Uli Walther

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Purdue University
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Curriculum Vitae

Last updated: Mar 1, 2025.

Research Interests

- Commutative Algebra: local cohomology, multiplier ideals, test ideals, logarithmic derivations, configurations, log-canonical/F-thresholds;
- Algebraic Geometry: de Rham cohomology, Bernstein–Sato polynomials, Milnor fibers, zeta functions, arrangements, monodromy conjecture;
- D-modules: Riemann–Hilbert correspondence, b-functions; GKZ-systems, tautological systems from Lie group actions; irregularity and slopes; logarithmic vector fields; rings of differential operators; Hodge theoretic aspects;
- Physics/Combinatorics: singularities of matroid configuration polynomials, and Feynman type GKZ systems;
- Gröbner basis theory: explicit algorithmic computations of cohomological functors, specifically in the subjects above.

Education

Ph.D. in Mathematics, July 1999, University of Minnesota.
Thesis advisor: Gennady Lyubeznik.
Thesis title: "Algorithmic Computation of Local and de Rham Cohomology - an application of D-module theory to algebraic geometry"

Diplom in Mathematik, July 1993, Martin-Luther-Universität Halle–Wittenberg, Germany.
Thesis advisor: Konrad Drechsler.
Thesis title: "On Singularities on Generalized Flag Manifolds"

M. Sc. in Pure Mathematics, September 1992, University of Sheffield, UK.
Thesis advisor: Rodney Y. Sharp.
Thesis title: "Local Cohomology: A Survey"

Abitur, July 1986, Spezialklassen für Mathematik und Physik Halle–Wittenberg, Germany.

Awards / Fellowships

- Special Purdue Award for Involvement in Data Science Curriculum Development (2024).
- Oberwolfach Simons Visiting Professor (June 2024)
- Research Member, MSRI/SLMath (Spring 2024).
- Undergraduate Mentoring Award (2024).
- Ross–Lynn Dissertation Fellowship for Hunter Simper (08/22 – 07/23)
- NSF grant DMS-2100288 (07/2021 – 06/2025)
- Purdue Research Foundation Grant for Daniel Bath (2019 – 2020)
- Simons Foundation Collaboration Grant for Mathematicians #580839 (2018 – 2023, terminated 08/2022 because of DMS-2100288)
- Bilsland Dissertation Grant for Avi Steiner (2018 – 2019)
- Mathematics Advisor Award 2018.
- NSF grant DMS-1762086 (02/2018 – 01/2019, Conference grant)
- NSF grant DMS-1700748 (04/2017 – 03/2018, with Christine Berkesch and Wenliang Zhang, Conference grant)
- Joel and Ruth Spira Award for excellence in undergraduate teaching (2015).
- Purdue Research Foundation Grant for Arnold Yim (2015 – 2016)
- NSF grant DMS-1401392 (07/2014 – 06/2018)

- Simons Foundation Collaboration Grant for Mathematicians (2014-2019; declined because awarded concurrently with DMS-1401392)
- Research Professorship, Mathematical Sciences Research Institute, Berkeley, California (Spring 2013)
- NSF grant DMS-1146096 "ALGECOM (Algebra-Geometry-Combinatorics)", with Alex Yong, Evgeny Mukhin, Hal Schenck, and Saugata Basu (1/2012 – 12/2014)
- Purdue Research Foundation Grant for Jen-Chieh Hsiao (2010 – 2011)
- Bilsland Dissertation Grant for Christine Berkesch (2009 – 2010)
- NSF grant DMS-0901123 (07/2009 – 06/2013)
- NSF grant DMS-0555319 (07/2006 – 06/2009).
- NSA grant H98230-06-1-0012 (02/2006 – 02/2008).
- Purdue Research Foundation Grant for Darren Tapp (2005 – 2006).
- Alexander von Humboldt Research Fellowship at Universität Leipzig (2003).
- Deutsche Forschungsgemeinschaft (DFG) Research Fellowship at Universität Leipzig (2002 – 2003).
- NSF grant DMS-0100509 (07/2001 – 07/2005).
- Postdoctoral Fellowship, Mathematical Sciences Research Institute, Berkeley, California (1999 – 2000).
- Eugene Fabes Best Thesis Award in Mathematics, University of Minnesota (1999).
- Alfred P. Sloan Foundation Dissertation Fellowship (1998 – 1999).
- University of Minnesota "Citation for Excellence in Teaching" (1997).
- Deutscher Akademischer Austauschdienst (DAAD) Fellowship at University of Sheffield (1991 – 1992).

