Jonathan Montaño

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INTERESTS

Commutative algebra, combinatorics, and algebraic geometry.

EXPERIENCE

Assistant Professor Arizona State University August 2022-

Assistant Professor* New Mexico State University August 2018-July 2022

*Granted tenure and promoted to Associate Professor in the spring of 2022

Oberwolfach Leibniz Fellow (postdoc) MFO, Oberwolfach Res. Inst. for Math. Summer 2018

Visiting Assistant Professor (postdoc) University of Kansas August 2015-May 2018
Graduate Assistant Purdue University August 2009-July 2015
Graduate Assistant Universidad Nacional de Colombia, Bogotá August 2008-August 2008

EDUCATION

Purdue University, West Lafayette, IN

Ph.D. in Mathematics, August 2015 (Advisor: Bernd Ulrich)

M.Sc. in Mathematics, August 2011

Universidad Nacional de Colombia, Bogotá

M.Sc. in Mathematics, August 2009 B.Sc. in Mathematics, August 2008

PUBLICATIONS

Mathematics:

- 25. Rational powers, invariant ideals, and the summation formula, with Sankhaneel Bisui, Sudipta Das, and Tài Huy Hà,, arXiv: 2402.12350, submitted.
- 24. Ladder determinantal varieties and their symbolic blowups, with Alessandro De Stefani, Luis Núñez-Betancourt, Lisa Seccia, and Matteo Varbaro, arXiv: 2305.18167, submitted.
- 23. K-polynomials of multiplicity-free varieties, with Federico Castillo, Yairon Cid-Ruiz, and Fatemeh Mohammadi, arXiv: 2212.13091, submitted.
- 22. The core of monomial ideals, with Louiza Fouli, Claudia Polini, and Bernd Ulrich, arXiv: 2303.10486, to appear in Algebra & Number Theory.
- 21. Blowup algebras of determinantal ideals in prime characteristic, with Alessandro De Stefani and Luis Núñez-Betancourt, **Journal of the London Mathematical Society**, 110 (2024), e12969.
- 20. Computing multiplicity sequences, with Justin Chen and Youngsu Kim, Journal of Software for Algebra and Geometry 14 (2024), 13-18.
- 21. Double Schubert polynomials do have saturated Newton polytopes, with Federico Castillo, Yairon Cid-Ruiz, and Fatemeh Mohammadi, Forum of Mathematics, Sigma 11 (2023), e100.
- 18. Purity of monoids and characteristic-free splittings in semigroup rings, with Alessandro De Stefani and Luis Núñez-Betancourt, **Mathematische Zeitschrift** 305:31 (2023).

- 17. Frobenius methods in combinatorics, with Alessandro De Stefani and Luis Núñez-Betancourt, **São Paulo Journal of Mathematical Sciences** 17 (2023), 387-429.
- 16. Convex bodies and graded families of monomial ideals, with Yairon Cid-Ruiz, Revista Matemática Iberoamericana 38 (2022), 2033-2056.
- 15. Mixed multiplicities of graded families of ideals, with Yairon Cid-Ruiz, Journal of Algebra 590 (2022), 394-412.
- 14. When are multidegrees positive?, with Federico Castillo, Yairon Cid-Ruiz, Binglin Li, and Naizhen Zhang, Advances in Mathematics 374 (2020), 107382.
- 13. Exterior powers and Tor-persistence, with Justin Lyle and Keri Sather-Wagstaff, **Journal of Pure and Applied Algebra** 226 (2022), 106890.
- 12. Analytic spread and integral closure of integrally decomposable modules, with Carles Bivià-Ausina, Nagoya Mathematical Journal 245 (2022), 166–191.
- 11. Symbolic analytic spread: upper bounds and applications, with Hailong Dao, Journal of the Institute of Mathematics of Jussieu 20 (2021), 1969-1981.
- 10. Extremal growth of Betti numbers and trivial vanishing of (co)homology, with Justin Lyle, **Transactions of the American Mathematical Society** 373 (2020), 7937-7958.
- 9. Splittings and symbolic powers of square-free monomial Ideals, with Luis Núñez-Betancourt, International Mathematics Research Notices 2021 (2021), 2304–2320.
- 8. On asymptotic vanishing behavior of local cohomology, with Hailong Dao, Mathematische Zeitschrift 295 (2020), 73-86.
- 7. Length of local cohomology of powers of ideals, with Hailong Dao, **Transactions of the American Mathematical Society** 371 (2019), 3483-3503.
- 6. Lower bounds on projective levels of complexes, with Hannah Altmann, Eloísa Grifo, William Sanders, and Thanh Vu, Journal of Algebra 491 (2017), 343-356.
- 5. On the growth of deviations, with Adam Boocher, Alessio D'Alì, Eloísa Grifo, and Alessio Sammartano, **Proceedings of the American Mathematical Society** 144 (2016), 5049-5060.
- 4. Edge ideals and DG algebra resolutions, with Adam Boocher, Alessio D'Alì, Eloísa Grifo, and Alessio Sammartano, Le Matematiche 70 (2015), no.1, 215-237.
- 3. Artin-Nagata properties, minimal multiplicities, and depth of fiber cones, Journal of Algebra 425 (2015), 423-449.
- 2. Multiplicities of classical varieties, with Jack Jeffries and Matteo Varbaro, Proceedings of the London Mathematical Society 110 (2015), 1033-1055.
- 1. The j-multiplicity of monomial ideals, with Jack Jeffries, Mathematical Research Letters 20 (2013), 729-744.

