

# Josh Pollitz

## Curriculum Vitae

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### Research Interests

My research interests are primarily in the homological aspects of commutative algebra. I enjoy thinking about DG homological algebra, triangulated categories, growth and structure of resolutions, theories of support and relations between local algebra and representation theory.

### Academic Appointments

- 2020–2023 **NSF Postdoctoral Research Fellow**, *University of Utah*.  
Postdoc Mentor: Srikanth B. Iyengar
- 2019–2020 **Research Assistant Professor**, *University of Utah*.  
RTG Postdoc. Postdoc Mentor: Srikanth B. Iyengar

### 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**.

### Published Papers and Preprints

#### Submitted preprints

- (11) **The homotopy Lie algebra of a Tor-independent tensor product** joint with Luigi Ferraro, Mohsen Gheibi, Dave Jorgensen and Nicholas Packauskas. [arXiv:2109.01003](https://arxiv.org/abs/2109.01003)
- (10) **A comparison of dg algebra resolutions with prime residual characteristic** joint with Michael DeBellevue. [arXiv:2108.12512](https://arxiv.org/abs/2108.12512)
- (9) **Exceptional complete intersection maps of local rings** joint with Srikanth Iyengar, Janina Letz, and Jian Liu. [arXiv:2107.07354](https://arxiv.org/abs/2107.07354)
- (8) **Support varieties over skew complete intersections via derived braided Hochschild cohomology**, joint with Luigi Ferraro and W. Frank Moore. [arXiv:2101.12287](https://arxiv.org/abs/2101.12287)
- (7) **A partial converse ghost lemma for the derived category of a commutative noetherian ring**, joint with Jian Liu. [arXiv:2101.02829](https://arxiv.org/abs/2101.02829)

#### Published or accepted papers

- (6) **Constructing non-proxy small test modules**, joint with Benjamin Briggs and Eloísa Grifo. *Nagoya Mathematical Journal*
- (5) **Cohomological support over derived complete intersections and local rings**. *Mathematische Zeitschrift* (2021)
- (4) **Locally complete intersection maps and the proxy small property**, joint with Benjamin Briggs, Srikanth Iyengar, and Janina Letz. *International Mathematics Research Notices IMRN* (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)

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## Grants and Awards

- 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; scholarship is the major factor in determining who receives this award.*
- 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**, *The scholarship is awarded to the students with the two highest cumulative GPAs in mathematics courses during their first three years of study.*

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## Teaching & Mentorship

### Instructor of Record

Fall 2021	Math 4400: Introduction to Number Theory	<i>University of Utah</i>
Spring 2020	Math 3210: Foundations of Analysis	<i>University of Utah</i>
Fall 2019	Math 2200: Discrete Mathematics	<i>University of Utah</i>
Spring 2019	Math 314: Linear Algebra	<i>University of Nebraska</i>
Fall 2018	Math 208: Calculus III	<i>University of Nebraska</i>
Fall 2017	Math 208: Calculus III	<i>University of Nebraska</i>
Summer 2017	Math 802P: Numbers, Geometry and Algebraic Thinking II*	<i>University of Nebraska</i>
Spring 2017	Math 302: Mathematical Modeling*	<i>University of Nebraska</i>
Fall 2016	Math 301: Mathematics Matters*	<i>University of Nebraska</i>
Spring 2016	Math 104: Applied Calculus (Thompson Scholars)	<i>University of Nebraska</i>
Fall 2015	Math 203: Contemporary Mathematics	<i>University of Nebraska</i>
Summer 2015	Math 104: Applied Calculus	<i>University of Nebraska</i>
Spring 2015	Math 101: College Algebra	<i>University of Nebraska</i>
Fall 2014	Math 101: College Algebra	<i>University of Nebraska</i>
Spring 2012	Math 111: College Algebra	<i>Oregon State University</i>
Summer 2012	Math 111: College Algebra	<i>Oregon State University</i>
Spring 2012	Math 251: Differential Calculus	<i>Oregon State University</i>

