Josh Pollitz

Curriculum Vitae

Syracuse University
Department of Mathematics
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Research Interests

My research interests are primarily in the homological aspects of commutative algebra. I have a particular interest in studying properties of commutative rings using theories of cohomological support and structures on resolutions. I often work with triangulated categories as they are well-suited to study such data, and it allows me to draw on ideas from a variety of other areas such as homotopy theory and representation theory.

Academic Appointments

2023–current **Assistant Professor (Tenure Track)**, *Syracuse University*.

2020–2023 **NSF Postdoctoral Research Fellow**, *University of Utah*.
Postdoc Mentor: Srikanth B. Iyengar

2019–2020 **Research Assistant Professor (RTG Postdoc)**, *University of Utah*.
Postdoc Mentor: Srikanth B. Iyengar

Honors

Fall 2022 **Hausdorff Research Institute for Mathematics: Special Trimester**.
I was invited to spend two (funded) months at the Hausdorff Research Institute in Bonn, Germany during their special trimester on Spectral Methods in Algebra, Geometry, and Topology.

Education

August 2019 **Ph.D. Mathematics, University of Nebraska**, *Lincoln*.
Advisors: Luchezar L. Avramov and Mark E. Walker
Thesis: The derived category of a locally complete intersection ring

May 2015 **M.S. Mathematics, University of Nebraska**, *Lincoln*.

June 2013 **M.S. Mathematics, Oregon State University**.

December 2010 **B.S. Mathematics, California Polytechnic State University**, *San Luis Obispo*.

Grants and Awards

2023 **NSF standard grant (3 years)**, *PI on Grant # 2302567*.

2022 **Don H. Tucker Postdoctoral Fellowship, University of Utah**, *This award is given to a postdoc for excellence in research*.

2021 **Outstanding Postdoc Award, University of Utah**, *This award is annually given to a postdoctoral scholar in recognition of their exceptional research and teaching*.

2020 **NSF Postdoctoral Research Fellowship (3 years)**, *Grant #2002173*.

2018 **NSF grant funding *Conferences on Commutative Algebra for Early Career Researchers* (2 years)**, *Co-P.I. on Grant #1802088*.

2018 **AMS Graduate Student Travel Grant**, *Used for the Fall 2018 AMS Sectional in Fayetteville, AR*.

2017 **Bill Leavitt Award, University of Nebraska, Lincoln**, *This award is given each academic year to support graduate student research based on academic success*.

2015 **Steven Haataja Award, University of Nebraska, Lincoln**, *This award is for outstanding exposition by a graduate student.*

2010 **Charles J. Hanks Excellence in Math Award, California Polytechnic State University**, *This award is given to a student who demonstrated excellence and outstanding ability.*

2009 **Robert P. Balles Mathematics Scholarship, California Polytechnic State University**, *A scholarship awarded to a student for excellence in undergraduate math courses.*

Published Papers, Preprints and Packages

Submitted preprints

(21) **The embedded deformation problem for monomial ideals** joint with Benjamin Briggs and Eloísa Grifo. arXiv:2506.10827

Published or accepted papers

(20) **Resolutions of differential operators of low order for an isolated hypersurface singularity** joint with Rachel Diethorn, Jack Jeffries, Claudia Miller, Nick Packauskas, Hamid Rahmati, and Sophia Vassiliadou. *Michigan Mathematical Journal* (to appear)

(19) **High Frobenius pushforwards generate the bounded derived category** joint with Matthew Ballard, Srikanth Iyengar, Patrick Lank, and Alapan Mukhopadhyay. *Forum of Mathematics, Sigma* (2026)

(18) **Classifying thick subcategories over a Koszul complex via the curved BGG correspondence** joint with Jian Liu. *Journal of the London Mathemtical Society* (2025)

(17) **Lower bounds on Loewy lengths of modules of finite projective dimension** joint with Nawaj KC. *Advances in Mathematics* (2025)

(16) **Koszul homomorphisms and universal resolutions in local algebra** joint with Benjamin Briggs, James Cameron, and Janina Letz. *Forum of Mathematics, Sigma* (2025)

(15) **Relations on Poincaré series for quasi-complete intersection homomorphisms** joint with Liana Șega. *Proceedings of the American Mathematical Society* (2025)

(14) **Bounds on cohomological support varieties** joint with Benjamin Briggs and Eloísa Grifo. *Transactions of the American Mathematical Society, Series B* (2024)

(13) **Cohomological jump loci and duality in local algebra** joint with Ben Briggs and Daniel McCormick. *Mathematische Zeitschrift* (2023)

(12) **The homotopy Lie algebra of a Tor-independent tensor product** joint with Luigi Ferraro, Mohsen Gheibi, Dave Jorgensen and Nicholas Packauskas. *Illinois Journal of Mathematics* (2023)

