borga and Jasper Shogren-Knaak) arXiv:2411.11676

Global well-posedness of the dynamical sine-Gordon model up to 6π. (with Bjoern Bringmann) arXiv:2410.15493

Fractional Gaussian forms and gauge theory: an overview. (with Scott Sheffield) arXiv:1407.5598

Global well-posedness of the stochastic Abelian-Higgs equations in two dimensions. (with Bjoern Bringmann) arXiv:2403.16878

Random surfaces and lattice Yang-Mills. (with Minjae Park and Scott Sheffield) arXiv:2307.06790

A para-controlled approach to the stochastic Yang-Mills equation in two dimensions. (with Bjoern Bringmann) arXiv:2305.07197. To appear in *Mem. Amer. Math. Soc.*

Correlation decay for finite lattice gauge theories at weak coupling. (with Arka Adhikari) arXiv:2202.10375. *Ann. Probab.*, **53** no. 1, 140-174, 2025.

A state space for 3D Euclidean Yang-Mills theories. (with Sourav Chatterjee) *Comm. Math. Phys.*, **405** no. 3, 2024.

The Yang-Mills heat flow with random distributional initial data. (with Sourav Chatterjee) *Comm. Partial Diff. Eq.*, **48** no. 2, 209-251, 2023.

Correlations with tailored extremal properties. (with Peter J. Bickel) arXiv:2008.10177

Wilson loop expectations in lattice gauge theories with finite gauge groups. *Comm. Math. Phys.*, **380**, 1439–1505, 2020.

Central limit theorems for combinatorial optimization problems on sparse Erdős-Rényi graphs. *Ann. Appl. Probab.*, **31** no. 4, 1687-1723, 2021.

INVITED TALKS	Spring AMS Sectional (April 2025)
	UMD Probability seminar (January 2025)
	Penn Probability and Combinatorics Seminar (December 2024)
	UCLA Probability seminar (December 2024)
	Brown Probability seminar (November 2024)
	One World IAMP Mathematical Physics seminar (September 2024)
	IAS Analysis and Mathematical Physics seminar (May 2024)
	Statistical physics and random surfaces workshop, Oberwolfach (May 2024)
	Webinar on stochastic analysis, Beijing Institute of Technology (April 2024)
	University of Rochester Probability seminar (March 2024)
	Harvard Probability seminar (March 2024)
	MIT Probability seminar (March 2024)
	Fields Institute, four lecture mini course on Yang–Mills (February 2024)
	Stanford University Probability seminar (January 2024)
	Webinar on stochastic analysis, Beijing Institute of Technology (September 2023)
	IAS School of Mathematics Members Colloquium (March 2023)
	Courant Probability & Mathematical Physics Seminar (December 2022)
	Texas Tech Probability, Differential Geometry, and Mathematical Physics Seminar (November 2022)
	UW Madison Probability Seminar (November 2022)
	Random Geometry and Statistical Physics Workshop (October 2022)
	Cornell Probability Seminar (May 2022)
	MIT Probability Seminar (April 2022)
	LU–NU–UMN Joint Probability Seminar (April 2022)
	Percolation Today Seminar (March 2022)
	UChicago Probability & Statistical Physics Seminar (March 2022)
	University of Victoria Dynamics & Probability Seminar (March 2022)
	ICL Stochastic Analysis Seminar (February 2022)
	UCLA Probability Seminar (January 2022)
	UC Davis Mathematical Physics & Probability Seminar (December 2021)
	IISA 2021 Conference (May 2021)
	Stanford Probability Seminar (June 2020)
	Berkeley Probability Seminar (February 2020)
CONTRIBUTED TALKS	Northeast Probability Seminar (November 2021)
	Bernoulli IMS One World Symposium (August 2020)

HONORS AND AWARDS		
	2023	US Junior Oberwolfach Fellow
	2022	US Junior Oberwolfach Fellow
	2022	Probability Theory Dissertation Award, Department of Statistics, Stanford University
	2021	IISA Student Paper Competition Winner
	2017	Dorothea Klumpke Roberts Prize

TEACHING	Instructor

Stats 302: Probability Qualifying Exam Workshop. Summer 2019.

TA

18.821 Project Laboratory in Mathematics. Fall 2024.
SLMath summer school on Stochastic Quantization. Summer 2024.
Stats 310A: Theory of Probability I. Fall 2021, Fall 2020, Fall 2019.
Stats 310B: Theory of Probability II. Winter 2020.
Stats 310C: Theory of Probability III. Spring 2020.
Stats 318: Modern Markov Chains. Spring 2021.
Stats 219: Stochastic Processes. Winter 2021.
Stats 217: Introduction to Stochastic Processes I. Winter 2018.
Stats 116: Theory of Probability. Spring 2019, Summer 2018.
Stats 60: Introduction to Statistical Methods: Precalculus. Summer 2021, Fall 2018, Fall 2017.