Nicholas Ovenhouse

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Research Interests
I am interested in algebra, combinatorics, and geometry. Specifically, I work on topics related to cluster algebras, especially those that also involve

- enumerative combinatorics
- symplectic/Poisson geometry and integrable systems
- Teichmüller spaces and character varieties
- noncommutative algebra & noncommutative geometry
- Grassmannians and flag varieties

Publications & Preprints

Matrix Formulae for Decorated Super Teichmüller Spaces
(with Gregg Musiker and Sylvester Zhang)
Arxiv preprint (2022), arXiv:2208.13664

q-Rationals and Finite Schubert Varieties
Comptes Rendus Mathematique (to appear)
Arxiv preprint (2021), arXiv:2111.07912 [math.CO]

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)
Symmetry, Integrability, and Geometry: Methods and Applications, Vol 17 (2021)

Noncommutative Networks on a Cylinder
(with Semeon Arthamonov and Michael Shapiro)
Arxiv preprint (2020), arXiv:2008.02889 [math.QA]

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

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

Education
Ph.D. in Mathematics
May 2019
Michigan State University
Advisor: Michael Shapiro
Thesis: Log-Canonical Poisson Structures and Non-Commutative Integrable Systems
B.S. in Computer Science
Michigan State University
Minor in Mathematics

Employment
Postdoctoral Associate
Yale University
2022 ~ Present

RTG Postdoc
University of Minnesota
2019 ~ 2022

Graduate Teaching Assistant
Michigan State University
2013 ~ 2019

Undergraduate Teaching Assistant
Michigan State University
2010 ~ 2012

Undergraduate Research Assistant
Michigan State University
2011 ~ 2013

- Worked on software package HOM4PS 3.0, (solves polynomial systems numerically using homotopy continuation)
- Supervised by Tianran Chen and Tien-Yien Li

Invited Talks
- 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

| University             | Time          |
|------------------------|---------------|
| **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 Capstone & Honors Theses | Time          |
|--------------------------------------------------|---------------|
| University of Minnesota                          | 2019 ~ 2022   |
| • 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

| University of Minnesota | 2020          |
|-------------------------|---------------|
| Project: Unimodality conjecture for $q$-rational numbers |
| Students: Preston Cranford & Eli Fonseca           |

### Center for Instructional Mentoring

| Michigan State University | Time          |
|---------------------------|---------------|
| Lead TA / Mentor for:     | 2015 ~ 2019   |
| • Survey of Calculus     |
| • Calculus II and III    |
| • all courses (during summer semester) |

### Seminars Organized

| Combinatorics Seminar | Time          |
|-----------------------|---------------|
| University of Minnesota | 2020 ~ 2022   |

| Student Algebra Seminar | Time          |
|-------------------------|---------------|
| Michigan State University | 2017 ~ 2019   |
| Conference Name                                                      | Date         |
|---------------------------------------------------------------------|--------------|
| **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                                          |              |
| **Interdisciplinary Applications of Cluster Algebras**              | November 2021|
| Isaac Newton Institute, Cambridge                                   |              |
| **AMS Sectional Meeting**                                           | October 2020 |
| Penn State                                                          |              |
| **Dimers in Combinatorics and Cluster Algebras**                   | August 2020  |
| University of Michigan                                              |              |
| **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 University                                                   |              |
| **Cluster Algebra Spring School**                                   | May 2017     |
| University of Connecticut                                          |              |
| **“Gone Fishing” Poisson Geometry Conference**                     | May 2017     |
| Notre Dame                                                          |              |
Midwest Algebraic Geometry Graduate Conference
University of Illinois, Chicago

Graduate Student Topology and Geometry Conference
Michigan State University

AMS Sectional Meeting
Loyola University, Chicago

AMS Sectional Meeting
Michigan State University