Jay Yang

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Employment

2025-Current Vanderbilt University, Research Assistant Professor
2022-2025 Washington University in St. Louis, Postdoctoral Lecturer
2021-2022 McMaster University, Postdoctoral Fellow
2018-2021 University of Minnesota, RTG Postdoctoral Associate

Education

2012-2018 University of Wisconsin - Madison

- Advisor: Daniel Erman
- Ph.D. in Mathematics, August 2018

2009-2012 University of Michigan

- B.S. in Mathematics, 2012

Research Interests

Commutative Algebra, Algebraic Geometry, Syzygies, and Combinatorics

Papers

- *Conditions for virtually Cohen–Macaulay simplicial complexes.*
(with Adam Van Tuyl), Advances in Applied Math **164** (2025)
DOI:10.1016/j.aam.2024.102830
- *Hadamard products and binomial ideals.*
(with Büşra Atar, Kieran Bhaskara, Adrian Cook, Sergio Da Silva, Megumi Harada, Jenna Rajchgot, Adam Van Tuyl, Runyue Wang), Journal of Pure and Applied Algebra **228**(2024) iss. 6
DOI:10.1016/j.jpaa.2023.107568
- *Asymptotic degrees of random monomial ideals.*
(with Lily Silverstein and Dane Wilburne), Journal of Commutative Algebra **15** (2023)
DOI:10.1216/jca.2023.15.99
- *Characteristic dependence of syzygies of random monomial ideals.*
(with Caitlyn Booms and Daniel Erman), SIAM J. Discrete Math **36** (2022)
DOI:10.1137/21M1392474
- *Syzygies of $\mathbb{P}^1 \times \mathbb{P}^1$: data and conjectures.*
(with Juliette Bruce, Daniel Corey, Daniel Erman, Steve Goldstein, and Robert P. Laudone), Journal of Algebra **593** (2022)
DOI:10.1016/j.jalgebra.2021.10.023

- *The SchurVeronese package in Macaulay2.*
(with Juliette Bruce, Daniel Erman, Steve Goldstein), JSAG **11** (2021)
DOI:10.2140/jsag.2021.11.83
- *Homological and combinatorial aspects of virtually Cohen–Macaulay sheaves.*
(with Christine Berkesch, Patricia Klein, and Michael C. Loper), Trans. London Math. Soc. **8** (2021)
DOI:10.1112/tlm3.12036
- *Combinatorial aspects of virtually Cohen–Macaulay sheaves.*
(with Christine Berkesch, Patricia Klein, and Michael C. Loper), Séminaire Lotharingien de Combinatoire **85B** (2021)
- *Virtual resolutions of monomial ideals on toric varieties.*
Proc. AMS, Ser. B **8** (2021)
DOI:10.1090/bproc/72
- *Random Toric Surfaces and a Threshold for Smoothness.*
Journal of Algebra **524** (2019)
DOI:10.1016/j.jalgebra.2018.12.023
- *Random Flag Complexes and Asymptotic Syzygies.*
(with Daniel Erman), Algebra and Number Theory **12** (2018) no. 9
DOI:10.2140/ant.2018.12.2151
- *Conjectures and Computations about Veronese Syzygies.*
(with Juliette Bruce, Daniel Erman, and Steve Goldstein), Experimental Mathematics **29** (2018) iss. 4
DOI:10.1080/10586458.2018.1474506

Preprints

- *Cellular free resolutions for normalizations of toric ideals.*
(with Christine Berkesch, Lauren Cranton Heller and Gregory G. Smith)
arXiv:2512.17871
- *CellularResolutions M2 package.*
(with Aleksandra Sobieska)
arXiv:2307.08224

Software

- Consultant on the *Bridging Proof and Computation* project funded by Renaissance Philanthropy
- Contributor to `CellularResolutions.m2`
- Contributor to `RandomIdeals.m2`
- Contributor to `NormalToricVarieties.m2`
- Contributor to `SchurVeronese.m2`
- Contributor to Macaualy2 core

Awards

- Thank a Teacher Note (2020,2021), University of Minnesota
A program allowing students to formally recognize instructors who challenge and inspire

them.

- Excellence in Research Award (2017), University of Wisconsin - Madison
  Awarded annually by the Mathematics Department for exceptional thesis research.

Conference Talks

2025 CMS Winter Meeting - Special Session on Commutative Algebra *Controlling Homology in Virtual Resolutions of Monomial Ideals*

2025 AMS Fall Central Sectional - Special Session on Applied and Computational Algebra
Computing free resolutions of toric subvarieties

2024 AMS Fall Southeastern Sectional - Special Session on Topics in Commutative Algebra and Algebraic Geometry (Canceled due to Hurricane Helene)
Virtual Resolutions on Toric Varieties

2023 AMS Spring Southeastern Sectional - Special Session on Commutative Algebra and its Interactions with Algebraic Geometry
Virtual Resolutions and Shellability

2022 AMS Spring Central Sectional - Special Session on Combinatorial Algebra & Geometry
Virtual Cohen–Macaulay Monomial Ideals

