

# Matthew N. Mastroeni

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## Employment

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| <b>Assistant Professor</b> , SUNY Polytechnic Institute   | August 2024 – Present  |
| <b>Postdoc Research Associate</b> , Iowa State University | August 2021 – May 2024 |
| <b>Postdoctoral Fellow</b> , Oklahoma State University    | August 2018 – May 2021 |

## Education

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| <b>Ph.D. in Mathematics</b> , University of Illinois at Urbana-Champaign<br>Thesis: <i>Betti Numbers of Koszul Algebras and Codimension Two Matrix Factorizations</i><br>Advisor: Hal Schenck | 2018 |
| <b>M.S. in Mathematics</b> , Syracuse University  | 2012 |
| <b>B.A. in Mathematics</b> , 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) A. LaClair, M. Mastroeni, J. McCullough, and I. Peeva. *Koszul graded Möbius algebras and strongly chordal graphs*. Submitted.
- (2) 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)
- (3) M. Mastroeni and J. McCullough. *Chow rings of matroids are Koszul*. Math. Ann. 387 (2023), no.3-4, 1819–1851.
- (4) 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)

- (5) L. Ferraro, F. Galetto, F. Gandini, H. Huang, M. Mastroeni, and X. Ni. *The InvariantRing package for Macaulay2*. J. Softw. Algebra Geom. 14 (2024), 5–11.
- (6) P. Mantero and M. Mastroeni. *The structure of Koszul algebras defined by four quadrics*. J. Algebra 601 (2022), 280–311.
- (7) 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.
- (8) 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.
- (9) 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.
- (10) M. Mastroeni. *Koszul almost complete intersections*. J. Algebra 501 (2018), 285–302.
- (11) 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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| <p><b>Postdoctoral Scholar Excellence Award for Teaching/Mentoring</b><br/>Iowa State University</p> <p><i>One of only two university-wide awards based on a teaching statement, CV, student evaluations, and classroom observation.</i></p> | 2022 |
| <p><b>AMS-Simons Travel Grant</b></p>  | 2021 |
| <p><b>Departmental TA Instructional Award</b><br/>University of Illinois Math Department</p> <p><i>Annual departmental award based on a teaching portfolio, student evaluations, an interview, and classroom observation.</i></p>            | 2017 |
| <p><b>REGS Day Award</b><br/>University of Illinois Math Department</p> <p><i>Award for the best summer research project on higher codimension matrix factorizations.</i></p>  | 2013 |
| <p><b>Donald E. Kibbey Prize</b><br/>Syracuse University Math Department</p>   | 2010 |
| <p><b>University Fellowship</b><br/>Syracuse University</p>  | 2009 |

## Teaching Experience

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### Instructor (SUNY Polytechnic Institute)

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|------------------------|-----------|
| MAT 151 Calculus 1     | Fall 2024 |
| MAT 280 Linear Algebra | Fall 2024 |

### Large Lecture Instructor (Iowa State University)

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|---|--------------------------|
| 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)

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|-------------------------------------|-------------------------------------|
| 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)

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

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|---|------------------------|
| 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)

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

### Teaching Assistant (University of Illinois)

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|---------------------|--|
| Math 221 Calculus 1 | Fall 2016, Fall 2015   |
| Math 231 Calculus 2 | Fall 2017, Spring 2016, Spring 2015,<br>Fall 2014, Spring 2014, Spring 2013, Fall 2012 |
| Math 241 Calculus 3 | Fall 2013  |

### Teaching Assistant (Syracuse University)

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|---|-----------|
| MAT 121 Probability and Statistics for the Liberal Arts 1 | Fall 2010 |
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## Invited Talks

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| <b>Route 81 Conference on Commutative Algebra and Algebraic Geometry</b><br>Cornell University                       | November 2024  |
| <b>AMS Special Session on Commutative Algebra and Its Connections to Combinatorics</b><br>San Antonio, TX            | September 2024 |
| <b>AMS Special Session on Homological Methods in Commutative Algebra and Algebraic Geometry</b><br>San Francisco, CA | May 2024       |
| <b>AMS Special Session on Connections between Commutative Algebra and Algebraic Combinatorics</b><br>Milwaukee, WI   | April 2024     |
| <b>AMS Special Session on Group Actions in Commutative Algebra</b><br>San Francisco, CA                              | January 2024   |
| <b>Algebra Seminar</b><br>New Mexico State University  | November 2023  |
| <b>AMS Special Session on Commutative Algebra</b><br>Omaha, NE   | October 2023   |
| <b>Commutative Algebra and Algebraic Geometry Seminar</b><br>University of Minnesota                                 | April 2023     |
| <b>Fellowship of the Ring National Seminar</b><br>virtual  | January 2023   |
| <b>AMS Special Session on Topological and Combinatorial Methods in Commutative Algebra</b><br>Boston, MA             | January 2023   |
| <b>AMS Special Session on Interactions between Combinatorics and Commutative Algebra</b><br>El Paso, TX              | September 2022 |
| <b>AMS Special Session on Commutative Algebra</b><br>virtual   | May 2022       |
| <b>Algebra and Geometry Seminar</b>  | April 2022     |

