

Dr. Sabina Jehan Haque

*James Van Loo Independent Postdoctoral Research Fellow
University of Michigan, Department of Mathematics*

<https://sjhaque14.github.io/> • sjhaque@umich.edu

Weiser Hall 707 • 500 Church St, Ann Arbor MI 48109-1043

Employment	University of Michigan Ann Arbor Van Loo Independent Postdoctoral Research Fellow	Jul 2024 - present
Education	Harvard University PhD in Systems Biology Advisor: Jeremy Gunawardena <i>Dissertation title: Graph-theoretic approaches to biochemical reaction networks</i>	Sep 2018 - May 2024
	Middlebury College B.A. in Mathematics (high honors), Molecular Biology & Biochemistry	Sep 2014 - May 2018

Research interests: algebraic graph theory, dynamical systems theory, applied algebraic geometry, chemical reaction network theory, continuous-time Markov processes, non-equilibrium biophysics, fast-slow dynamics and model reduction, structural identifiability

Publications

**Manuscript available upon request*

Submitted

1. ***Haque S. J.**, Eisenberg, M. Effects of infinite parameter limits on the structural identifiability of linear compartment models. Submitted to *SIAM J. Appl. Algebra Geom.* (2026). [Preprint available here.](#)

Published

2. **Haque, S. J.**, Satriano, M., Sorea, M. & Yu, P. Y. The Disguised Toric Locus and Affine Equivalence of Reaction Networks. *SIAM J. Appl. Dyn. Syst.* **22**, 1423–1444 (2023).
3. Chavez, A., Tuttle M, Pruitt B. W., Ewen-Campen B., Chari R., Ter-Ovanesyan D., **Haque S. J. et al.** Comparison of Cas9 activators in multiple species. *Nat. Meth.* **13**, 563–567 (2016).

In Preparation

4. ***Haque S. J.**, Nam K.-M., Gunawardena J. A graph construction for analysing the parametric asymptotics of Markov processes (2026).
5. ***Haque S. J.**, Cetiner U., Gunawardena J. Anomalous behaviour of the Steinberg signature for detecting departure from thermodynamic equilibrium. (2026).

Fellowships and Awards

James Van Loo Independent Postdoctoral Fellowship Michigan Center for Applied and Interdisciplinary Mathematics (MCAIM), University of Michigan Ann Arbor • \$4K travel and research funding each year for 3 years of postdoctoral fellowship	2024 - 2027
SMB Travel Grant for CRNT 2026 Workshop in Hawaii • Lodging accommodated for week-long workshop in chemical reaction networks	2026
Junior Scientists Board Research Grant Challenge (\$10K funding) Center for Complex Particle Systems (COMPASS), University of Michigan Ann Arbor	2024 - 2025
Lynch Foundation PhD Fellowship Department of Systems Biology, Harvard University • 100% salary and tuition support for 3 years of PhD	2019 - 2021, 2023 - 2024
NSF-Simons QBio PhD Fellowship NSF-Simons Center for Mathematical & Statistical Analysis of Biology • 50% salary and tuition support for 1 year, \$4K travel funding	2021 - 2022

Selected Talks

Exploring the effect of parametric model reduction on the structural identifiability of linear compartment models Special session on “Identifiability and Indistinguishability in Dynamical Systems”, Joint Mathematics Meetings 2027, Chicago, IL	Jan 15 2027
Singular parametric limits on graphs, dynamical systems, and algebraic varieties Special session on “Algebraic, Combinatoric, and Stochastic Approaches in Mathematical Biology”, Joint Mathematics Meetings 2027, Chicago, IL	Jan 15 2027
A graph construction for analysing the parametric asymptotics of Markov processes Special session on “Analysis of Interaction Network Models and Its Application to Mathematical Biology”, Joint Mathematics Meetings 2027, Chicago, IL	Jan 14 2027
Discrete structure, continuous dynamics: Graph-theoretic approaches and singular parametric limits in biochemical reaction networks Applied and Interdisciplinary Mathematics (AIM) Seminar, University of Michigan, Ann Arbor MI	Sep 25 2026

