Josh Pollitz

Curriculum Vitae

Syracuse University
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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 funded to spend two 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

(19) **Lower bounds on Loewy lengths of modules of finite projective dimension** joint with Nawaj KC. arXiv:2404.18368

(18) **Relations on Poincaré series for quasi-complete intersection homomorphisms** joint with Liana Şega. arXiv:2403.17079

(17) **Koszul homomorphisms and universal resolutions in local algebra** joint with Benjamin Briggs, James Cameron, and Janina Letz. arXiv:2310.08400

(16) **High Frobenius pushforwards generate the bounded derived category** joint with Matthew Ballard, Srikanth Iyengar, Patrick Lank, and Alapan Mukhopadhyay. arXiv:2303.18085

Published or accepted papers

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

(14) **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)

(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

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.

Graduate Students

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

Undergraduate Mentoring/Reading Courses

Fall 2020	**"Cohen-Macaulay Rings" by Bruns and Herzog and "Infinite Free Resolutions" by Avramov**, *mentored undergraduate Taylor Murray at the University of Utah: currently a grad student at University of Nebraska-Lincoln.*
Fall 2020–Spring 2022	**"Introduction to Commutative Algebra" by Atiyah and MacDonald, "Cohen-Macaulay Rings" by Bruns and Herzog, "Infinite Free Resolutions" by Avramov, and various research articles**, *mentored undergraduate Mason Hart at the University of Utah. I was Mason's honor's thesis advisor; currently a grad student at University of Virginia.*
Spring 2021-Summer 2022	**"Introduction to Commutative Algebra" by Atiyah and MacDonald**, *mentored undergraduate Annie Giokas at the University of Utah; currently a grad student at Purdue University.*
Summer 2021-Fall 2022	**"Introduction to Commutative Algebra" by Atiyah and MacDonald**, *mentored undergraduate Ben Huenemann at the University of Utah; currently a grad student at University of Nebraska-Lincoln.*

Fall 2022 **"Infinite Free Resolutions" by Avramov**, *mentored master's student Jorge Eduardo Gasper Lara at the Centro de Investigación en Matemáticas; currently a grad student at University of Utah.*

Research talks

January 2025	TBA	*JMM AMS Sectional, Seattle*
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 2023	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

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, Workshops and Summer Schools

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

2023 Tensor-Triangular Geometry and Interactions.
An Oberwolfach workshop in September 2023; my travel was funded by Paul Goerr's NSF grant.

2022 Spectral Methods in Algebra, Geometry, and Topology.
I will spend 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 from September 11 - 16.

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

2019 Recent Developments in Commutative Algebra.
A workshop for graduate students and postdocs in commutative algebra. There were four lecture series that ran July 1-5 in Levico Terme, Trento, Italy.

2019 Morgantown Algebra Days.
A two-day Commutative Algebra conference which was held at the West Virginia University in Morgantown, WV during April 13-14 (Saturday-Sunday).

2018 Derived Categories, MSRI Summer School.
MSRI 2018 A two week summer school held at the MSRI June 25-July 6. This consisted of four week long courses building towards Orlov's theorem.

2018 Stable Cohomology: Foundations and Applications.
The workshop was supported by the National Science Foundation and the Department of Mathematics at the University of Nebraska. Took place in Snowbird, Utah May 28-June 1.

2018 RTG Graduate Summer School: Topics in commutative algebra.
Took place at the University of Utah May 7-11. There were fourteen lectures and problems sessions, covering aspects of the following: limits in positive characteristic, symbolic powers and differential operators, and syzygies and free resolutions

2017 Structures on Free Resolutions.
A workshop-style conference on "Structures on Free Resolutions" held at Texas Tech University from October 26-28

2017	**Local Cohomology in Commutative Algebra and Algebraic Geometry, Minnesota**.
	A week long conference focused on recent advances in commutative algebra centered around topics influenced by the contributions of Gennady Lyubeznik.
2017	**Commutative Algebra and Related Topics, MSRI Summer School, OIST**.
	A two week summer school held at the Okinawa Institute of Science and Technology from May 22-June 2. This consisted of four week long courses
2017	**Stillman's Conjecture and other Progress on Free Resolutions**.
	A conference and workshop at UC Berkeley, July 17-21, on regularity and Stillman's problem.
2016	**RTG Workshop on the Homological Conjectures in Commutative Algebra**.
	The University of Illinois at Chicago hosted an RTG Workshop, November 18-20, consisting of three mini-courses on the Homological Conjectures.

Other Conferences

2023	**Route 81**.
	An annual conference on commutative algebra and algebraic geometry. The location rotates between Cornell University, Queen's University, and Syracuse University.
2015-2019, 2022	**KUMUNU**.
	An annual NSF-funded conference for commutative algebraists in the Great Plains region since 1999.
2015-2019	**KUMUNU JR**.
	An annual NSF-funded conference for graduate students and postdocs in commutative algebra in the Midwest that is held each Spring at UNL.

Leadership and Service

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*.
Fall 2023-currently	**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.