Publications

1. "Algorithmic Computation of Local Cohomology Modules and the Local Cohomological Dimension of Algebraic Varieties", *J. Pure Appl. Algebra*, **139**, 303–321, (1999).
2. "Algorithmic Computation of de Rham Cohomology of Complements of Complex Affine Varieties", *J. Symb. Comput.*, **29**, 795–839 (2000).
3. "A Localization Algorithm for D-modules" (with T. Oaku and N. Takayama), *Journal of Symbolic Computation*, **29**, 721–728 (2000).
4. "On the Lyubeznik Numbers", *Proc. of the AMS*, **129**(6), 1631–1634, (2001).
5. "Computing the cup product structure for complements of complex affine varieties", *J. Pure Appl. Algebra*, **164**, 247–273, (2001).
6. "D-modules on smooth toric varieties" (with M. Mustaţă, G. Smith, H. Tsai), *J. Algebra*, **240**, 744–770 (2001).
7. "Switching Surfaces and Gröbner bases" (with T. Georgiou and A. Tannenbaum), *IEEE Trans. Automat. Control*, **46**, 534–540 (2001).
8. "Computing homomorphisms between holonomic D-modules" (with H. Tsai), *J. Symb. Comput.*, **32**, 597–617 (2001).
9. "Algorithmic Determination of the Rational Cohomology of Complex Varieties via Differential Forms", *Contemp. Math.* **286**, 185–206 (2001).
10. "D-modules and cohomology of varieties", a chapter in *Computations in algebraic geometry with Macaulay 2*, D. Eisenbud, D. Grayson, M. Stillman, B. Sturmfels edts., Springer-Verlag (2002).
11. "Gröbner Bases, de Rham Cohomology and Stratifications", *J. Symb. Comput.*, **35**, 527–542 (2003).
12. "Bernstein–Sato polynomials, integration, and Milnor fiber cohomology of generic hyperplane arrangements", *Compositio Math.* **141** 121–145 (2005).

13. "Algorithmic stratification of $\mathbb{R}\mathcal{H}om(\mathcal{M}, N)$ for regular holonomic modules on $\mathbb{C}^n$", *J. Symb. Comput.* **39**, 493–499 (2005).
14. "Duality and irreducibility of hypergeometric systems", *Math. Ann.* **338**, 55–74 (2005).
15. "Homological methods for hypergeometric systems" (with E. Miller and L. Matusevich), *JAMS* **18**, 919–941 (2005).
16. "Arbitrary rank jumps of hypergeometric systems" (with L. Matusevich), *J. of the LMS* **75**, 212–242 (2007).
17. "On the arithmetic rank of certain Segre products" (with A. Singh), *Contemp. Math.* **390**, 147–155 (2005).
18. "Local cohomology and pure morphisms" (with A. Singh), *Illinois J. Math.* **51**, 287–298 (2007).
19. "24 Hours of Local Cohomology" (with S. Iyengar, G. Leuschke, A. Leykin, C. Miller, E. Miller, A. Singh), *AMS Graduate Studies in Mathematics* **87**, xviii+282 pp. (2007).
20. "A connectedness result in positive characteristic" (with A. Singh), *Trans. of the AMS* **360**, 3107–3119 (2008).
21. "Regularity and slopes of hypergeometric systems" (with M. Schulze), *Duke Math. J.* **142**, 465–509 (2008).
22. "Cohen–Macaulayness and computation of Newton graded toric rings", *JPAA* **213** (8), 1522–1535 (2009).
23. " Hypergeometric D-modules and twisted Gauss–Manin systems" (with M. Schulze), *JA* **322**, 3392–3409 (2009).
24. "Bockstein homomorphisms in local cohomology" (with A. Singh), *Crelle's Journal* **655**, 147–164 (2011).
25. "Restriction of A-hypergeometric systems to coordinate subspaces" (with M. Fernandez-Fernandez), *Proceedings of the AMS* **139**, 3175–3180 (2011).
26. "Resonance equals reducibility for A-hypergeometric systems" (with M. Schulze), *Algebra and Number Theory* **6**), 527–537 (2012).
27. "A note on Bockstein homomorphisms in local cohomology", (with A.K. Singh), *Adv. Stud. Pure Math.* **62**, 513–521 (2012).
28. "Local cohomoloy of logarithmic forms" (with G. Denham, H. Schenck, M. Schulze, M. Wakefield), *Ann. Inst. Fourier* **63**, 1177–1203 (2013).
29. "Survey on the D-module generated by f^s, with an appendix by A. Leykin, Math. Sci. Res. Inst. Publ. **67**, *Commutative algebra and noncommutative algebraic geometry.* Vol. I, 391—430, *Cambridge Univ. Press, New York* (2015).
30. "Singularities and holonomicity of binomial D-modules" (with C.B. Zamaere and L.F. Matusevich), *Journal of Algebra* **439**, 360–372 (2015).
31. "Local cohomology modules supported at determinantal ideals" (with G. Lyubeznik and A.K. Singh), *J. Europ. Math. Soc.* **18**, 2545–2578 (2016).
32. "B-functions of determinantal ideals" (with A. Lörincz, C. Raicu, J. Weyman), *Adv. Math* **307**, 224–252 (2017).
33. "The Jacobian, the Milnor fiber, and the D-module generated by f^s", *Inventiones Math.* **207**, 1239–1287 (2017).
34. "On B-functions of hypergeometric systems" (with T. Reichelt and C. Sevenheck), *Int. Mat. Res. Not. IMRN* **21**, 6535–6555 (2018).
35. "Gauß–Manin systems of families of Laurent polynomials and A-hypergeometric systems" (with T. Reichelt), *Comm. in Alg.*, **47**, Special issue in honor of G. Lyubeznik, 2503–2524 (2019),