Computer Science:

- 3. Improving Locality Sensitive Hashing by Efficiently Finding Projected Nearest Neighbors, with Omid Jafari and Parth Nagarkar, 13th International Conference on Similarity Search and Applications (SISAP) 2020.
- 2. mmLSH: A Practical and Efficient Technique for Processing Approximate Nearest Neighbor Queries on Multimedia Data, with Omid Jafari and Parth Nagarkar, 13th International Conference on Similarity Search and Applications (SISAP) 2020.
- 1. Efficient Bitmap-based Indexing and Retrieval of Similarity Search Image Queries, with Omid Jafari and Parth Nagarkar, IEEE Southwest Symposium on Image Analysis and Interpretation (SSIAI) 2020.

CODES

MultiplicitySequence package in Macaulay2, with Justin Chen and Youngsu Kim, certified by JSAG.

GRANTS

NSF Standard Grant, DMS #2401522 NSF, \$225,000 2024-2027 NSF Standard Grant, DMS #2001645/2303605 NSF. \$139.794 2020-2024 NSA Conference Grant SLAM 2024, \$20,368 February 2024 $March\ 2023$ NSF Conference Grant, DMS #2302498 SLAM 2023, \$16,000 Natural Sciences DEI Seed Grant ASU, \$10,000 2023 PASCA 2022, \$11,900 NSF Conference Grant, DMS #2220824 June 2022 NSF Conference Grant, DMS #1745772 KUMUNU 2017, \$13,000 October 2017 AMS - Simons Travel Grant AMS & Simons Foundation, \$4,000 July 2017-June 2019

FELLOWSHIPS AND HONORS

Research Member January-April 2024 SLMath(MSRI) AIM SQuaREs 2023-2025 AIM Oberwolfach Research Fellow MFO, Oberwolfach Res. Inst. for Math. November-December 2022 Oberwolfach Leibniz Fellow MFO, Oberwolfach Res. Inst. for Math. Summer 2018 Bilsland Dissertation Fellowship Purdue University, College of Science June 2014-May 2015 Program Associate **MSRI** August-December 2012 Ross Fellowship Purdue University August 2009-July 2010 Outstanding Graduate Students Fellowship Universidad Nacional de Colombia, Bogotá August 2008- July 2009 Second place (nationwide) ECAES in Mathematics, Colombia 2008

