Nicholas Ovenhouse

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Research Interests

I am primarily interested in combinatorics. Specifically, I work on topics related to *dimer models*, especially those that also involve

- cluster algebras
- enumerative and algebraic combinatorics
- Poisson geometry, symplectic geometry, and integrable systems
- Teichmüller spaces and character varieties

Publications & Preprints

Eigenvalues of Matrix Products
(with Richard Kenyon)
Arxiv preprint (2024), arXiv:2407.10786

Noncommutative Networks on a Cylinder
(with Semeon Arthamonov and Michael Shapiro)
Communications in Mathematical Physics, Volume 405 (2024)

Some Aspects of Higher Continued Fractions
(with Anuj Sakarda and Etan Basser)
Arxiv preprint (2024), arXiv:2401.12859

Higher-Rank Dimer Models
(with Richard Kenyon)
Arxiv preprint (2023), arXiv:2312.03087

Higher Dimer Covers on Snake Graphs
(with Gregg Musiker, Ralf Schiffler, and Sylvester Zhang)
Arxiv preprint (2023), arXiv:2306.14389

q-Rational and q-Real Binomial Coefficients
(with John Machacek)
Advances in Applied Mathematics (2023)

Matrix Formulae for Decorated Super Teichmüller Spaces
(with Gregg Musiker and Sylvester Zhang)
Journal of Geometry and Physics, Volume 189 (2023)

q-Rationals and Finite Schubert Varieties
Comptes Rendus Mathematique, Volume 361 (2023)

Double Dimer Covers on Snake Graphs from Super Cluster Expansions
(with Gregg Musiker and Sylvester Zhang)
Journal of Algebra, Volume 608 (2022)

Discrete Dynamical Systems from Real Valued Mutation

(with John Machacek)
Experimental Mathematics (2022)

An Expansion Formula for Decorated Super-Teichmüller Spaces
(with Gregg Musiker and Sylvester Zhang)
SIGMA, Vol 17 (2021)

Non-Commutative Integrability of the Grassmann Pentagram Map
Advances in Mathematics, Volume 373 (2020)

Log-Canonical Coordinates for Poisson Brackets and Rational Changes of Coordinates
(with John Machacek)
Journal of Geometry and Physics, Volume 121 (2017)

Employment	**Gibbs Assistant Professor** Yale University	2024 ∼ Present
	Postdoctoral Associate Yale University	2022 ∼ 2024
	RTG Postdoc University of Minnesota	2019 ∼ 2022
	Graduate Teaching Assistant Michigan State University	2013 ∼ 2019
Education	**Ph.D. in Mathematics** Michigan State University Advisor: Michael Shapiro Thesis: *Log-Canonical Poisson Structures and Non-Commutative Integrable Systems*	May 2019
	B.S. in Computer Science Michigan State Univsersity Minor in Mathematics	December 2012

Invited Talks	• Max Planck Institute Geometry Seminar (remote)	May 2024
	• University of Illinois Algebra-Geometry-Combinatorics Seminar	Mar 2024
	• Selected Topics in Mathematics (online UK seminar)	Feb 2024
	• Dimers: Combinatorics, Rep Theory and Physics, New York City	Aug 2023
	• JMM session on Cluster Algebras, Boston	Jan 2023
	• Michigan State University Cluster Algebras Seminar	Nov 2022
	• University of Arizona Algebra Seminar	Nov 2022
	• University of Connecticut Algebra Seminar	Sep 2022
	• Gone Fishing Poisson Geometry Conference, Savannah GA	Apr 2022
	• Workshop on Supergeometry, Fields Institute, Toronto	Mar 2022
	• Paris Algebra Seminar (online)	Dec 2021

- Quantum Curves, Integrability, and Cluster Algebras, Melbourne   Dec 2021
- Online Cluster Algebra Seminar   May 2021
- Michigan State Combinatorics and Graph Theory Seminar   Feb 2021
- Yale Clusters and Geometry Seminar (online)   Oct 2020
- AMS Sectional, Penn State (online)   Oct 2020
- University of Arizona Hamiltonian Systems Seminar (online)   Oct 2020
- University of Wisconsin-Madison Combinatorics Seminar   Mar 2020
- Michigan State University Cluster Algebras Seminar   Feb 2020
- Notre Dame Cluster Algebras Seminar   Oct 2019
- KUMUNU Jr, Student Comm. Alg. Conference, U of Nebraska   Mar 2019
- York University Combinatorics Seminar   Jan 2019
- University of Minnesota Combinatorics Seminar   Nov 2018
- AMS Sectional, University of Michigan   Oct 2018
- Grad Student Topology/Geometry Conference, Michigan State   Apr 2017