36. "Torus equivariant D-modules and hypergeometric systems" (with C. Berkesch and L. Matusevich), *Adv. Math.*, **350**, 1226–1266 (2019).
37. "On categories of equivariant D-modules " (with A. Lörincz), *Adv. Math.*, **351**, 429–478 (2019).
38. "On a conjecture of Lynch" (with A. Singh), *Comm. Algebra*, **48**, 2681–2682 (2020).
39. "On normalized Horn systems" (C. Berkesch and L. Matusevich), *Coll. Math.* **71**, 279–286 (2020).
40. "Matroid connectivity and singularities of configuration hypersurfaces" (with G. Denham and M. Schulze), *Lett. Math. Phys.*, **111**, 1–67 (2021).
41. "Dependence of Lyubeznik numbers of cones of projective schemes on projective embeddings" (with T. Reichelt and M. Saito), *Selecta Math.*, **27**, article 6 (22pp), (2021)
42. "Graph hypersurfaces with torus action and a conjecture of Aluffi" (with G. Denham, D. Pol, M. Schulze), *Commun. Number Theory Phys.*, **15**, 455–488, (2021).
43. "Algebraic aspects of hypergeometric differential equations" (with T. Reichelt, M. Schulze, C. Sevenheck), *Beiträge zur Algebra und Geometrie*, **62** (1), 137–203 (2021).
44. "Koszul and local cohomology, and a question of Dutta", (with L. Ma and A.K. Singh), *Math. Z.* (298), 697–711 (2021).
45. "Local cohomology – an invitation" (with W. Zhang), *Commutative Algebra, Springer, Cham*, 773–858 (2021).
46. "On Lyubeznik type invariants" (with T. Reichelt, W. Zhang), *Topol. Appl.*, **313**, Paper 107983, (31pp), (2022).
47. "Weight filtrations on GKZ-systems" (with T. Reichelt), *American J. Math.*, **144** (5), 1437–1485 (2022).
48. "Configuration polynomials under contact equivalence" (with G. Denham, D. Pol, M. Schulze) *Ann. Inst. Henri Poincaré D* **9** (4), 793-812 (2022).
49. "On Feynman graphs, matroids, and GKZ-systems", *Lett. Math. Phys.* **112** (6), Paper No. 120, 27pp (2022).
50. "Topological calculation of local cohomological dimension" (with T. Reichelt, M. Saito), *J. Sing.* **26**, 12–22 (2023).
51. "Tautological systems, homogeneous spaces and the holonomic rank problem" (with P. Görlach, T. Reichelt, C. Sevenheck, A. Steiner), 63pp., `arXiv:2211.05356`.
52. "On the natural nullcones of the symplectic and general linear groups" (with V. Pandey, J. Tarasova) *J. LMS* (to appear).
53. "The shape of a Gaussian mixture is characterized by the probability density of the distance between two samples" (with M. Boutin, K. King), `arXiv:2111.10834`.
54. "GKZ-systems from groups with torsion" (with T. Reichelt, C. Sevenheck); `arXiv:2402.00762`.
55. "Matroidal polynomials and Feynman integrands" (with D. Bath; `arXiv:2404.07885`, 55pp.
56. "Singularities of square-free polynomials" (with D. Bath, M. Mustaţă; `arXiv:2412.11309`, 9pp.
57. "Arithmetic ranks of nullcones" (with J. Jeffries, A. Singh, V. Pandey; in preparation, 35pp).
58. "Free resolution of graph polynomial singularities" (with S. St Rain; in preparation, 9pp).

Selected Talks

- Lecture series in Oberwolfach Seminar "Modern Developments in Matroid Theory", June 2025.