INVITED TALKS Mathematical Congress of the Americas Miami, Florida July 21, 2025 50th Spring Lecture Series University of Arkansas May 15, 2025 AMS Sectional Meeting University of California, Riverside October 26, 2024 Latin-American & Caribbean Math. Congress João Pessoa, Brazil August 26, 2024 Latin-American Alg. Colloquium (plenary) Pont. Univ. Católica, Chile July 22, 2024 CAAGTUS 2024 Conference University of Arizona May 4, 2024 Bay Area Discrete Math Day Santa Clara University April 20, 2024 Commutative Algebra Seminar SLMath/MSRI March 21, 2024 Algebra Seminar Auburn University October 16, 2023 September 27, 2023 ICMAM Latin-America, Satellite Conference Online Summer CAMP University of Nebraska-Lincoln August 9, 2023 MSRI summer school Colloquium University of Notre Dame May 26, 2023 April 17, 2023 Algebra Seminar University of Missouri Tulane Mathematics Colloquium Tulane University March 30, 2023 XII School of Mathematics Fed. Univ. of Sergipe, Brazil (Online) February 14-16, 2023 Algebra&Geometry seminar University of Genova, Italy December 21, 2022 Dept. of Mathematical Sciences Colloquium University of Texas at El Paso (Online) November 4, 2022 AMS Sectional Meeting University of Utah October 23, 2022 Comb. and Commalg. Seminar Oklahoma State University (Online) April 20, 2022 2022 JMMOnline April 7, 2022 AMS Sectional Meeting Online March 26, 2022 AMS Sectional Meeting Online March 19, 2022 Southwest Local Alg. Mtg. (SLAM) Baylor University February 26, 2022 Sch. Math and Stat. Sc. Colloquium Arizona State University February 22, 2022 Dept. of Mathematics Millican Colloquium University of North Texas February 8, 2022 Dept. of Math., Stat., Comp. Sc. Colloquium University of Ilinois Chicago (Online) December 7, 2021 AG-CA Seminar November 16, 2021 University of Notre Dame (Online) Commutative Algebra Seminar U. of Illinois at Chicago (Online) November 4, 2021 AMS Sectional Meeting Online October 23, 2021 Nat. Congress Mexican Math Soc. Online October 21, 2021

Algebra and Alg. Geometry Seminar McMaster University, Canada (Online) July 19, 2021 Virtual CA seminar IIT Bombay, India (Online) July 9, 2021 Fellowship of the Ring MSRI (Online) April 29, 2021 AMS Sectional Meeting Online April 17, 2021 Dept. of Math. Colloquium New Mexico State University (Online) April 9, 2021 Algebra and Geometry Seminar Iowa State University (Online) March 16, 2021 Dept. of Math. Colloquium U. of California, Riverside (Online) February 24, 2021 Combinatorics Seminar University of Kansas (Online) November 13, 2020 Dept. of Math. Colloquium U. de los Andes, Colombia (Online) October 22, 2020 Dept. of Math. Colloquium University of New Mexico (Online) October 13, 2020 AMS Sectional Meeting Online October 3, 2020 AG and CA seminar NU/UIC/UofC (Online) July 29, 2020 eCARs conference Online June 28, 2020 Algebra Seminar U./Neu./Frib./Bern, Switzerland (Online) May 15, 2020 AMS Sectional Meeting (meeting canceled) Purdue University April 4, 2020 Algebra and Algebraic Geometry Seminar University of Wisconsin, Madison February 7, 2020 Commutative Algebra Seminar Purdue University April 22, 2019 AMS Sectional Meeting Auburn University March 15, 2019 January 18, 2019 Frobenius Action in CA Workshop Barcelona, Spain Universitat Pol. València, Spain January 15, 2019 Algebra Seminar Fall School in CA CIMAT, Mexico November 13-17, 2018 Algebra Seminar Georgia State University September 11, 2018 Public Lecture at ECCO 2018 Barranquilla, Colombia June 7, 2018 Col.-Mex. Math Soc. joint meeting Universidad del Norte, Colombia May 30, 2018 AMS Sectional Meeting Portland State University April 14, 2018 **CA-AG** Seminar CIMAT, Mexico March 22, 2018 Geometry and Topology Seminar San Francisco State University March 12, 2018 Commutative Algebra Seminar University of Michigan November 2, 2017 Commutative Algebra Seminar University of Utah October 19, 2017 **PRIMA 2017** Oaxaca, Mexico August 14, 2017 Combinatorial and CA Seminar Oklahoma State University April 20, 2017 Commutative Algebra Seminar University of Nebraska-Lincoln April 10, 2017 KUMUNU jr 2017 University of Nebraska-Lincoln April 8, 2017 Algebra Seminar University of Missouri February 27, 2017 Department of Mathematics Colloquium New Mexico State University February 9, 2017 2016 CMS Winter Meeting Niagara Falls, Canada December 4, 2016 Algebra & Combinatorics Seminar Tulane University November 10, 2016 Commutative Algebra Seminar Purdue University October 21, 2016 KUMUNU 2016 University of Kansas October 1, 2016 AMS Sectional Meeting North Dakota State University April 16, 2016 Algebra Seminar University of Arkansas January 29, 2016 AMS Sectional Meeting Rutgers University November 14, 2015 Combinatorics Seminar November 6, 2015 University of Kansas Commutative Algebra Seminar Purdue University October 7, 2015 Midwest Commutative Algebra Meeting Purdue University August 5, 2015 CA and related topics 2015 University of Kansas March 22, 2015 Commutative Algebra Seminar Purdue University February 4, 2015 2015 Joint Mathematics Meeting January 13, 2015 San Antonio, TX University of Utah November 21, 2014 Commutative Algebra Seminar Commutative Algebra Seminar Purdue University November 5, 2014

