Jonathan Montaño

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INTERESTS

Commutative algebra, combinatorics, and algebraic geometry.

EXPERIENCE

Assistant Professor	Arizona State University	August 2022-
Research Member	SLMath(MSRI), Berkeley, CA	January 2024-April 2024
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	MFO, Oberwolfach Res. Inst. for Math.	Summer 2018
Visiting Assistant Professor	University of Kansas	August 2015-May 2018
Graduate Assistant	Purdue University	August 2009-July 2015
Program Associate	MSRI, Berkeley, CA	August 2012-December 2012
Graduate Assistant	Universidad Nacional de Colombia, Bogotá	August 2008-August 2009

EDUCATION

Purdue University, West Lafayette, IN
  Ph.D. in Mathematics, August 2015
    Thesis: *Generalized multiplicities, reductions of ideals, and depth of blowup algebras.*
    Advisor: Prof. Bernd Ulrich
  M.Sc. in Mathematics, August 2011

Universidad Nacional de Colombia, Bogotá
  M.Sc. in Mathematics, August 2009
    Thesis: *Idempotents, adjoining an identity, and connectedness.* (in Spanish)
    Advisor: Prof. Lorenzo Acosta
  B.Sc. in Mathematics, August 2008
    Thesis: *Applications of the algorithmic proofs of the Quillen-Suslin theorem in algebraic geometry.* (in Spanish)
    Advisor: Prof. José Oswaldo Lezama

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. *Blowup algebras of determinantal ideals in prime characteristic*, with Alessandro De Stefani and Luis Núñez-Betancourt, `arXiv: 2109.00592`, to appear in **Journal of the London Mathematical Society**.

21. *The core of monomial ideals*, with Louiza Fouli, Claudia Polini, and Bernd Ulrich, `arXiv: 2303.10486`, to appear in **Algebra & Number Theory**.

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**.

FELLOWSHIPS, HONORS, AND GRANTS

Research Member	SLMath(MSRI)	Spring 2024
NSA Conference Grant	SLAM 2024	February 2024
AIM SQuaREs Grant	AIM	2023-2025
NSF Conference Grant, DMS #2302498	SLAM 2023	March 2023
Natural Sciences DEI Seed Grant	ASU	2023
NSF Conference Grant, DMS #2302498	SLAM 2023	March 2023
Oberwolfach Research Fellow	MFO, Oberwolfach Res. Inst. for Math.	November-December 2022
NSF Conference Grant, DMS #2220824	PASCA 2022	June 2022
NSF Standard Grant, DMS #2001645/2303605	NSF	2020-2024
Oberwolfach Leibniz Fellow	MFO, Oberwolfach Res. Inst. for Math.	Summer 2018
NSF Conference Grant, DMS #1745772	KUMUNU 2017	October 2017
AMS - Simons Travel Grant	AMS & Simons Foundation	July 2017-June 2019
Bilsland Dissertation Fellowship	Purdue University, College of Science	June 2014-May 2015
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

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
ICMAM Latin-America, Satellite Conference	Online	September 27, 2023
Summer CAMP	University of Nebraska-Lincoln	August 9, 2023
MSRI summer school Colloquium	University of Notre Dame	May 26, 2023
Algebra Seminar	University of Missouri	April 17, 2023
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 JMM	Online	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	University of Notre Dame (Online)	November 16, 2021
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
Frobenius Action in CA Workshop	Barcelona, Spain	January 18, 2019
Algebra Seminar	Universitat Pol. València, Spain	January 15, 2019
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	University of Kansas	November 6, 2015
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	San Antonio, TX	January 13, 2015
Commutative Algebra Seminar	University of Utah	November 21, 2014
Commutative Algebra Seminar	Purdue University	November 5, 2014
Algebra Seminar	New Mexico State University	November 3, 2014
AMS Sectional Meeting	San Francisco State University	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, Transactions of the American Mathematical Society.

ADVISING

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 -)
 Jacob Cooper (2023 -)
 Chris Tapo (2023)
 Emmy Lewis (2018 - 2019) - Currently a PhD Student at Cornell University

SELECTED OUTREACH ACTIVITIES

Associate Editor, AMS Blog on Teaching and Learning		August 2020 - July 2021
Associate Editor, Frontiers for Young Minds		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 -

Algebraic Geometry and Toric Varieties	Instructor	Fall 2023
Advanced Linear Algebra	Instructor	Fall 2023
Ring Theory	Instructor	Spring 2023
Advanced Linear Algebra	Instructor	Fall 2022

New Mexico State University, August 2018 - July 2022

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

University of Kansas, August 2015 - May 2018

Calculus III (Honors)	Instructor	Spring 2018
Introductory Modern Algebra	Instructor	Fall 2017
Elementary Linear Algebra	Instructor	Fall 2017
Linear Algebra	Instructor	Summer 2017
Linear Algebra	Instructor	Spring 2017
Elementary Linear Algebra	Instructor	Fall 2016
Calculus III (Honors)	Instructor	Fall 2016
Elementary Linear Algebra	Instructor	Spring 2016
Vector Calculus	Instructor	Spring 2016
Linear Algebra	Instructor	Fall 2015

Purdue University, August 2009 - July 2015

Introductory Analysis I	Instructor	Spring 2014
Introductory Analysis II	Instructor	Fall 2013
Calculus I	Recitation Instructor	Spring 2013
Calculus II	Recitation Instructor	Spring 2012
Multivariable Calculus	Recitation Instructor	Fall 2011
Multivariable Calculus	Recitation Instructor	Fall 2010

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

Linear Algebra	Instructor	Spring 2009
Calculus I	Instructor	Fall 2008

LANGUAGES

English (bilingual proficiency), Spanish (native).

MEMBERSHIP

American Mathematical Society, 2010-