- Algebraic Geometry Seminar, CIMAT, Guanajuato, Mexico (February 2025).
- Commutative Algebra Seminar, University of Nebraska, Lincoln (January 2025).
- Algebraic Geometry Seminar, Universität Graz, Austria (August 2024).
- Algebraic Geometry Seminar, University Mannheim, Germany (July 2024).
- Singularities Seminar, Basque Center of Applied Mathematics, Bilbao, Spain (July 2024).
- Simons Lecture Series "Matroids and Singularities", Ruhr-Universität Bochum, Germany (June 2024).
- Algebraic Geometry Seminar, Chemnitz University, Germany (June 2024).
- Eisenbud Seminar, UC Berkeley, Berkeley CA (February 2024).
- Commutative Algebra Seminar, University of Nebraska, Lincoln NE (October 2023).
- MPI für Angewandte Mathematik, Leipzig Germany (June 2023) (Cancelled because of accident).
- Conference on "D-modules and hyperplane arrangements", Kyushu University, Fukuoka, Japan (February 2023).
- Special session on Commutative Algebra, Cincinnati, OH (April 2023).
- "Tropical and Convex Geometry, and Feynman integrals", ETH Zürich (September 2022).
- "D-Modules: Applications to Algebraic Geometry, Arithmetic and Mirror Symmetry", CIRM, Luminy (April 2022).
- Commutative Algebra Seminar, University of Minnesota, Minneapolis MN (March 2022).
- Commutative Algebra Seminar, University of Nebraska, Lincoln NE (February 2022).
- Algebraic Geometry/Commutative Algebra Seminar, University of Utah, SaltLake City UT (February 2022).
- "Singularities in Positive Characteristic", CIRM, Luminy (July 2021). (Declined because of pandemic).
- Oberwolfach workshop "Logarithmic Vector Fields and Freeness of Divisors and Arrangements", (January 2021).
- Algebraic Geometry Seminar, University of Alberta, Calgary (November 2020). (Postponed because of pandemic)
- Summer school Lecture Series in "Commutative Algebra and Algebraic Geometry", IIT Bombay, India (May 2020). (Postponed because of pandemic)
- Conference on "Homological trends in Commutative Algebra and Algebraic Geometry", Bucharest, Romania (June 2020). (Postponed because of pandemic)
- Commutative Algebra Seminar, University of Minnesota, Minneapolis MN (February 2020).
- Conference on "Differential systems: from theory to computer mathematics", Tokyo, Japan (December 2019)
- "41st Japan Symposium on Commutative Algebra", Kurashiki, Japan (November 2019)
- HyperJARCS conference on "Singularities and Hyperplane Arrangements in memory of S. Papadima", Tokyo, Japan (December 2019).
- Conference on Algebraic Geometry and Hodge Theory, Madison WI (September 2019)
- Workshop on "Singularities", University of Wisconsin, Madison WI (March 2019)
- Colloquium, National Cheng Kung University, Tainan, Taiwan (January 2019)
- Algebraic Geometry Seminar, National Cheng Kung University, Tainan, Taiwan (January 2019)
- Algebraic Geometry Seminar, National Taiwan University, Taipei, Taiwan (January 2019)
- Commutative Algebra Seminar, UIC, Chicago IL (November 2018)
- Special Session on "Singularities of Spaces and Maps", Boston, MA (April 2018)

- "Singularities of Arrangements Day", Northeastern University, Boston, MA (April 2018)
- Algebraic Geometry Seminar, University of Michigan, Ann Arbor, MI (January 2018).
- SYSIPH ("Mirror SYmmetry and irregular SIngularities coming from PHysics") CIRM Luminy, France (April 2017).
- Algebraic Geometry Seminar, Northeastern University, Boston, MA (February 2017).
- Commutative Algebra Seminar, University of Nebraska, Lincoln, NE (January 2017).
- Conference on Hyperplane Arrangements, Sapporo, Japan (August 2016).
- Special session on Commutative Algebra, Salt Lake City, UT (April 2016).
- Special session on Singularities and Hyperplane Arrangements, Stony Brook, NY (March 2016).
- Stockholm University, Stockholm, Sweden (September 2015).
- "SinKLarities" conference on combinatorial aspects in singularities, Kaiserslautern, Germany (August 2015).
- "D-modules in Commutative Algebra Conference", Guanajuato, Mexico (August 2015).
- "Computational Geometric Topology in Arrangement Theory", ICERM, Providence, RI (July 2015).
- "Mirror Symmetry, Hodge Theory and Differential Equations" workshop, Mathematisches Forschungsinstitut Oberwolfach, Germany (April 2015).
- Algebraic geometry seminar, University of Notre Dame, South Bend, IN (March 2015).
- RTG Workshop in "Local cohomology", UIC, Chicago, IL (February/March 2015).
- Special session on Commutative Algebra, Washigton, DC (March 2015).
- Special session on Commutative Algebra, Halifax, Canada (October 2014).
- Special session on Commutative Algebra, Eau Claire, WI (October 2014).
- Colloquium, U. Western Ontario, London, Canada (March 2014).
- SIAM conference on Applied Algebraic Geometry, Fort Collins, CO (August 2013).
- Conference on Motivic Invariants and Singularities, South Bend, IN (June 2013).
- Local Cohomology Focus Period, Mathematical Sciences Research Institute Berkeley, CA (April 2013).
- MSRI Colloquium, Mathematical Sciences Research Institute, Berkeley, CA (March 2013).
- 3rd Bluegrass Algebra Conference, Lexington, KY (June 2012).
- Distinguished Visiting Professor Lecture Series, US Naval Academy, Annapolis, MD (April 2012).
- Workshop on Singularities, Madison, WI (March 2012).
- Workshop on Algebraic and Analytic D-modules, E. Schrödinger Institut, Vienna, Austria, (Novemver 2011).
- Special session on Hypergeometric systems, Salt Lake City, UT (October 2011).
- Algebra seminar, University of Utah, Salt Lake City, UT (Oct 2011).
- Special session on Arrangements, Worcester, MA (April 2011).
- Special session on Geometric Commutative Algebra and Applications, Iowa City, IA (March 2011).
- Algebra/Topology seminar, Georgia Tech, Atlanta, GA (November 2010).
- Special session on Singularities in algebraic geometry, Notre Dame, IN (November 2010).
- MSJ-SI Conference on Hyperplane Arrangements, Sapporo, Japan (August 2009).
- Algebra/Topology seminar, Georgia Tech, Atlanta, GA (April 2009).
- Special session in Theor. and Alg. Aspects of D-modules, AMS Sectional Meeting in Raleigh, NC (April 2009).
- Algebraic Geometry Seminar at Georgia Inst. of Technology, Atlanta, GA (April 2009).

