

NELSON SHUHENG NIU

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EDUCATION

University of Washington, Seattle, WA – **Doctoral Candidate in Mathematics**, Ongoing

Advised by XiaoLin Danny Shi

University of Washington, Seattle, WA – **Master of Science in Mathematics**, Jun. 2023

Massachusetts Institute of Technology, Cambridge, MA – **Bachelor of Science in Mathematics with Computer Science**, Jun. 2021 (Minors in Theater Arts, Writing)

PUBLICATIONS

(in mathematics, authors are conventionally listed alphabetically)

Tanya Khovanova and Nelson Niu. “ m -modular Wythoff.” Urban Larsson, ed. *Games of No Chance 6*, Mathematical Sciences Research Institute Publications, Cambridge University Press, vol. 71, pp. 491–506, May 2025. doi:10.1017/9781009565486.023. Preprint: [arXiv:1608.01025](https://arxiv.org/abs/1608.01025) [math.CO].

Nelson Niu, Katie Waddle, Marquia Williams, and Yufei Zhang. “SUBgroups: Online peer groups for first-year math graduate students (gradsubgroups.org).” *Eur. Math. Soc. Mag.* 132, pp. 53–55, Jun. 2024. doi:10.4171/MAG/191.

Joseph Dorta, Samantha Jarvis, and Nelson Niu. “Monoidal Structures on Generalized Polynomial Categories.” *Proceedings of the Sixth International Conference on Applied Category Theory*, Electronic Proceedings in Theoretical Computer Science, vol. 397, pp. 84–97, Dec. 2023. doi:10.4204/EPTCS.397.6.

ACCEPTED FOR PUBLICATION

Nelson Niu and David I. Spivak. *Polynomial Functors: A Mathematical Theory of Interaction*. Cambridge University Press. To appear 2025. URL: <https://topos.site/poly-book.pdf>

PREPRINTS

Nelson Niu and David I. Spivak. “Collectives: Compositional protocols for contributions and returns.” Dec. 2021. [arXiv:2112.11518](https://arxiv.org/abs/2112.11518) [math.CT]

Nelson Niu and Lillian Zhang. “A multiplicity-free Macdonald identity.” Aug. 2019. URL: <https://math.mit.edu/research/undergraduate/spur/documents/2019Niu-Zhang.pdf>

TALKS

Joint Mathematics Meetings: AMS Special Session on Applied Category Theory, “Applications of Category Theory to Advanced Air Mobility Architecture,” 8 Jan. 2025

Applied Category Theory Conference: “Monoidal structures on generalized polynomial categories,” 2 Aug. 2023

Joint Mathematics Meetings: AMS Special Session on Applied Category Theory (a Mathematics Research Communities Session), "Monoidal structures on generalized polynomial categories,"
5 Jan. 2023

AGI Conference: Technical Keynote, "Polynomial Functors: Natural Formal Models of Interaction,"
20 Aug. 2022

RESEARCH POSITIONS

RESEARCH INTERN, NASA LANGLEY RESEARCH CENTER – JUN '24-MAY '25

Supervisor: Ian Levitt

RESEARCH CONTRACTOR, TOPOS INSTITUTE – JUN-NOV '23

Contact: David Spivak

RESEARCH ASSISTANT, UNIVERSITY OF WASHINGTON – JAN-JUN '22

Supervisor: Max Lieblich

SUMMER RESEARCH ASSOCIATE, TOPOS INSTITUTE – JUN-SEP '21

Supervisor: David Spivak

RESEARCH ASSISTANT, MIT – FEB-MAY '21, JUN-AUG '20, AUG-DEC '19, JUN '18-MAY '19

Supervisor: David Spivak

TEACHING AND MENTORSHIP

TUTOR, UW MATHEMATICS DEPARTMENT – JAN-MAR '25, JAN-MAR '24, MAR-JUN '23

Program: Math Major Study Hall

Supervisors: Rekha Thomas, Jennifer Taggart

TEACHING ASSISTANT, UW MATHEMATICS DEPARTMENT – SEP-DEC '24, MAR-JUN '24, JUN-DEC '22, SEP-DEC '21

Classes: MATH 126 Calculus with Analytic Geometry III; MATH 318 Advanced Linear Algebra: Tools and Applications; MATH 125 Calculus with Analytic Geometry II

