Michael Zshornack

RTG Fellow, Northwestern University

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Research interests

Character varieties, arithmetic groups, mapping class groups, hyperbolic manifolds

Academic positions

Northwestern University — Evanston, IL
RTG Fellow and Boas Assistant Professor — September 2024 - present

Education

University of California, Santa Barbara — Santa Barbara, CA
Ph.D. in Mathematics — September 2019 - June 2024
Advisor: Darren Long

University of California, Santa Barbara — Santa Barbara, CA
M.A. in Mathematics — September 2019 - June 2020

University of California, Los Angeles — Los Angeles, CA
B.S. in Mathematics, specialization in Computing — September 2015 - June 2019

Honors, grants and fellowships

NSF Research Training Grant Postdoctoral Fellowship — 2024 - present
ICM 2026 Travel Grant — 2026
Big Bang Theory Fellowship (The Chuck Lorre Family Foundation) — 2019 - 2024
Academic Senate Outstanding Teaching Assistant Award (Nominated) — 2021
Raymond L. Wilder Award (Department of Mathematics, UCSB) — 2020
Big Bang Theory Scholarship (The Chuck Lorre Family Foundation) — 2015 - 2019

Publications and preprints

(with Sara Edelman-Muñoz) *Thin surface subgroups of non-uniform arithmetic lattices in* $\mathrm{SO}^+(n,1)$, 2026. Submitted

(with Christopher Buyalos[†], Jayden Thadani[†], Xinbei Wang[†] and Bradley Zykoski) *A family of accumulation points of non-free rational numbers*, 2025. Submitted.

(with Jacques Audibert) *Rational approximation for Hitchin representations*, 2023. To appear in Groups, Geometry, and Dynamics.

Integral Zariski dense surface groups in $\mathrm{SL}(n,\mathbf{R})$. Math. Proc. Cambridge Philos. Soc. **179** (2025), no. 1, 63-78.

Invited talks

Twist flows on character varieties of surfaces
University of Illinois Chicago, Geometry Seminar — April 22, 2026

[†]Indicates undergraduate author.

Bending and the arithmetic of surface group representations
University of Illinois Urbana-Champaign, GGT Seminar February 27, 2025

Thin surface group embeddings and deformation theory in higher rank
Northwestern University, Dynamical Systems Seminar October 29, 2025

Subarithmeticity and convex projective structures
CIRM, Group Actions and Rigidity: Around the Zimmer Program, Introductory School April 16, 2024
Lightning Talk

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Twist flows and the arithmetic of surface group representations
UC San Diego, Group Actions Seminar March 7, 2024

Rational surface groups on the Hitchin component
University of Wisconsin–Madison,
Group Actions and Dynamics Seminar January 29, 2024

The arithmetic of the Hitchin component
Joint Mathematics Meetings 2024, Special Session on Geometric Group Theory (associated with the AMS Retiring Presidential Address) January 5, 2024

Rational Hitchin surface subgroups
66th Texas Geometry and Topology Conference November 11, 2023
Lightning Talk

Rational surface groups in higher Teichmüller spaces
UC Santa Barbara, Topology Seminar November 7, 2023

Arithmetic with Mickey Mouse
Wasatch Topology Conference October 21, 2023
Lightning Talk

Zariski dense surface groups in $\mathrm{SL}(n, \mathbf{Z})$
Young Geometric Group Theory XI February 13, 2023
Lightning Talk

Conferences attended

Recent Progress in Topological and Geometric Structures in Low Dimensions
Simons Laufer Mathematical Sciences Institute, Berkeley, CA March 2026

Pathways Workshop: Topological and Geometric Structures in Low Dimensions & Geometry and Dynamics for Discrete Subgroups of Higher Rank Lie Groups
Simons Laufer Mathematical Sciences Institute, Berkeley, CA January 2026

Introductory Workshop: Topological and Geometric Structures in Low Dimensions & Geometry and Dynamics for Discrete Subgroups of Higher Rank Lie Groups
Simons Laufer Mathematical Sciences Institute, Berkeley, CA January 2026

Computational problems about 3-manifolds, associated groups and varieties
Rutgers University-Newark, Newark, NJ October 2025

Low-dimensional phenomena: geometry and dynamics
Institut Henri Poincaré, Paris, France June 2025

The Ergodic Method in Group Theory
Northwestern University, Evanston, IL May 2025

Summer School on Arithmetic and Random Groups
Northwestern University, Evanston, IL May 2025

Hyperbolic Manifolds, Their Submanifolds and Fundamental Groups
Impa, Rio de Janeiro, Brazil January 2025

20 years of Anosov representations
MPI MIS, Leipzig, Germany October 2024

NU Trends in Ergodic Theory
Northwestern University, Evanston, IL August 2024

Moving to higher rank: from hyperbolic to Anosov
Cetraro, Italy July 2024

Computational Aspects of Thin Groups
IMS-NUS, Singapore June 2024

Group Actions and Rigidity: Around the Zimmer Program, Introductory School
CIRM, Marseille, France April 2024