- Alg. Geom. Seminar, Univ. of Illinois at Chicago, Chicago IL (March 2009).
- Comm. Alg./ Alg. Geom. Seminar at Univ. of Notre Dame, South Bend, IN (February 2009).
- Sequence of plenary lectures at the "Summer School on Hypergeometric Functions", Kleinwalsertal, Austria (September 2007).
- Special Session in Comb. and Geom. Aspects of Comm. Alg., AMS Sectional Meeting Bloomington, IN (April 2008).
- Conference on Macaulay2, Ithaca, NY (March 2008).
- Workshop on "D-modules and F-singularities", Ann Arbor, MI (August 2007).
- Representation theory, systems of differential equations, and related topics, Hokkaido University, Sapporo, Japan (July 2007).
- International Conference on Theoretical Effectivity and Practical Effectivity of Gröbner Bases, RIMS Kyoto, Japan (January 2007).
- Workshop on computational and combinatorial commutative algebra, Toronto, Canada (August 2006)
- Workshop on Gröbner bases, RISC Linz, Austria (May 2006).
- Plenary Speaker, JSPS Conference on Theoretical Effectivity and Practical Effectivity of Gröbner Bases, Tokyo, Japan (August 2005).
- Plenary Speaker, D-Modules and Hypergeometric Functions Workshop, Lisbon, Portugal (July 2005).
- Colloquium, University of Illinois at Urbana-Champaign (January 2004).
- Special session in Hypergeometric Functions, AMS Sectional Meeting, Pittsburgh, PA (November 2004).
- Lipman-Fest, West Lafayette, Indiana (May 2004).
- Algebra/Geometry/Topology Seminar, Georgia Tech, Atlanta, Georgia (March 2004).
- Special session in Computational Methods in Algebra and Analysis, RSME-AMS Joint Meeting Sevilla, Spain (June 2003).
- MEGA 2003 Conference on Algorithmic Algebraic Geometry, Kaiserslautern, Germany (June 2003).
- Instituto de Matemáticas de la Universidad de Sevilla, Spain (June 2003).
- 3-City Algebra Day, Jena, Germany (November 2002).
- Plenary Speaker, EACA Conference, Valladolid, Spain (September 2002).
- Special Session in Hyperplane Arrangements, AMS Sectional Meeting, Madison, Wisconsin (October 2002).
- CBMS Conference on "Solving systems of polynomial equations", College Station, Texas (June 2002).
- Special Session in Commutative Algebra and Algebraic Geometry, AMS Sectional Meeting, Montreal, Canada (May 2002).
- Special Session in Commutative Algebra, AMS Sectional Meeting, Ann Arbor, Michigan (March 2002).
- ACA Conference, Albuquerque, New Mexico (June 2001).
- Shape Seminar, Brown University, Providence, Rhode Island (August 2001).
- AMS Sectional Meeting, Columbia University, New York, New York (October 2000).
- Special Session in Commutative Algebra and Algebraic Geometry, Mathematics Joint Meeting, Washington, DC (January, 2000).
- Commutative and Noncommutative Algebra Seminar, University of California, Berkeley (November 1999).
- Conference on Local Cohomology, CIMAT, Guanajuato, Mexico (November 1999).
- Colloquium, North Dakota State University, Fargo (April 1999).

- Workshop on Gröbner bases, CIMAT, Guanajuato, Mexico (February 1999).
- Colloquium, University of Arizona, Tucson (January 1999).
- Midwest Algebraic Geometry Conference, Columbia (October 1999).
- Symbolic Computation Seminar, MSRI, Berkeley (October 1998).
- Commutative Algebra, Algebraic Geometry and Combinatorics Seminar, University of California at Berkeley (September 1998).
- MEGA 98 Conference on Algorithmic Algebraic Geometry, St. Malo, France (June 1998).
- MITO Seminar, Research Institute of the Mathematical Sciences, Kyoto, Japan (April 1998).
- Colloquium, Department of Mathematics, Kobe University, Kobe, Japan (May 1998).
- Special Session on Commutative Algebra, Mathematics Joint Meeting in Baltimore, Maryland (January, 1998).
- Poster session at the Conference in Honor of David Buchsbaum, Northeastern University, Boston, Massachusetts (October 1997).