2021 AMS Spring Southeastern Sectional - Commutative Algebra and its Interaction with Algebraic Geometry and Combinatorics Special Session
Virtual Resolutions of Monomial Ideals

2020 AMS Fall Central Sectional - Free resolutions, Combinatorics, and Geometry Special Session
Virtual Resolutions of Monomial Ideals on Toric Varieties

2020 AMS Spring Central Sectional - Combinatorial Algebra and Geometry Special Session (Canceled due to COVID)
Virtual Resolutions of Monomial Ideals

2019 AMS Fall Central Sectional - Combinatorial Algebraic Geometry Special Session
Virtual Resolutions of Monomial Ideals

2019 SIAM AG - Random Geometry and Topology Minisymposium
Degree of Random Monomial Ideals

2019 Summer School on Randomness and Learning in Non-Linear Algebra
Degrees of Random Monomial Ideals

2017 CMS Winter Meeting - Toric Geometry Session
Syzygies of Random Monomial Ideals

2017 CA+ (2017)
Random Flag Complexes and Asymptotic Syzygies

2017 SIAM Conference on Applied Algebraic Geometry - Core Algorithms in Algebra and Geometry Minisymposium
Asymptotic Syzygies via Numerical Linear Algebra and High Throughput Computing

2016 HTCondor Week
Computing Betti Tables with HTCondor

Seminar Talks

2025 Cornell University, Algebraic Seminar

2025 Fields Institute, Commutative Algebra and Applications Seminar

2023 UC Berkely, Commutative Algebra and Algebraic Geometry Seminar
2022 Washington University in St. Louis, Algebra Seminar
2021 McMaster, Algebra and Algebraic Geometry Seminar
2020 Texas A&M, Algebra and Combinatorics Seminar
2020 Commutative and Homological Algebra Market Presentations
2020 University of Minnesota, Combinatorics and Commutative Algebra Seminar
2019 University of Minnesota, Commutative Algebra Seminar
2018 University of Minnesota, Commutative Algebra Seminar
2016 University of Wisconsin, Algebraic Geometry Seminar
2016 University of Miami, Combinatorics Seminar
2016 University of Wisconsin, Combinatorics Seminar
2016 University of Illinois - Urbana Champaign, Commutative Algebra Seminar
2015 University of Wisconsin, Graduate Algebraic Geometry Seminar

Teaching

Courses Taught at Vanderbilt University
Fall 2025 Math 2300 *Calculus 3*
Courses Taught at Washington University in St. Louis
Spring 2025 Math 429 *Linear Algebra*
Fall 2024 Math 309 *Matrix Algebra*
Spring 2024 Math 429 *Linear Algebra*
Fall 2023 Math 132 *Calculus 2*
Fall 2022 Math 221 *Calculus 3*
Courses Taught at McMaster University
Spring 2022 Math 1MM3 *Calculus for Business, Humanities and the Social Sciences*
Fall 2021 Math 1ZA3 *Engineering Mathematics 1*
Courses Taught at University of Minnesota
Spring 2021 Math 1572H *Honors Calculus 2*
Fall 2020 Math 1571H *Honors Calculus 1*
Spring 2020 Math 1272 *Calculus 2*
Fall 2019 UMTYMP *Advanced Topics: Computational Algebraic Geometry*
Spring 2019 Math 5385 *Computational Algebraic Geometry*
Fall 2018 Math 4242 *Applied Linear Algebra*
Courses Taught at University of Wisconsin
Spring 2017 Math 490 *Computational Undergraduate Research Lab* TA
Fall 2016 Math 114 *Algebra & Trigonometry* TA
Fall 2015 Math 114 *Algebra & Trigonometry* TA
Spring 2015 Math 217 *Calculus with Algebra & Trigonometry* TA
Fall 2014 Math 114 *Algebra & Trigonometry* TA
Spring 2014 Math 211 *Business Calculus* TA
Fall 2013 Math 234 *Calculus 3* TA
Spring 2013 Math 222 *Calculus 2* TA
Fall 2012 Math 221 *Calculus 1* TA

Mentoring

Summer 2023 Minnesota Research Workshop in Algebra and Combinatorics Problem Leader
Summer 2020 University of Minnesota Research Experience for Undergraduates Mentor
Summer 2019 Senior Thesis Mentor
Summer 2017 Computational Undergraduate Research Lab Mentor
2015-2019 Directed Reading Program Mentor

Organization

2025 Vanderbilt Math Department Colloquium Committee
2023 Co-organizer for AMS Special Session on Commutative Algebra with Connections to Combinatorics and Geometry
2021 Co-organizer for CMS Winter Meeting Special Session on Combinatorial methods in algebraic geometry and commutative algebra
2021-2022 Organizer of the Algebra and Algebraic Geometry Seminar and McMaster
2019-2021 Organizer of the Commutative Algebra Seimnar at Minnesota
2018 Co-organizer for Macaulay2 Workshop at Wisconsin

Outreach Work

2022 Putnam Advisor at WUSTL
2015 & 2017 Problem Writer for Mega Math Meet
2014 & 2017 Grader for Mega Math Meet