Matthew N. Mastroeni

Email: mmastro@iastate.edu *Website*: mnmastro/github.io

Employment

Postdoc Research Associate, Iowa State University August 2021 – Present

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.* Submitted. arXiv:2208.03366

(2) M. Mastroeni and J. McCullough. *Chow rings of matroids are Koszul.* To appear in Math. Ann. arXiv:2111.00393

(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.* Submitted. 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

Large Lecture Instructor (Iowa State University)

Math 151 Calculus for Business and Social Sciences — Fall 2021

Math 165 Calculus 1 — Spring 2023, Spring 2022

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 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

Grader (University of Illinois)

Math 416 Abstract Linear Algebra	Spring 2018

Invited Talks

AMS Special Session on Commutative Algebra — October 2023
Omaha, NE

Commutative Algebra and Algebraic Geometry Seminar — April 2023
University of Minnesota

Fellowship of the Ring National Seminar — January 2023

virtual

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

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

AMS Special Session on Commutative Algebra — May 2022
virtual

Algebra and Geometry Seminar — April 2022
Queen's University

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 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

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