Editorial Responsibilities

- Editor of "Communications in Algebra", 2011 – 2020.

Teaching Experience

Purdue University

- Professor 2011 – present
- Associate Professor 2006 – 2011
- Assistant Professor 2000 – 2006

University of Minnesota 1993 – 1999

- Co-instructor/Course Supervisor 1997 – 1998
- Teaching Assistant 1993 – 1997

Graduate Reading courses:

- Barnes, Dixon, Chan, Dunaisky, Wightman (Spring 2025), 3 credits each.

Undergraduate reading courses:

- Boes, Darlington (Summer 2023, 3 credits each), Rahman
- St Rain (Spring 2022, 3 credits).

Outreach

- Highschool Colloquium Series: bi-weekly survey lectures at local high schools on various vignettes of mathematics (With Sam Nariman). Spring 2022-present.
- Talks in the Purdue Math Club
- Talks in "Bridge to Research Seminar"

Other Experience

- Research in Pairs, CIMAT, Guanajuato, Mexico (February 2025).
- Mathematisches Forschungsinstitut Oberwolfach, "Arrangements, Matroids and Logarithmic Vector Fields" (June 2024).
- "Written Geometry: Commutative Algebra", CIRM, Luminy (January 2023).
- Focussed Research Group, "Logarithmic comparison theorems", Centro Di Ricerca Matematica Ennio De Giorgi, Pisa, Italy (Apr 2022).

- Mathematisches Forschungsinstitut Oberwolfach "Logarithmic Vector Fields and Freeness of Divisors and Arrangements" (January 2021).
- Focussed Research Group, "Arrangements and logarithmic derivations", Centro Di Ricerca Matematica Ennio De Giorgi, Pisa, Italy (Feb 2020).
- Bernoulli Brainstorming "Configurations and their Singularities", Bernoulli Center at EPFL, Lausanne, Switzerland (February 2019).
- Focussed Research Group, "Arrangements and logarithmic derivations", Centro Di Ricerca Matematica Ennio De Giorgi, Pisa, Italy (Feb 2018).
- SYSIPH ("Mirror SYmmetry and irregular SIngularities coming from PHysics") CIRM Luminy, France (April 2017).
- "Opponent" at PhD defense of K. Tweiten, Stockholm University (September 2015).
- Mathematisches Forschungsinstitut Oberwolfach "Mirror Symmetry, Hodge Theory and Differential Equations" (April 2015).
- Research in pairs, "Questions around the monodromy conjecture", Centro Internazionale perla Ricerca Matematica, Trieste, Italy (June 2011)
- Structured Quartet Research Ensemble (SQuarE) on "Arrangements, logarithmic vector fields, and D-modules", American Institute of Mathematics, Palo Alto (May 2009, Feb 2010, Feb 2011).
- Research Fellow, Mathematical Sciences Research Institute, Berkeley, California (February – March 2003).
- Research Fellow, Mathematical Sciences Research Institute, Berkeley, California (August – September 2002).
- Research Fellow, Mathematical Sciences Research Institute, Berkeley, California (August – October 1998).
- Research Visitor, Kobe University, Kobe, Japan (March-May 1998).
- Summer School in Commutative Algebra, Centre de Recerca Matemática, Barcelona, Spain (July–August 1996).

Synergistic Activities:

- Mentor in "MRWAC 2025 (Minnesota Research Workshop in Algebra and Combinatorics)", Minneapolis, MN (May 2025).
- Organizer (with C. Miller, D. Bath) of Special Session in "Commutative algebra, D-modules and singularities" at AMS Sectional Meeting in St. Louis, MO (October 2025).
- Organizer (with G. Denham, J. Matherne, G. Röhrle), Oberwolfach Seminar "Modern Developments in Matroid Theory", Oberwolfach, (June 2025).
- Lead Organizer (Co-organizers: C. Berkesch, L. Ma, C. Miller, S. Olano) of "Singularities, D-modules, and Connections to Physics", Banff International Research Station, Alberta, Canada (September 2025).
- Organizer (with L. Ma, V. Pandey, B. Ulrich) of "Algebra across time: a conference in honor of Bill Heinzer", West Lafayette, IN (April 2025).
- Organizer (with V. Pandey, J. Tarasova) of Special Session in "Recent developments in commutative algebra" at AMS Sectional Meeting in Omaha, NE, (October 2023).
- Organizer (with J. Kenkel, L. Ma) of Special Session in "Recent developments in commutative algebra" at AMS Sectional Meeting in West Lafayette, IN, (March 2022).
- Organizer (with C. Berkesch, L. Ma, C. Miller, C. Raicu) of ICERM workshop "Computational aspects of singularities via D-modules", Providence, RI (August 2021).
- Organizer (with K. Altman, C. Sevenheck) of "Hodge Theory and Differential equations", Chemnitz, Germany (March 2018).
- Organizer (with C. Berkesch, W. Zhang) of "Local Cohomology in Commutative Algebra and Algebraic Geometry", Minneapolis, MN (August 2017).