(11) **A comparison of dg algebra resolutions with prime residual characteristic** joint with Michael DeBellevue. *Quarterly Journal of Mathematics* (2023)

(10) **A partial converse ghost lemma for the derived category of a commutative noetherian ring**, joint with Jian Liu. *Proceedings of the American Mathematical Society* (2023)

(9) **Exceptional complete intersection maps of local rings** joint with Srikanth Iyengar, Janina Letz, and Jian Liu. *Pacific Journal of Mathematics* (2022)

(8) **Locally complete intersection maps and the proxy small property**, joint with Benjamin Briggs, Srikanth Iyengar, and Janina Letz. *International Mathematics Research Notices IMRN* (2022)

(7) **Constructing non-proxy small test modules**, joint with Benjamin Briggs and Eloísa Grifo. *Nagoya Mathematical Journal* (2022)

(6) **Cohomological supports of tensor products of modules over commutative rings** joint with Srikanth Iyengar and William Sanders. *Research in the Mathematical Sciences* (2022)

(5) **Support varieties over skew complete intersections via derived braided Hochschild cohomology**, joint with Luigi Ferraro and W. Frank Moore. *Journal of Algebra* (2022)

(4) **Cohomological support over derived complete intersections and local rings**. *Mathematische Zeitschrift* (2021)

(3) **Duality and symmetry of complexity over complete intersections via exterior homology**, joint with Jian Liu. *Proceedings of the American Mathematical Society* (2021)

(2) **Equivariant isomorphisms of Ext and Tor modules**. *Journal of Algebra* (2020)
(1) **The derived category of a locally complete intersection ring**. *Advances in Mathematics* (2019)

Software: I am a co-author of the ThickSubcategories package for the software system `Macaulay2` with Eloísa Grifo and Janina Letz. This is available for use at `https://github.com/eloisagrifo/levels`. (This package is still under construction)

Teaching & Mentorship

Instructor of Record

Spring 2026	Math 732: Homological Algebra	*Syracuse University*
Fall 2025	Math 733: Commutative Algebra	*Syracuse University*
Spring 2024	Math 732: Homological Algebra	*Syracuse University*
Fall 2024	Math 534: Introduction to Abstract Algebra	*Syracuse University*
	Math 830: Topics in Algebra	*Syracuse University*
Fall 2023	Math 331: Linear Algebra	*Syracuse University*
Spring 2023	Math 3210: Foundations of Analysis	*University of Utah*
Fall 2021	Math 4400: Introduction to Number Theory	*University of Utah*
Spring 2020	Math 3210: Foundations of Analysis	*University of Utah*
Fall 2019	Math 2200: Discrete Mathematics	*University of Utah*
Spring 2019	Math 314: Linear Algebra	*University of Nebraska*
Fall 2018	Math 208: Calculus III	*University of Nebraska*
Fall 2017	Math 208: Calculus III	*University of Nebraska*
Summer 2017	Math 802P: Numbers, Geometry and Algebraic Thinking II*	*University of Nebraska*
Spring 2017	Math 302: Mathematical Modeling*	*University of Nebraska*
Fall 2016	Math 301: Mathematics Matters*	*University of Nebraska*
Spring 2016	Math 104: Applied Calculus (Thompson Scholars)	*University of Nebraska*
Fall 2015	Math 203: Contemporary Mathematics	*University of Nebraska*
Summer 2015	Math 104: Applied Calculus	*University of Nebraska*
Spring 2015	Math 101: College Algebra	*University of Nebraska*
Fall 2014	Math 101: College Algebra	*University of Nebraska*
Spring 2012	Math 111: College Algebra	*Oregon State University*
Summer 2012	Math 111: College Algebra	*Oregon State University*
Spring 2012	Math 251: Differential Calculus	*Oregon State University*

*: These courses were for current and future K-12 educators in the Lincoln and Omaha area.

Doctoral Students

Dorian Kalir (2024-present)
Kory Pollicove (2024-present)

Undergraduate Reading Courses

I have supervsised semester/year-long reading courses on the following texts for undergraduates:
- "Introduction to Commutative Algebra" by Atiyah and MacDonald
- "Cohen-Macaulay Rings" by Bruns and Herzog
- "Infinite Free Resolutions" by Avramov

The students were the following. Taylor Murray at the University of Utah; currently a grad student at University

of Nebraska-Lincoln. Mason Hart at the University of Utah, where I was Mason's honor's thesis advisor; currently Mason is a grad student at University of Virginia. Annie Giokas at the University of Utah; currently a grad student at Purdue University. Ben Huenemann at the University of Utah; currently a grad student at University of Nebraska-Lincoln. Jorge Eduardo Gasper Lara at the Centro de Investigación en Matemáticas; currently a grad student at University of Utah.