Exploring the effect of parametric model reduction on the structural identifiability of linear compartment models 14th European Conference on Mathematical & Theoretical Biology, University of Graz, Graz, Austria	Jul 13 2026
Exploring the effect of parametric model reduction on the structural identifiability of linear compartment models Chemical Reaction Networks Workshop in Hawai'i 2026, University of Hawai'i at Mānoa, Honolulu, HI	May 18 2026
Graph-theoretic approaches to biochemical reaction networks and structural identifiability Applied Algebra Group, Department of Mathematics, University of Copenhagen, Copenhagen, Denmark	Feb 05 2026
Graph-theoretic and algebraic geometric approaches to biochemical reaction networks Mathematics of Reaction Networks (MoRN) Seminar, virtual	Nov 11 2025
Graph-theoretic and algebraic geometric approaches to biochemical reaction networks Mathematics Seminar, Algebraic Systems Biology Group, MPI-CBG, Dresden, Germany	Oct 03 2025
A graph construction for analysing the parametric asymptotics of Markov processes 2025 SIAM Conference on Applied Algebraic Geometry, 4th Madison Workshop on Mathematics of Reaction Networks, Madison, WI	Jul 12 2025
Following the energy: graph-theoretic models of broken detailed balance with biochemical applications. National Institute for Theoretical and Mathematical Biology, Chicago IL	Jan 12 2024
Following the energy: graph-theoretic models of broken detailed balance with biochemical applications. Barcelona Collaboratorium for Modelling and Predictive Biology, UPF, Barcelona Spain	Oct 17 2023
A graph-theoretic approach to Markov processes with applications in biochemical reaction networks. Mathematics Department Colloquium, Middlebury College, Middlebury VT	Oct 03 2023
Following the energy: graph-theoretic models of broken detailed balance with biochemical applications. NSF-Simons QBio Seminar, Harvard University, Cambridge MA	Apr 25 2023
Graph-theoretic models of detecting broken detailed balance in molecular information processing. 2022 SIAM Annual Meeting MS 26: Trends and New Results in Deterministic Models of Biochemical Interaction Networks, Pittsburgh PA	Jul 11 2022

Teaching and mentoring

University of Michigan Ann Arbor

Instructor of record:

MATH 404: Intermediate Differential Equations
(Introduction to Nonlinear Dynamics & Chaos)

Winter 2025
Fall 2025
Fall 2026

MATH 464: Inverse Problems

- Designed undergraduate topics course in Foundations of Chemical Reaction Networks

Winter 2027

Undergraduate students mentored:

Joe Bogdan, University of Michigan

- Project title: Toric geometry of chemical reaction networks (CRNs)
- Independent research study on network operations and toric dynamical systems; poster presentation at SIAM Student Chapter Symposium 2025

Summer 2025

Daniel Le (Colby College) and George Simmons (University of Michigan)

- Project title: Computing Gröbner fans to understand parameter geometry in mathematical biology
- Math REU project focused on Gröbner fan algorithm development

Summer 2026

Harvard University

Teaching fellow:

AM 50: Introduction to Applied Mathematics

Spring 2020

Service

Conferences and seminars organized

Co-organizer for JMM Special Session (accepted)

Joint Mathematics Meetings, Chicago IL

- Session title: “Algebraic, Combinatoric, and Stochastic Approaches in Mathematical Biology”
- Co-organizers: Dr. Ruby Kim, Dr. Naghmeh Akhavan

Jan 2027

Organizer for MCAIM Colloquium

University of Michigan, Ann Arbor MI

- Invited Dr. Jinsu Kim for a visit and a colloquium talk at Michigan Center for Applied and Interdisciplinary Mathematics

2026-present

University and departmental service

Math Corps summer instructor for high school students

University of Michigan, Ann Arbor MI

- Developed and taught 5-week class “What is graph theory” for 9th grade students

2026-present

Intercollegiate Math Modeling Challenge (IM²C) judge University of Michigan, Ann Arbor MI	Nov 2025
Association for Women in Mathematics (AWM) peer mentor University of Michigan, Ann Arbor MI • Run peer mentoring groups for graduate and undergraduate students at University of Michigan	2024-present
<i>Public engagement</i>	
Math Club speaker Department of Mathematics, University of Michigan, Ann Arbor MI	Oct 2024
Guest speaker for summer class on Physics of Biological Function Wentworth Institute of Technology, Boston MA	Jun 2023
Cambridge Science Festival volunteer Cambridge, MA	Oct 2022
“What is Systems Biology?” outreach event creator/coordinator Cambridge Science Festival, Cambridge MA • Developed an interactive public event for the Cambridge Science Festival with hands-on activities illustrating concepts from systems biology	Apr 2019

Science communication

Cellular mathematics Public-facing Substack on mathematics and biology	2022-present
Graph Theory 101 Science in the News: Networks: https://sitn.hms.harvard.edu/flash/2021/graph-theory-101/	Jun-Aug 2021

Professional activities

Referee, SIAM Journal of Life Sciences (SIALS)	2026-present
Member, Society of Industrial and Applied Mathematics (SIAM)	2025-present
Member, Society of Mathematical Biology (SMB)	2026-present