- Organizer (with G. Denham, M. Schulze, C. Sevenheck) of "SinKLarities" conference on combinatorial aspects in singularities, Kaiserslautern, Germany (August 2015).
- Organizer of Special Session in "Effectve Methods in D-modules and singularities" at SIAM Conference in Fort Collins, CO, with K. Schwede, C. Raicu, Aug. 1-4 2013.
- Organizer of Special Session in "Computations and Effective Bounds in Commutative Algebra" at SIAM Conference in Fort Collins, CO, with K. Schwede, C. Raicu, Aug. 1-4 2013.
- Co-Organizer of Midwestern biannual conference "Algebra, Geometry and Combinatorics", April/October 2009-present (Co-Founder with S. Basu, H. Schenck, A. Yong).
- Organizer of Special Session in "D-modules" at AMS Sectional Meeting in Bloomington, IN, with M. Schulze, Apr. 5–6 2008.
- Organizer of AMS-IMS-SIAM Summer School in "Commutative Algebra: Local Cohomology and its interactions with Algebra, Analysis and Geometry" at Snowbird, UT, with A. Singh, June 19 – July 1 2005.
- Organizer of Special Session in "D-modules" at Joint AMS Meeting in Atlanta, GA, with S. Sperber, Jan. 5–8 2005.
- Organizer of "Workshop in Computational Algebraic Analysis", at MSRI, with B. Sturmfels and N. Takayama, Jan. 5–7 2000.
- Referee for
  Acta Math., Adv. Math., AJM, ANT, Beiträge Math., Bulletin LMS, Bulletin Belg. Math. Soc., Comm. Alg., Comm. Math. Phys. Comm. Numb. Th. Phys., Compositio Math., Duke M. J., Electronic J. Comb., Hacettepe, IJM, Illinois J. Math., IMRN, Indagationes, Inventiones Math., ISSAAC, JAMS, J. AAECC, J. Algebra, J. Comb. Th. J. Complexity, J. LMS, J. Lie Theory, J. Optimization, JPAA, JSC, Kyushu J. Math., Math. Ann., Math. Z., Math. Res. Lett., Michigan J. Math., PAMS, Publ. RIMS, Rev. Mat. Iberoamericana, Selecta Math., Sigma, Springer LNM, TAMS, Transf. Groups
- Reviewer for "Mathematical Reviews".
- Referee for EACA, MEGA, ISSAC, SIAM conferences.
- External Referee for
  - American Institute of Mathematics,
  - Deutsche Forschungsgesellschaft,
  - Humboldt Foundation,
  - Marie Curie Foundation of the European Community,
  - National Science Center of Poland,
  - Netherlands Organisation for Scientific Research,
  - NSF (panels 1999, 2002, 2009, 2023),
  - NSA (2010, 2011),
  - Research Foundation Flanders,
  - Simons Foundation (several times),
  - Award Selection Committee, 2024 International Congress of Basic Science in Beijing.

Advisorial

- Postdoctoral fellows
  - Mathias Schulze (2005/6, now professor at U Kaiserlautern/Germany)
  - Peter Scheiblechner (co-advisor with Saugata Basu, now professor at Luzern U/Switzerland)
  - Emily Witt (2013, at MSRI, now professor at U Kansas/USA)
  - Linquan Ma (2014/5, now professor at Purdue U/USA)
  - Andras Lörincz (2016-19, now professor at U Oklahoma/USA)
  - Vaibhav Pandey (2022-26).
- Graduate students and papers resulting from the thesis

