

# Matthew N. Mastroeni

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## Employment

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**Postdoc Research Associate**, Iowa State University

August 2021 – Present

**Postdoctoral Fellow**, Oklahoma State University

August 2018 – May 2021

## Education

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**Ph.D. in Mathematics**, University of Illinois at Urbana-Champaign

2018

Thesis: *Betti Numbers of Koszul Algebras and Codimension Two Matrix Factorizations*

Advisor: Hal Schenck

**M.S. in Mathematics**, Syracuse University

2012

**B.A. in Mathematics**, Ithaca College

2009

## Research

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**Interests:** Computational, combinatorial, and homological aspects of commutative algebra, especially the structure of free resolutions, Koszul algebras, linkage, and Rees algebras.

### Publications:

\* = undergraduate coauthor

- (1) M. Mastroeni, J. McCullough, A. Osborne\*, J. Rice, and C. Willis\*. *Depth and singular varieties of exterior edge ideals*. To appear in Rocky Mountain J. Math. [arXiv:2208.03366](https://arxiv.org/abs/2208.03366)
- (2) M. Mastroeni and J. McCullough. *Chow rings of matroids are Koszul*. Math. Ann. 387 (2023), no.3-4, 1819–1851.
- (3) C. Francisco, M. Mastroeni, J. Mermin, and J. Schweig. *Computing generalized Frobenius powers of monomial ideals*. Submitted. [arXiv:2005.14643](https://arxiv.org/abs/2005.14643)
- (4) L. Ferraro, F. Galetto, F. Gandini, H. Huang, M. Mastroeni, and X. Ni. *The InvariantRing package for Macaulay2*. To appear in J. Softw. Algebra Geom. [arXiv:2010.15331](https://arxiv.org/abs/2010.15331)
- (5) P. Mantero and M. Mastroeni. *The structure of Koszul algebras defined by four quadrics*. J. Algebra 601 (2022), 280–311.

- (6) M. Mastroeni, H. Schenck, and M. Stillman. *Quadratic Gorenstein rings and the Koszul property II*. Int. Math. Res. Not. IMRN 2023, no. 2, 1461–1482.
- (7) P. Mantero and M. Mastroeni. *Betti numbers of Koszul algebras defined by four quadrics*. J. Pure Appl. Algebra 225 (2021), no. 2, Paper No. 106504.
- (8) M. Mastroeni, H. Schenck, and M. Stillman. *Quadratic Gorenstein rings and the Koszul property I*. Trans. Amer. Math. Soc. 374 (2021), no. 2, 1077–1093.
- (9) M. Mastroeni. *Koszul almost complete intersections*. J. Algebra 501 (2018), 285–302.
- (10) M. Mastroeni. *Matrix factorizations and singularity categories in codimension two*. Proc. Amer. Math. Soc. 136 (2018), no. 11, 4605–4617.

## Honors and Awards

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### Postdoctoral Scholar Excellence Award for Teaching/Mentoring

2022

Iowa State University

*One of only two university-wide awards based on a teaching statement, CV, student evaluations, and classroom observation.*

### AMS-Simons Travel Grant

2021

### Departmental TA Instructional Award

2017

University of Illinois Math Department

*Annual departmental award based on a teaching portfolio, student evaluations, an interview, and classroom observation.*

### REGS Day Award

2013

University of Illinois Math Department

*Award for the best summer research project on higher codimension matrix factorizations.*

### Donald E. Kibbey Prize

2010

Syracuse University Math Department

### University Fellowship

2009

Syracuse University

## Teaching Experience

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### Large Lecture Instructor (Iowa State University)

Math 151 Calculus for Business and Social Sciences	Fall 2021
Math 165 Calculus 1	Spring 2023, Spring 2022
Math 267 Elementary Differential Equations and Laplace Transforms	Spring 2024

### Instructor (Oklahoma State University)

Math 2144 Calculus 1	Spring 2021, Fall 2020, Fall 2018
Math 2153 Calculus 2	Fall 2019
Math 3013 Linear Algebra	Spring 2020
Math 3613 Intro to Abstract Algebra	Spring 2020, Fall 2019, Spring 2019

### Instructor (University of Illinois)

Math 124 Finite Mathematics	Spring 2018
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### Instructor (Syracuse University)

MAT 221 Elementary Probability and Statistics 1	Fall 2011, Spring 2011
MAT 286 Calculus for the Life Sciences	Spring 2012

### Recitation Instructor (Iowa State University)

Math 166 Calculus 2	Fall 2023, Fall 2022
Math 267 Elementary Differential Equations and Laplace Transforms	Fall 2021

### Teaching Assistant (University of Illinois)

Math 221 Calculus 1	Fall 2016, Fall 2015
Math 231 Calculus 2	Fall 2017, Spring 2016, Spring 2015, Fall 2014, Spring 2014, Spring 2013, Fall 2012
Math 241 Calculus 3	Fall 2013

### Teaching Assistant (Syracuse University)

MAT 121 Probability and Statistics for the Liberal Arts 1	Fall 2010
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### Grader (University of Illinois)

Math 416 Abstract Linear Algebra	Spring 2018
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## Invited Talks