Queen's University

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| <b>Algebra Seminar</b><br>University of Arkansas   | March 2022               |
| <b>AMS Special Session on Combinatorial Methods in Commutative Algebra</b><br>virtual                                      | March 2022               |
| <b>CA+ Conference invited plenary talk</b><br>Minneapolis, MN  | October 2021             |
| <b>AMS Special Session on Commutative Algebra</b><br>virtual   | October 2021             |
| <b>AMS Special Session on Commutative Algebra</b><br>virtual   | April 2021               |
| <b>AMS Special Session on Commutative Algebra and its Interaction with Algebraic Geometry and Combinatorics</b><br>virtual | March 2021               |
| <b>Algebra and Geometry Seminar</b><br>Iowa State University   | October 2020             |
| <b>AMS Special Session on Commutative Algebra and Connections to Algebraic Geometry and Combinatorics</b><br>virtual       | October 2020             |
| <b>AMS Special Session on Combinatorial Techniques in Commutative Algebra</b><br>West Lafayette, IN                        | April 2020<br>(canceled) |
| <b>Algebra Seminar</b><br>University of Arkansas   | April 2019               |
| <b>AMS Special Session on Interactions Between Combinatorics and Commutative Algebra</b><br>Fayetteville, AR               | November 2018            |
| <b>AMS Special Session on Commutative Algebra and Complexity</b><br>Ann Arbor, MI  | October 2018             |
| <b>Math Department Colloquium</b><br>Oklahoma State University   | October 2018             |
| <b>Algebra Seminar</b><br>University of Arkansas   | April 2018               |
| <b>Combinatorial and Commutative Algebra Seminar</b><br>Oklahoma State University  | April 2018               |

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| <b>Commutative Algebra Seminar</b><br>University of Nebraska–Lincoln                      | April 2018   |
| <b>AMS Special Session on Commutative and Combinatorial Algebra</b><br>Columbus, OH       | March 2018   |
| <b>AMS Special Session on Commutative Algebra in All Characteristics</b><br>San Diego, CA | January 2018 |
| <b>Structures on Free Resolutions Conference</b><br>Lubbock, TX                           | October 2017 |

## Service, Mentoring, and Outreach

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| <b>AWM Graduate Student Poster Session Judge</b><br>Joint Math Meetings              | January 2023                            |
| <b>Iowa State Mathematics Research Teams Mentor</b><br>Iowa State University         | Spring 2024, Spring 2022                |
| <b>Stillwater High School Math Seminar</b><br>Stillwater, OK                         | April 2020 (canceled),<br>November 2019 |
| <b>Graduate Affairs Committee Member</b><br>University of Illinois Math Department   | Fall 2017 – Spring 2018                 |
| <b>TA Teaching Awards Committee Member</b><br>University of Illinois Math Department | Fall 2017                               |
| <b>Illinois Geometry Lab Graduate Student Mentor</b><br>University of Illinois       | June 2017                               |
| <b>Commutative Ring Theory Seminar Organizer</b><br>University of Illinois           | Fall 2014 – Spring 2018                 |

## Software Creation

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| <b>LatticeChowRings package</b> for Macaulay2<br><a href="https://github.com/mnmastro/LatticeChowRings">https://github.com/mnmastro/LatticeChowRings</a><br><i>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.</i> | 2022 |
| <b>InvariantRing package</b> for Macaulay2   | 2020 |

with L. Ferraro, F. Galetto, F. Gandini, T. Hawes, H. Huang, and X. Ni  
<https://github.com/galettof/InvariantRing>

*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 2019

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

*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** November 2023  
Arizona State University

**Macaulay2 Workshop** May 2020  
Cleveland State University (online workshop)

**CIME Recent Developments in Commutative Algebra Workshop** July 2019

**CBMS Conference on Applications of Polynomial Systems** June 2018  
Texas Christian University

**Macaulay2 Workshop** April 2018  
University of Wisconsin Madison

**MSRI Homological Conjectures Workshop** March 2018

**Stillman's Conjecture and other Progress on Free Resolutions** July 2017  
UC Berkeley

**RTG Homological Conjectures in Commutative Algebra Workshop** November 2016  
University of Illinois Chicago

**Macaulay2 Workshop** May 2016  
University of Utah

**RTG Local Cohomology Workshop** February 2015  
University of Illinois Chicago