Matthew N. Mastroeni

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Employment

Assistant Professor, SUNY Polytechnic Institute   August 2024 − Present

Postdoc Research Associate, Iowa State University   August 2021 − May 2024

Postdoctoral Fellow, Oklahoma State University   August 2018 − May 2021

Education

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

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

(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

(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

(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

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

Instructor (SUNY Polytechnic Institute)

MAT 151 Calculus 1   Fall 2024

MAT 280 Linear Algebra   Fall 2024

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   Spring 2024
Laplace Transforms

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

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   Fall 2021
Laplace Transforms

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

Grader (University of Illinois)

Math 416 Abstract Linear Algebra

Invited Talks

AMS Special Session on Commutative Algebra and Its Connections to Combinatorics
San Antonio, TX
September 2024

AMS Special Session on Homological Methods in Commutative Algebra and Algebraic Geometry
San Francisco, CA
May 2024

AMS Special Session on Connections between Commutative Algebra and Algebraic Combinatorics
Milwaukee, WI
April 2024

AMS Special Session on Group Actions in Commutative Algebra
San Francisco, CA
January 2024

Algebra Seminar
New Mexico State University
November 2023

AMS Special Session on Commutative Algebra
Omaha, NE
October 2023

Commutative Algebra and Algebraic Geometry Seminar
University of Minnesota
April 2023

Fellowship of the Ring National Seminar
virtual
January 2023

AMS Special Session on Topological and Combinatorial Methods in Commutative Algebra
Boston, MA
January 2023

AMS Special Session on Interactions between Combinatorics and Commutative Algebra
El Paso, TX
September 2022

AMS Special Session on Commutative Algebra
virtual
May 2022

Algebra and Geometry Seminar
Queen's University
April 2022

Algebra Seminar
March 2022

University of Arkansas

AMS Special Session on Combinatorial Methods in Commutative Algebra   March 2022
virtual

CA+ Conference invited plenary talk   October 2021
Minneapolis, MN

AMS Special Session on Commutative Algebra   October 2021
virtual

AMS Special Session on Commutative Algebra   April 2021
virtual

AMS Special Session on Commutative Algebra and its Interaction with Algebraic Geometry and Combinatorics   March 2021
virtual

Algebra and Geometry Seminar   October 2020
Iowa State University

AMS Special Session on Commutative Algebra and Connections to Algebraic Geometry and Combinatorics   October 2020
virtual

AMS Special Session on Combinatorial Techniques in Commutative Algebra   April 2020 (canceled)
West Lafayette, IN

Algebra Seminar   April 2019
University of Arkansas

AMS Special Session on Interactions Between Combinatorics and Commutative Algebra   November 2018
Fayetteville, AR

AMS Special Session on Commutative Algebra and Complexity   October 2018
Ann Arbor, MI

Math Department Colloquium   October 2018
Oklahoma State University

Algebra Seminar   April 2018
University of Arkansas

Combinatorial and Commutative Algebra Seminar   April 2018
Oklahoma State University

Commutative Algebra Seminar   April 2018
University of Nebraska–Lincoln

AMS Special Session on Commutative and Combinatorial Algebra   March 2018
Columbus, OH

AMS Special Session on Commutative Algebra in All Characteristics   January 2018
San Diego, CA

Structures on Free Resolutions Conference   October 2017
Lubbock, TX

Service, Mentoring, and Outreach

AWM Graduate Student Poster Session Judge   January 2023
Joint Math Meetings

Iowa State Mathematics Research Teams Mentor   Spring 2024, Spring 2022
Iowa State University

Stillwater High School Math Seminar   April 2020 (canceled),
Stillwater, OK   November 2019

Graduate Affairs Committee Member   Fall 2017 − Spring 2018
University of Illinois Math Department

TA Teaching Awards Committee Member   Fall 2017
University of Illinois Math Department

Illinois Geometry Lab Graduate Student Mentor   June 2017
University of Illinois

Commutative Ring Theory Seminar Organizer   Fall 2014 − Spring 2018
University of Illinois

Software Creation

LatticeChowRings package for Macaulay2   2022
https://github.com/mnmastro/LatticeChowRings

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   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

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