Algebra Seminar AMS Sectional Meeting New Mexico State University

San Francisco State University

November 3, 2014

October 26, 2014

AMS Sectional Meeting	Dalhousie University	October 19, 2014
AMS Sectional Meeting	University of New Mexico	April 5, 2014
Commutative Algebra Seminar	Purdue University	February 27, 2014
Commutative Algebra Seminar	Purdue University	October 28, 2013
Commutative Ring Theory Seminar	University of Illinois at U-C	October 24, 2013
Commutative Algebra Seminar	Purdue University	October 21, 2013
AMS Sectional Meeting	University of Louisville	October 5, 2013
KUMUNU jr 2013	University of Nebraska-Lincoln	April 22, 2013
Commutative Ring Theory Seminar	University of Illinois at U-C	March 7, 2013
AG-CA Seminar	University of Notre Dame	February 26, 2013
Commutative Algebra Seminar	Purdue University	February 22, 2013

ORGANIZATIONAL ACTIVITIES

Co-Organizer, Southwest Local Algebra Meeting	Yearly	2023-
Co-Organizer, Number Theory&Algebra Seminar	Arizona State University	Fall 2022-
Co-Organizer, Algebra Days at Arizona State	Arizona State University	November 2023
Co-Organizer, AMS Spe. Ses. on CA and Comb.	University of Texas, El Paso, TX	September 2022
Co-Organizer, Pan-American School on CA	CIMAT, Mexico	June 2002
Co-Organizer, AMS Spe. Ses. on CA	Online	September 2020
Co-Organizer, Algebra Seminar	New Mexico State University	Fall 2019-Fall 2021
Co-Organizer, CAAG Reading Seminar	New Mexico State University	Spring 2019-
Co-Organizer, AMS Spe. Ses. on Multiplicities	University of Michigan, Ann Arbor, MI	October 2018
Co-Organizer, Algebra Seminar	University of Kansas	Fall 2015-Spring 2018
Co-Organizer, KUMUNU 2017	University of Kansas	October 2017
Co-Organizer, 2017 SACNAS, Session on CA	Salt Lake City, UT	October 2017
Co-Organizer, AMS Spe. Ses. on CA	University of North Texas, Denton, TX	September 2017
Co-Organizer, JMM - MRC Session on CA	Seattle, WA	January 2016
Co-Organizer, AMS Spe. Ses. on CA	Loyola University, Chicago, IL	October 2015
Co-Organizer, Student Comm. Alg. Seminar	Purdue University	Fall 2013-Spring 2015
Co-organizer, Student Colloquium	Dept. of Mathematics, Purdue University	Fall 2013-Spring 2015
Co-organizer, Program Associate Seminar	MSRI	Fall 2012

OTHER PROFESSIONAL ACTIVITIES

Scientific Committee member, Colombian Combinatorics Meeting (ECCO), summer 2024 Teaching Assistant, MSRI Summer Graduate School, University of Notre Dame, May 2019 Teaching Assistant, MSRI Summer Graduate School, Okinawa, Japan, May 2017

Reviewer, NSA-AMS Grant

Referee, Communications in Algebra, Contemporary Mathematics, European Journal of Combinatorics,
Journal of Algebra, Journal of Algebra and its Applications, Journal of Commutative Algebra,
Journal of Pure and Applied Algebra, Mathematical Research Letters, Mathematica Scandinavica,
Mathematische Zeitschrift, Nagoya Mathematical Journal, Proceedings of the American Mathematical Society,
Rocky Mountain Journal of Mathematics, Results in Mathematics,
Transactions of the American Mathematical Society.