- Darren Tapp (PhD 2007; Assistant Research Professor at ASU School of Computing, Informatics, and Decision Systems Engineering; CEO of TAPPMATH)
  - J. Pure Appl. Algebra 212 (2008), no. 10, 2314—2319
- Maria-Cruz Fernandez-Fernandez (visiting from Sevilla, Fall 2009; Professor at U Sevilla)
  - Proc. Amer. Math. Soc. 139 (2011), no. 9, 3175—3180
- Christine Berkesch (PhD 2010; Professor at U Minnesota)
  - Compos. Math. 147 (2011), no. 1, 284-–318
  - J. Algebra 322 (2009), no. 8, 2886–2904
- Jen-Chieh Hsiao (PhD 2012, Professor at NCKU)
  - Trans. Amer. Math. Soc. 364 (2012), no. 5, 2461–2478
  - Comm. Algebra 40 (2012), no. 5, 1618–1624
  - Illinois J. Math. 57 (2013), no. 1, 1–15
- Arnold Yim, (PhD 2016; Virginia Western Community College)
  - J. Algebra 471 (2017), 220–239
- Jim Vaught (PhD 2016 in ECE, co-advisor with M. Boutin)
- Avi Steiner (PhD 2019; Abhyankar Thesis Award; Postdoc at U Mannheim)
  - J. Pure Applied Algebra 223 (2019), no. 12, 5215–5231.
  - J. Algebra 524 (2019), 124–159.
  - `EulerKoszul.m2` (Macaulay2 package), uploaded March 2017
- Dan Bath (PhD 2021; Abhyankar Thesis Award; Postdoc at KU Leuven, 2021-2025)
  - Trans. Amer. Math. Soc. 373 (2020), no. 12, 8543–8582.
  - J. Singul. 20 (2020), 165–204.
  - `arXiv:2008.07447` (submitted).
  - `arXiv:2109.14223` (submitted).
- Michael Kaminski (PhD 2021; Data Scientist at John Deere)
- Hunter Simper (PhD 2023; Abhyankar Thesis Award; Postdoc 2023-2026 U Utah)
  - `arXiv:2209.06738` (submitted)
  - `arXiv:2110.02264` (with V. Nguyen, submitted).
- Sheng Tan (PhD 2023; Postdoc 2023-2025 at Beijing Institute of Mathematical Sciences and Applications BIMSA)
  - (with Z. Jia, D. Kaszlikowski) J. HEP, Article # 160 (2023)
  - (with Z. Jia, D. Kaszlikowski, L. Chang) Comm. Math. Phys. (2023)
  - (with L. Wei, Z. Jia, D. Kaszlikowski) Quant. Inf. Proc., Article # 290 (2024)
  - (with Z. Jia, D. Kaszlikowski) J. Phys. A: Math. Theor. 57, 255203 (2024)
- Kindyl King (PhD 2023, co-advisor with M. Boutin; Data Scientist at John Deere)
  - `arXiv:2111.10834` (with M. Boutin, U. Walther)
- Adam LaClair (current; Abhyankar Thesis Award 2024; Postdoc 2025-2028 U Nebraska Lincoln)
  - `arXiv:2312.07393` (submitted)
  - `arXiv:2304.13299` (submitted)
  - `arXiv:2307.09179` (submitted)
  - `arXiv:2405.14833` (submitted)
  - `arXiv:2412.18499`, (with M. Mastroeni, J. McCullough, I. Peeva) Selecta Math. (to appear).
- Justin Fong (current; Abhyankar Thesis Award 2025)
  - `arXiv:2311.06908` (submitted)
  - `arXiv:2407.09978` (submitted)
- Natalie Chlopecki (current)
- Manav Batavia (current; joint with Linquan Ma)
- Tyler Dunaisky (current)

- Graduate Mentoring (not as PhD advisor):

- Alejandra Montejo
- Daniel Slonim
- Stephanie Reyes
- Patrick Debonis
- Annie Giokas (mentor)
- June Weiland (mentor)
- Ben Doyle (initial)
- Asini Konpola (initial) (current)
- Ashton Keith (initial) (current)
- Kieran Hilmer (initial) (current)
- Alejandro Cano (mentor) (current)

- Undergraduate Metoring of/Research with gifted students
  - David Knott (2009-2012)
  - Abi Kommunduru 2011-2013)
  - Katie Marsh (2011-2013)
  - Colin Ford (2015-2016)
  - Alan Min (2014-2018; I am sponsor for his 2017 Goldwater Fellowship)
  - Ethan Brady (2019-2023; I am sponsor for his 2022 Goldwater Fellowship)
  - Krish Gupta (2020-2024)
  - Sterling St. Rain (2021-2023)
  - Aaron Boes (2021-now)
  - Sukrith Raman (2023-now)
  - Emily Darlington (2023-2025)
  - Rezza Hadian (2024-now)
  - Alan Mobley Burgos (2025-now)
  - Liangjie Yuan (2024-now)
- Summer REU Projects (sponsored by NSF or otherwise)
  - Jamie Gennis, Sam Vaughn (2003)
  - John Berlakovich, Matt Davis (2009)
  - Mike Burkhart, David Knott (2010)
  - David Knott, Abi Kommanduru (2011)
  - Katie Marsh (2012)
  - Alan Min, Colin Ford, Leonardo Rafael Azopardo Cadenas (2015).
  - Steven Kidd, Yang Mo (2016)
  - Michael Cincoske (2017)
  - Sterling St Rain (2022, 2023).
- Exchange Programs
  - Gabriel Esteban Perico Monsalve via Colombia Purdue Institute's Undergraduate Research Experience (2015)
- Emerging Leaders Science Scholars Mentor for
  - Joaquin Octavio McCreary (2021-24)
  - Noah Kyle Vanderwall (2022-26)
  - Jordan A Barclay (2024-2028)

Committees

- Promotions Subcommittee: 2011/12, 2013/14, 2019/20, 2023/24
  Chair: 2019/20
- Undergraduate Mathematics Majors and Curriculum Committee: 2011–present,
  Chair: 2012-present

- Committee on Industrial Connections: 2022-present
- Calculus Committee: 2010-present
- College of Science Data Science Curriculum Committee: 2021-present
- CoS Undergraduate Curriculum and Academic Policy Committee: 2012-present
- Computer Committee: 2007-2013
- Campus Grievance Appeals Committee: 2004-2006
- University Student Cases Committee: 2007-2012
- CoS Faculty Council: 2024-2027.