Supervisors: Charles Camacho; Elena Pezzoli; Matthew Conroy; Zhixu Su; Kelvin Lam; Yu Yuan

MENTOR, WASHINGTON DIRECTED READING PROGRAM – SEP '21-DEC '23

Students: George Peykanu; Andy Jiang; Anthony Xing; Mitchell Levy; Harper Hults; Hisham Bhatti; Josephine Noone; Seoyoung Cho

Texts: *Seven Sketches in Compositionality: An Invitation to Applied Category Theory* by Brendan Fong & David Spivak; *First Concepts of Topology* by W. G. Chinn and N. E. Steenrod

Supervisor: Bobby Wilson

TA MENTOR, UW MATHEMATICS DEPARTMENT – SEP-DEC '23

Mentees: Henry Cladouhos; Arkamouli Debnath; Tyson Klingner; Andrew Niu; Michael Zeng

Supervisor: Andrew Loveless

PREDOCTORAL INSTRUCTOR, UW MATHEMATICS DEPARTMENT – JAN-MAR '23, JUN-AUG '23

Classes: MATH 208 Matrix Algebra with Applications; MATH 126 Calculus with Analytic Geometry III

Supervisors: Patrick Perkins; Andrew Loveless

TEACHING ASSISTANT, MIT MATHEMATICS DEPARTMENT – SEP '20-MAY '21

Class: 18.200 Principles of Discrete Applied Math

Supervisors: Michel Goemans, Diego Cifuentes

FREELANCE TUTOR AND INSTRUCTOR – SEP '13-DEC '20

Worked with SpringLight Education Institute, City of Cupertino

Topics: Competition math, coding, writing, competition linguistics, calculus, geometry; for high schoolers & middle schoolers

MENTOR, MIT PRIMES CIRCLE – FEB-MAY '20

Students: Sarala Sharma, Stephanie Lu

Book: *A Walk Through Combinatorics* by Miklós Bóna

Supervisors: Pavel Etingof, Peter Haine

LAB ASSISTANT, MIT EECS DEPARTMENT – FEB-MAY '20

Class: 6.009 Fundamentals of Programming

Supervisor: Adam Hartz

LEADERSHIP, SERVICE, AND OUTREACH

UAW LOCAL 4121 LABOR UNION – FEB '23-PRESENT

Positions: Chair, Academic Student Employee (ASE) Unit (Jun '25-Present); Head Steward, ASE Unit (Dec '23-Jun '25); Steward, Department of Mathematics, ASE Unit (Feb '23-Dec '23)

MIT COUNCIL FOR MATH MAJORS – SEP '20-MAY '21

Positions: Representative to MIT Math Diversity & Community Building Committee; Structural Lead; Founding Member

MIT SHAKESPEARE ENSEMBLE – MAY '18-MAY '21

Positions: Chair (May '19-May '21); Officer-at-Large (May '18-May '19)

SKILLS

Languages: English, Mandarin

Programming languages: Python, Java, C++, Haskell, Coq, Idris, Agda, Lean, Mathematica, LaTeX

Other: Project management, creative writing, acting, stage directing

AWARDS & HONORS

UW Math Excellence in Teaching Award: Awarded 2023; Finalist 2022

UW Departmental Fellowship (Top Scholar): Awarded 2022

UW Provost Fellowship: Awarded 2021

MIT Math Teaching & Learning Award: Awarded 2021

MIT Alan Brody Prize: Awarded 2021

International Linguistics Olympiad: Silver medal, rank 13th, awarded 2016