Research talks

Invited Talks

March 2026	TBA	*Colloquium, University of Alabama*
March 2026	TBA	*Algebra and Topology Seminar, University of Alabama*
February 2026	Deformations and the HLA	*Algebraic Geometry Seminar, University of Illinois-Chicago*
November 2025	Homological methods in commutative algebra	*Colloquium, Bryn Mawr and Haverford College*
October 2025	Embedded deformations and the Homotopy Lie algebra	*AMS Sectional, Tulane University*
October 2025	Embedded deformations and the Homotopy Lie algebra	*AMS Sectional, St. Louis University*
May 2025	A positive answer to a question of Avramov	*AMS Sectional, Cal Poly-SLO*
April 2025	Frobenius pushforwards and generators...	*Alg and Top Seminar, SUNY-Albany*
January 2025	Loewy lengths of modules of finite projective dimension	*JMM AMS Sectional, Seattle*
December 2024	Lower bounds on Loewy lengths of modules...	*FARM: Algebra 2024 Conference*
November 2024	Lower bounds on Loewy lengths of modules...	*Route 81 Conference, Cornell University*
October 2024	Koszul homomorphisms and universal resolutions	*AMS Sectional, Georgia Southern Univ*
October 2024	Lower bounds on Loewy length Pt I	*AMS Sectional, Georgia Southern Univ*
May 2024	Koszul homomorphisms and universal resolutions	*AMS Sectional, San Francisco*
May 2024	Modules of finite Loewy length and finite projective...	*AMS Sectional, San Francisco*
April 2024	Frobenius pushforwards and generators...	*Comm. Alg. Seminar, University of Illinois-Chicago*
March 2024	Frobenius pushforwards and the derived category	*Fairfax Algebra Days Conference*
February 2024	dg tricks in local algebra III	*Special topics seminar, SLMath*
February 2024	dg tricks in local algebra II	*Special topics seminar, SLMath*
January 2024	Koszul homomorphisms and universal resolutions	*JMM AMS Sectional, San Francisco*
January 2024	Frobenius pushforwards generate the derived category	*JMM AMS Sectional, San Francisco*
November 2023	Frobenius pushforwards in the derived category	*Alg. Geom. Seminar, Cornell University*
October 2023	Frobenius pushforwards and generators...	*AMS Sectional, Creighton University*
September 2023	Frobenius pushforwards and the bounded derived category	*Oberwolfach: TTG Workshop*
April 2023	Structural results in commutative algebra	*Math 125, University of Nebraska*
April 2023	Frobenius pushforwards in the derived category	*Comm. Alg. Seminar, University of Nebraska*
March 2023	High Frobenius pushforwards ...	*Alg. Geom. and Comm. Alg. Seminar, Notre Dame Univ*
January 2023	Applications of support varieties in local algebra	*Algebra and Topology Seminar, Copenhagen*
December 2022	Cohomological support varieties in local algebra	*Seminar, Hausdorff Institute of Mathematics*
November 2022	Generation in derived categories and singularities	*Colloquium, Syracuse University*
October 2022	Cohomological support varieties and their applications	*Fellowship of the Ring Seminar, MRSI*
September 2022	Bounds on cohomological support varieties	*Seminar, Syracuse University*
August 2022	Cohomological jump loci in local algebra	*Conference, ICRA 2022*
April 2022	Bass and Betti numbers, and cohomological jump loci	*Seminar, University of Minnesota*
April 2022	Cohomological jump loci and duality	*Seminar, Syracuse University*
February 2022	Homotopy lie algebras of quasi-complete intersection maps	*Seminar, UC Berkeley/MSRI*

January 2022	Cohomological supports in local algebra	*JMM AMS Special Session, Seattle*
October 2021	Symmetries in Bass and Betti sequences over a c.i. ring	*Seminar, University of Arkansas*
October 2021	Symmetries in Bass and Betti sequences over a c.i. ring	*IIT Bombay Virtual Seminar*
October 2021	Cohomological support in local algebra	*Comm. Algebra Seminar, University of Nebraska*
October 2021	A comparison of dg algebra resolutions with prime...	*AMS Sectional, Creighton University*
May 2021	The derived category of a complete intersection ring	*Comm. Algebra Seminar, UC Riverside*
March 2021	Homological algebra of exceptional c.i. maps	*AMS Sectional, Georgia Tech University*
March 2021	Homological algebra of exceptional complete intersections	*Seminar, Texas Tech University*
October 2020	A characterization of relative complete intersections	*AMS Sectional, Univ of Tennessee*
November 2019	Cohomological support of a local ring	*AMS Sectional, University of Florida*
July 2019	The derived category of a complete intersection	*Seminar, University of Genova (Italy)*
March 2019	Cohomological support over derived complete int...	*AMS Sectional, Auburn University*
November 2018	The derived category of a complete intersection	*Seminar, University of Michigan*
November 2018	The derived category of a complete intersection	*AMS Sectional, University of Arkansas*
October 2018	The derived category of a complete intersection	*AMS Sectional, SF State University*
February 2018	A characterization of complete intersections...	*Algebra Seminar, University of Utah*