Young Geometric Group Theory XII
University of Bristol, Bristol, United Kingdom April 2024

Joint Math Meetings 2024
San Francisco, California, USA — January 2024

66th Texas Geometry and Topology Conference
Rice University, Houston, Texas, USA — November 2023

Wasatch Topology Conference
University of Utah, Salt Lake City, Utah, USA — October 2023

Higgs bundles, character varieties and higher Teichmüller spaces
ICMAT, Madrid, Spain — May 2023

Dynamics, Rigidity and Arithmetic in Hyperbolic Geometry
ICERM, Providence, Rhode Island, USA — May 2023

Riverside Workshop on Geometric Group Theory
UC Riverside, Riverside, California, USA — March 2023

Young Geometric Group Theory XI
WWU Münster, Münster, Germany — February 2023

Geometry, Arithmetic, and Groups
UT Austin, Austin, Texas, USA — July 2022

Teaching experience

Boas Assistant Professor, Department of Mathematics (Northwestern)

Math 240-0: Linear Algebra	Spring 2026
Math 220-1: Single-Variable Differential Calculus	Fall 2025
Math 220-2: Single-Variable Integral Calculus	Winter 2025
Math 220-1: Single-Variable Differential Calculus	Fall 2024

Teaching associate, Department of Mathematics (UCSB)

Math 6A: Vector Calculus	Summer 2023
Math 6A: Vector Calculus	Summer 2022

Teaching assistant, Department of Mathematics (UCSB)

Math 6A: Vector Calculus	Winter 2024
Math 111A: Abstract Algebra	Fall 2023
Math 182: History of Mathematics	Spring 2023
Math 8: Transition to Higher Mathematics	Winter 2023
Math 117: Methods of Analysis	Fall 2022
Math 108A: Introduction to Linear Algebra	Spring 2022
Math 108A: Introduction to Linear Algebra	Winter 2022
Math 8: Transition to Higher Mathematics	Fall 2021

Math 34B: Calculus for Social and Life Sciences	Winter 2021
Math 34A: Calculus for Social and Life Sciences	Fall 2020
Math 4A: Linear Algebra with Applications	Summer 2020
Math 8: Transition to Higher Mathematics	Spring 2020
Math 34B: Calculus for Social and Life Sciences	Winter 2020
Math 34A: Calculus for Social and Life Sciences	Fall 2019

Service and outreach

Northwestern Dynamics Seminar September 2024 – present

One of the organizers of a weekly faculty seminar on dynamical systems at Northwestern University. Speakers were brought in to discuss topics ranging from topological and smooth dynamics, to applications of dynamical systems to other areas of mathematics such as geometry, number theory and discrete subgroups of Lie groups.

Northwestern Arithmetic Groups Seminar September 2024 – present

One of the organizers of a weekly seminar on dynamical systems at Northwestern University. The seminar featured a mix of informal talks given by local faculty members and graduate students on topics around arithmetic groups and group theory, and talks from speakers from external institutes on current research.

Northwestern University REU June 2025–August 2025

Organized a research project on "Groups, Geometry and Dynamics" as a part of a broader REU on Dynamical Systems at Northwestern University. Students researched a conjecture originating with work of Lyndon–Ullman on groups generated by opposite parabolic matrices in $\mathrm{SL}(2,\mathbb{R})$. The REU resulted in a preprint that is currently submitted for publication.

Computational Aspects of Thin Groups Workshop June 2024

TA for mini-course *Computational Aspects of Strong Approximation* by Dane Flannery at the Computational Aspects of Thin Groups introductory workshop held at the National University of Singapore's Institute for Mathematical Sciences.

UCSB Graduate Topology Seminar September 2022 – June 2024

Organized a weekly seminar for UC Santa Barbara graduate students on topics in topology. Graduate students gave 50-minute talks each week on various topics around work in geometric topology, geometric group theory, quantitative topology and algebraic topology.

UCSB Graduate Scholars Program September 2021 – June 2024

Served as a mentor to new graduate students at UC Santa Barbara. Met and communicated with them regularly to set academic and research goals. Participated in career development workshops with mentees.

UCSB Directed Reading Program January 2023 – June 2023

Served as a mentor to a UC Santa Barbara undergraduate student in a directed reading project on mapping class groups of surfaces.

Math Department DEI Committee September 2020 – June 2021
Served on newly formed committee comprised of faculty, graduate students and staff within the department of mathematics at UC Santa Barbara to address issues regarding diversity, equity and inclusion within the department. Met with other members on a biweekly basis throughout the year and produced a strategic action plan for the Dean of the College of Letters and Science during Fall 2020 detailing an action plan for addressing these issues within the department.

UCSB Graduate Algebra Seminar September 2020 – December 2020
Organized a weekly reading seminar for UC Santa Barbara graduate students in the Fall of 2020. Together, graduate students read through select chapters of *A First Course in Modular Forms* by Diamond and Shurman, while giving weekly presentations on the content of the readings.

Skills

Programming and other technologies
Proficient in: Python, SageMath, C++, LaTeX.
Familiar with: Javascript, HTML.