Teaching Experience

Yale University   2022 ∼ Present

- Discrete Mathematics
- Combinatorics
- Linear Algebra
- Poisson Geometry (graduate topics course)

University of Minnesota   2019 ∼ 2022

- Enumerative Combinatorics
- Graph Theory
- Abstract Algebra
- Cryptology and Number Theory
- Multivariable Calculus

Michigan State University   2013 ∼ 2019

- Transitions and Proofs
- Calculus I, II, and III
- Survey of Calculus
- College Algebra

Mentoring Experience	**Supervised Undergraduate Independent Study** Yale University	2024

- Student: Etan Basser
  Project: Lie Algebras and Representation Theory

Minnesota Research Workshop in Algebra and Combinatorics   2024
University of Minnesota

- Problem mentor
- Research problem: local statistics for higher dimer models
- led to ongoing collaboration with grad students, currently in progress

Supervised Undergraduate Research   2023
Yale University

- Students: Etan Basser and Anuj Sakarda
  Project: Higher analogs of continued fractions
  Resulted in Preprint – arXiv:2401.12859

Supervised Undergraduate Capstone & Honors Theses $2019 \sim 2022$
University of Minnesota

- Student: Grace Ditmar
  Project: Representation Theory of Symmetric Groups
- Student: Isaac Martin
  Project: q-Analogues of Rational Numbers
- Student: Antonio Turley
  Project: Elliptic Curve Cryptology

Mentor for Summer REU   2020
University of Minnesota

- Project: Unimodality conjecture for q-rational numbers

Center for Instructional Mentoring $2015 \sim 2019$
Michigan State University
Lead TA / Mentor for:
- Survey of Calculus
- Calculus II and III
- all courses (during summer semester)

Organization	**AMS Sectional, Special Session on Cluster Algebras** University of Cincinnati	April 2023

Combinatorics Seminar $2020 \sim 2022$
University of Minnesota

Student Algebra Seminar $2017 \sim 2019$
Michigan State University

Conferences Attended

Journeys in Mathematics   June 2024
(conference in honor of Jim Propp)
MIT

Enumerative and Algebraic Combinatorics   Feb 2024
(conference in honor of Bruce Sagan)
University of Florida

Dimers: Combinatorics, Representation Theory, and Physics   Aug 2023
New York City

Cluster Algebras and Poisson Geometry   June 2023
(conference in honor of M. Gekhtman, M. Shapiro, and A. Vainshtein)
Levico Terme, Italy

Gone Fishing Poisson Geometry Conference   March 2023
Amherst College

Joint Mathematics Meeting   January 2023
Boston, MA

Open Problems in Algebraic Combinatorics   May 2022
University of Minnesota

Gone Fishing Poisson Geometry Conference   April 2022
Georgia Southern University

**Workshop on Supergeometry and
Bracket Structures in Math & Physics**   March 2022
Fields Institute, Toronto

AMS Sectional Meeting   October 2020
Penn State (online)

KUMUNU Jr Commutative Algebra Conference   March 2019
University of Nebraska

**Combinatorics & Beyond: the Many Facets
of Sergey Fomin's Mathematics**   November 2018
(conference in honor of Sergey Fomin)
University of Michigan

AMS Sectional Meeting   October 2018
University of Michigan

**Retakh Fest: Non-commutative Structures,
Cluster Algebras, and Applications**   June 2018

(conference in honor of Vladimir Retakh)
University of Angers, France

Combinatorics of Moduli Spaces, Cluster Algebras,
and Topological Recursion   June 2018
Steklov Mathematical Institute, Moscow, Russia

Cluster Algebras and Math Physics   May 2018
Michigan State University

Algebra Extravaganza   July 2017
Temple Univsersity

Cluster Algebra Spring School   May 2017
University of Connecticut

"Gone Fishing" Poisson Geometry Conference   May 2017
Notre Dame

Midwest Algebraic Geometry Graduate Conference   April 2017
University of Illinois, Chicago

Graduate Student Topology and Geometry Conference   April 2017
Michigan State University

AMS Sectional Meeting   October 2015
Loyola University, Chicago

AMS Sectional Meeting   March 2015
Michigan State University