Local Talks

January 2026	*Deformations and the homotopy Lie algebra*	*Algebra seminar, Syracuse University*
September 2023	*Homological methods in commutative algebra*	*MGO Colloquium, Syracuse University*
September 2023	*Frobenius pushforwards and generators for the...*	*Algebra Seminar, Syracuse University*
September 2019	*Cohomological support of a local ring*	*Algebra Seminar, University of Utah*
October 2018	The derived category of a complete intersection	*Algebra Seminar, University of Nebraska*
February 2018	A characterization of complete intersections...	*Algebra Seminar, University of Nebraska*
October 2017	Koszul varieties and a derived category application	*Algebra Seminar, University of Nebraska*
October 2017	Cohomological properties of the Koszul DGA	*Algebra Seminar, University of Nebraska*
March 2015	Hilbert's third problem and the Dehn invariant	*Graduate Student Seminar, Univ of Nebraska*

Funded Conferences and Workshops

2025 **CollaborateICERM**.
A week-long collaborative research program at ICERM January 20 - 24.

2024 **Betti numbers in commutative algebra and equivariant homotopy theory**.
A week-long workshop at Bielefeld University September 23 - 27.

2024 **Institute for Advanced Study: Summer collaborators program**.
Received travel, lodging and per diem to participate in the IAS's summer collaborator program for 2 weeks in July 2024.

2024 **Commutative Algebra and Non-Commutative Algebraic Geometry programs**.
I received funding to attend the introductory workshops and recent development conferences in each of the aforementioned programs during Spring 2024 at SLMath.

2023 **Tensor-Triangular Geometry and Interactions**.
An Oberwolfach workshop in September 2023.

2022 **Spectral Methods in Algebra, Geometry, and Topology**.
I spent October-December at the Hausdorff Research Institute for Mathematics (HIM) in Bonn, Germany during this special trimester.

2022 **Rank Conjectures in Algebraic Topology and Commutative Algebra**.
A workshop at the Banff International Research Station September 11 - 16.

2022 **ICRA 2022**.
Attended, and spoke in this biannual conference in Buenos Aires August 3-12.

Leadership and Service

Fall 2026 **Co-organizer**, *Route 81 Commutative Algebra and Algebraic Geometry Conference at Syracuse University*.

June 2025-present **Graduate pre-adivsor mentor**, *Assist mathematics graduate students early in their program find classes to take, seminars to attend, and potential advisors*.

2024 **NSF panelist**.

October 2024 **Co-organizer**, *AMS Special Session*.
Co-organizing *Singularities in commutative algebra* at the University of Albany–SUNY in October 2024 with Jason Howell and Claudia Miller.

Fall 2023 **Co-organizer**, *Route 81 Commutative Algebra and Algebraic Geometry Conference at Syracuse University*.

Fall 2023-preesent **Co-organizer**, *Syracuse University Algebra Seminar*.

April 2023 **Co-organizer**, *AMS Special Session*.
Co-organizing *Homological methods in commutative algebra* at the University of Cincinnati in April 2023 with Michael DeBellevue.

Summer 2020 **Online course**.
I organized a virtual course on Zoom where I lectured on the singularity category of Gorenstein rings for twelve weeks; there were two hour-long lectures a week. There were twelve other participants from universities such as: Utah, Nebraska, Wake Forest, University of Texas-Arlington, UC Riverside.

May 2020 **Online Conference Organizer**.
Organized *Dg Methods in Commutative Algebra and Representation Theory* with Benjamin Briggs and Janina Letz.

2017-2019 **Conference Co-Organizer (Co-P.I.)**, *KUMUNU JR*.
Served as a co-organizer and co-P.I. for this annual conference for graduate students and postdocs.

2017-2018 **Commutative Algebra Reading Seminar Organizer**.
I organized this graduate student seminar devoted to a wide range of talks in commutative algebra and related areas.

2017-2020 **Panelist for graduate students**.
I have served on several panels for graduate students at both the University of Nebraska and the University of Utah for topics including: choosing a research area and advisor, applying for academic jobs, applying for the NSF postdoc, and teaching.

Summer 2016 **WebWork development**.
I wrote 80 hours of WebWork code for the math department at the University of Nebraska during the Summer of 2016; these are homework problems for Math 106 and 107 (calculus I & II).

2013-2019 **Math Day Volunteer**.
For Math Day, held annualy at the University of Nebraska Lincoln, I held positions such as proctor, head proctor, local command center leader, and score keeper.