## Teaching Assistant

I have served as a graduate teaching assistant at University of Nebraska and Oregon State University; also, I was an undergraduate teaching assistant at California Polytechnic State University SLO. Here are the following courses I have been supervised in this role:

- University of Nebraska: Math 808T: Concepts of Calculus\*, Math 106: Calculus I.
- Oregon State University: Math 256: Differential Equations, Math 254: Vector Calculus, Math 245: Calculus for Management and Social Sciences, Math 241: Differential Calculus.
- California Polytechnic SLO: Math 413: Introduction to Analysis II, Math 412: Introduction to Analysis I, Math 248: Methods of Proof.

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

## Undergraduate Mentoring/Reading Courses

- Fall 2020 **"Cohen-Macaulay Rings" by Bruns and Herzog and "Infinite Free Resolutions" by Avramov**, mentoring undergraduate Taylor Murray at the University of Utah: currently a graduate 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**, mentoring undergraduate Mason Hart at the University of Utah, (I am serving as Mason's honor's thesis advisor, who under my supervision has done original (and interesting) research on the homotopy Lie algebra of a local ring).
- Spring 2021–Fall 2021 **"Introduction to Commutative Algebra" by Atiyah and MacDonald**, mentoring undergraduate Annie Giokas at the University of Utah.

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## Presentations

### Invited Talks

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| January 2022  | Cohomological supports in local algebra                    | JMM AMS Special Session, Seattle, WA                   |
| October 2021  | Tor independence and homotopy Lie algebras                 | Commutative Algebra Seminar, University of Arkansas    |
| October 2021  | Proxy small objects and the complete intersection property | IIT Bombay Virtual Commutative Algebra Seminar         |
| October 2021  | Betti-degrees and duality for complete intersections       | Commutative 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       | Commutative Algebra Seminar, UC Riverside              |
| March 2021    | Homological algebra of exceptional complete intersections  | AMS Sectional, Georgia Tech University                 |
| March 2021    | Homological algebra of exceptional complete intersections  | Algebra & Number Theory 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            | Algebra 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            | Algebra 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 2019	<i>Cohomological support of a local ring</i>	<i>Algebra Seminar, University of Utah</i>
October 2018	<i>The derived category of a complete intersection</i>	<i>Algebra Seminar, University of Nebraska</i>
February 2018	<i>A characterization of complete intersections...</i>	<i>Algebra Seminar, University of Nebraska</i>
October 2017	<i>Koszul varieties and a derived category application</i>	<i>Algebra Seminar, University of Nebraska</i>
October 2017	<i>Cohomological properties of the Koszul DGA</i>	<i>Algebra Seminar, University of Nebraska</i>
March 2015	Hilbert's third problem and the Dehn invariant	<i>Graduate Student Seminar, Univ of Nebraska</i>

## Posters

April 2019	The derived category of a complete intersection	<i>Morgantown Algebra Days, WVU</i>
October 2018	The derived category of a complete intersection	<i>KUMUNU, Kansas University</i>
October 2017	Koszul varieties and a derived category application	<i>KUMUNU, Kansas University</i>

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## Funded Conferences, Workshops and Summer Schools

- 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

- 2015-2019 **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.

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## Leadership and Service

Fall 2022 **AMS Sectional Organizer**, *University of Utah*.

*Building bridges between commutative algebra and nearby areas.* To be co-organized with Benjamin Briggs.

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.

Fall 2018 **Math 106 Recitation Coordinator**, *University of Nebraska*.

One of the major duties involved observing recitation instructors for Math 106 and meeting with them to discuss their observation and ways to improve their classrooms. Also, would lead a weekly meeting for all recitation instructors.

2017-2019 **Conference Co-Organizer (Co-P.I.)**.

Served as a co-organizer and co-P.I. for the annual conference for graduate students and postdocs KUMUNU JR.

2017-2018 **Commutative Algebra Reading Seminar Co-Organizers**.

I helped organize 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 annually at the University of Nebraska Lincoln, I held positions such as proctor, head proctor, local command center leader, and score keeper.