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<b>AMS Special Session on Homological Methods in Commutative Algebra and Algebraic Geometry</b> San Francisco, CA	May 2024
<b>AMS Special Session on Connections between Commutative Algebra and Algebraic Combinatorics</b> Milwaukee, WI	April 2024
<b>AMS Special Session on Group Actions in Commutative Algebra</b> San Francisco, CA	January 2024
<b>Algebra Seminar</b> New Mexico State University	November 2023
<b>AMS Special Session on Commutative Algebra</b> Omaha, NE	October 2023
<b>Commutative Algebra and Algebraic Geometry Seminar</b> University of Minnesota	April 2023
<b>Fellowship of the Ring National Seminar</b> virtual	January 2023
<b>AMS Special Session on Topological and Combinatorial Methods in Commutative Algebra</b> Boston, MA	January 2023
<b>AMS Special Session on Interactions between Combinatorics and Commutative Algebra</b> El Paso, TX	September 2022
<b>AMS Special Session on Commutative Algebra</b> virtual	May 2022
<b>Algebra and Geometry Seminar</b> Queen's University	April 2022
<b>Algebra Seminar</b> University of Arkansas	March 2022
<b>AMS Special Session on Combinatorial Methods in Commutative Algebra</b> virtual	March 2022
<b>CA+ Conference invited plenary talk</b> Minneapolis, MN	October 2021
<b>AMS Special Session on Commutative Algebra</b> virtual	October 2021

<b>AMS Special Session on Commutative Algebra</b> virtual	April 2021
<b>AMS Special Session on Commutative Algebra and its Interaction with Algebraic Geometry and Combinatorics</b> virtual	March 2021
<b>Algebra and Geometry Seminar</b> Iowa State University	October 2020
<b>AMS Special Session on Commutative Algebra and Connections to Algebraic Geometry and Combinatorics</b> virtual	October 2020
<b>AMS Special Session on Combinatorial Techniques in Commutative Algebra</b> West Lafayette, IN	April 2020 (canceled)
<b>Algebra Seminar</b> University of Arkansas	April 2019
<b>AMS Special Session on Interactions Between Combinatorics and Commutative Algebra</b> Fayetteville, AR	November 2018
<b>AMS Special Session on Commutative Algebra and Complexity</b> Ann Arbor, MI	October 2018
<b>Math Department Colloquium</b> Oklahoma State University	October 2018
<b>Algebra Seminar</b> University of Arkansas	April 2018
<b>Combinatorial and Commutative Algebra Seminar</b> Oklahoma State University	April 2018
<b>Commutative Algebra Seminar</b> University of Nebraska–Lincoln	April 2018
<b>AMS Special Session on Commutative and Combinatorial Algebra</b> Columbus, OH	March 2018
<b>AMS Special Session on Commutative Algebra in All Characteristics</b> San Diego, CA	January 2018
<b>Structures on Free Resolutions Conference</b> Lubbock, TX	October 2017

## Service, Mentoring, and Outreach

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### AWM Graduate Student Poster Session Judge

Joint Math Meetings

January 2023

### Iowa State Mathematics Research Teams Mentor

Iowa State University

Spring 2024, Spring 2022

### Stillwater High School Math Seminar

Stillwater, OK

April 2020 (canceled),  
November 2019

### Graduate Affairs Committee Member

University of Illinois Math Department

Fall 2017 – Spring 2018

### TA Teaching Awards Committee Member

University of Illinois Math Department

Fall 2017

### Illinois Geometry Lab Graduate Student Mentor

University of Illinois

June 2017

### Commutative Ring Theory Seminar Organizer

University of Illinois

Fall 2014 – Spring 2018

## Software Creation

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### LatticeChowRings package for Macaulay2

<https://github.com/mnmastro/LatticeChowRings>

2022

*A package for working with the Feichtner-Yuzvinsky Chow rings of atomic lattices with respect to a given building set, including the augmented Chow rings and graded "obius algebras of matroids.*

### InvariantRing package for Macaulay2

with L. Ferraro, F. Galetto, F. Gandini, T. Hawes, H. Huang, and X. Ni

<https://github.com/galettof/InvariantRing>

2020

*A package for computing invariants of group actions on polynomial rings. Includes a variety of methods for computing invariants of finite groups, diagonal actions of tori and finite abelian groups, and actions of linearly reductive groups.*

### TestIdeals package for Macaulay2

with E. Bela, A. Boix, J. Bruce, D. Ellingson, D. Hernández, Z. Kadyrsizova, M. Katzman, S. Malec, M. Mostafazadehfard, M. Robinson, K. Schwede, D. Smolkin, P. Teixeira, and E. Witt

2019

*A package for working with singularities in positive characteristic via computations of test ideals and related objects.*

## Professional Development

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**Algebra Days Workshop**

Arizona State University

November 2023

**Macaulay2 Workshop**

Cleveland State University (online workshop)

May 2020

**CIME Recent Developments in Commutative Algebra Workshop**

July 2019

**CBMS Conference on Applications of Polynomial Systems**

Texas Christian University

June 2018

**Macaulay2 Workshop**

University of Wisconsin Madison

April 2018

**MSRI Homological Conjectures Workshop**

March 2018

**Stillman's Conjecture and other Progress on Free Resolutions**

UC Berkeley

July 2017

**RTG Homological Conjectures in Commutative Algebra Workshop**

University of Illinois Chicago

November 2016

**Macaulay2 Workshop**

University of Utah

May 2016

**RTG Local Cohomology Workshop**

University of Illinois Chicago

February 2015