ADVISING

Postdocs:

Sankhaneel Bisui (2023 -)

Ph.D. students:

Sudipta Das (2020 -)

Master's Degree students:

Emmy Lewis (2019 - 2021) - Currently a PhD Student at Cornell University

Undergraduate students:

Ethan Leventhal (2022 - 2024) - Currently a PhD Student at Georgia Tech

Jacob Cooper (2023 - 2024) - Currently a PhD Student at ASU

Emmy Lewis (2018 - 2019) - Currently a PhD Student at Cornell University

SELECTED OUTREACH ACTIVITIES

Associate Editor, AMS Blog on Teaching and Learning
Associate Editor, Frontiers for Young Minds

August 2020 - July 2021
May 2017 - May 2021

Grader, USAMO 2015, 2016 Cambridge, MA April 2015, 2016

Coordinator (Problem Captain), IMO 2013 Santa Marta, Colombia July 2013
Trainer, AAAS Olympiad Program Washington D.C. 2012
President, Colombian St. Association at Purdue Purdue University 2011

SELECTED AWARDS IN MATHEMATICS AND PROGRAMMING COMPETITIONS

International Collegiate Programming Contest, South American Final, first place, Bogotá, Colombia, 2008. Colombian Programming Contest (college level), first place, 2008.

International Mathematics Competition for University Students, third prize, Bulgaria, 2008; Ukraine, 2006.

International Mathematical Olympiad, bronze medal, Greece, 2004.

Colombian Mathematical Olympiad, gold medal, 2003.

Colombian Programming Olympiad, first place, 2002, 2001, third place, 2003.

TEACHING EXPERIENCE

Arizona State University, August 2022 -

Abstract Algebra I	Fall 2024
Algebraic Geometry and Toric Varieties	Fall 2023
Advanced Linear Algebra	Fall 2023
Ring Theory	Spring 2023
Advanced Linear Algebra	Fall 2022

New Mexico State University, August 2018 - July 2022

Abstract Algebra I: Groups and Rings	Spring 2022
Calculus and Analytic Geometry II	Spring 2022
Introduction to Modern Algebra	Fall 2021
Calculus and Analytic Geometry II	Fall 2021
Introduction to Algebraic Statistics	Spring 2021
Introduction to Higher Mathematics	Spring 2021
Advanced Linear Algebra	Fall 2020
Calculus and Analytic Geometry II	Fall 2020
Introduction to Algebraic Geometry	Spring 2020
Matrix Theory and Applied Linear Algebra	Fall 2019
Calculus and Analytic Geometry III	Fall 2019
Calculus and Analytic Geometry II	Spring 2019
Calculus and Analytic Geometry I (two sections)	Fall 2018

University of Kansas, August 2015 - May 2018

Calculus III (Honors)	Spring 2018
Introductory Modern Algebra	Fall 2017
Elementary Linear Algebra	Fall 2017

Linear Algebra	Summer 2017
Linear Algebra	Spring 2017
Elementary Linear Algebra	Fall 2016
Calculus III (Honors)	Fall 2016
Elementary Linear Algebra	Spring 2016
Vector Calculus	Spring 2016
Linear Algebra	Fall 2015

Purdue University, August 2009 - July 2015

Introductory Analysis I Spring 2014
Introductory Analysis II Fall 2013
Calculus I, recitation Spring 2012
Calculus II, recitation Spring 2012
Multivariable Calculus, recitation Fall 2011
Multivariable Calculus, recitation Fall 2010

Universidad Nacional de Colombia, Bogotá, August 2008 - August 2009

Linear Algebra Spring 2009 Calculus I Fall 2008

LANGUAGES

English (bilingual proficiency), Spanish (native).

MEMBERSHIP

American Mathematical Society, 2010-