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Current Position

Visiting Assistant Professor, Harvey Mudd College — *June 2023 - present*
Duties: Teaching, mentoring a thesis student and faculty advisor for capstone clinic project. — Claremont, CA, USA
Research interests: Algebraic geometry and its interactions with combinatorics and commutative algebra.

Previous appointments

Visiting Assistant Professor, University of California, Riverside — *July 2020 - June 2023*
Duties: Teaching 2 courses per quarter, leading reading courses and student research projects. — Riverside, CA, USA

Teaching Assistant, University of British Columbia — *September 2015 - June 2020*
Classes: Pre-calculus, first-year calculus (differential, integral, both single and multivariate), proof-based linear algebra, proof-based number theory, mathematical logic, complex analysis. — Vancouver, BC, Canada
Responsibilities: Head TA, directing discussion sessions, grading, helping students at the Mathematics Learning Center.

Teaching Assistant, Universidad Nacional Autónoma de México — *August 2012 - June 2015*
Classes: Linear Algebra I and II, Modern Algebra: Modules and homological algebra. Responsibilities: Designing discussion sessions and grading. — CU, Mexico City, Mexico

Education

Ph.D. in Mathematics, University of British Columbia — *September 2015 - June 2020*
Thesis: *Negative curves in blowups of weighted projective planes.* — Vancouver, BC, Canada

M.Sc. in Mathematics, Universidad Nacional Autónoma de México (UNAM) — *August 2013 - May 2015*
Thesis: *Study of the Lie algebra of vector fields that preserve the conformal structure of Minkowski spacetime.* — CU, Mexico City, Mexico

Licenciatura en Física, Universidad Nacional Autónoma de México (UNAM) — *August 2007 - May 2013*
Thesis: *Maxwell equations, the Clifford algebra of Minkowski spacetime and the Dirac operator; with an associated generalization to the Lie algebra of the conformal transformations of a Lorentz metric.* — CU, Mexico City, Mexico

Semester abroad, Department of Physics, UC Berkeley — *August - December 2011*
Graduate classes: Quantum Field Theory. — Berkeley, CA, USA
Undergraduate classes: Particle Physics, Modern Physics and Advanced Electrical Laboratory.

Publications and preprints

10. *Polymatroids and moduli of points in flags.* With P. Gallardo and J.L. González. Submitted to Selecta Mathematica, New Series, `arXiv:2411.06816`, 2024.

9. *P-nestohedra and toric compactifications of the moduli space of points in projective space.* With M. Bit (undergraduate coauthor), D. Karp, and J. Luo (undergraduate coauthor). In preparation, 2024.

8. *Hypergraph associahedra and compactifications of moduli spaces of points.* With J. Bown (undergraduate thesis student). Submitted to Journal of Algebraic Combinatorics, `arXiv:2409.08611`, 2024.

7. *Higher-dimensional Losev-Manin spaces and their geometry.* With P. Gallardo, J.L. González and E. Routis. Submitted, working on first round of revisions for IMRN, `arXiv:2308.07911`.

6. *Enumeration of max-pooling responses with generalized permutohedra.* With L. Escobar, P. Gallardo, J.L. González, G. Montúfar and A.H. Morales. Submitted, `arXiv:2209.14978`, 2022.

5. *Nonexistence of negative curves.* With J.L. González and K. Karu. International Mathematics Research Notices (IMRN), Volume 2023, Issue 16, pp. 14368—14400, 2023.

4. *The geography of negative curves.* With J.L. González and K. Karu. Michigan Mathematical Journal, Volume 1, Issue 1, 2023, pp. 1–30.

3. *Curves generating extremal rays in blowups of weighted projective planes.* With J.L. González and K. Karu. Journal of the London Mathematical Society, Volume 104, Issue 3, 2021, pp. 1342–1362.

2. *Constructing non-Mori Dream Spaces from negative curves.* With J.L. González and K. Karu. Journal of Algebra, Volume 539, 2019, pp. 118–137.

1. *On a family of negative curves.* With J.L. González and K. Karu. Journal of Pure and Applied Algebra, Volume 223, Issue 11, 2019, pp. 4871–4887.

Teaching experience as Instructor of Record

Lower Division Courses
Calculus and precalculus:

- Multivariable Calculus (**HMC**, Math 19, two sections, Fall 2024).
- Introduction to College Mathematics for Sciences II (Precalculus) (**UCR**, Math 6B, Spring 2021, two sections).
- First-year Calculus I (**UCR**, Math 9A, two sections in Fall 2021, two sections in Fall 2022).
- First-year Calculus III (**UCR**, Math 9C, two sections in Fall 2020).
- First-year Calculus I (**UBC**, Math 100, Fall 2018).

Upper Division Courses

- Ordinary Differential Equations (**HMC**, Math 82, Fall 2024).
- Ordinary Differential Equations (**HMC**, Math 82, two sections, Fall 2023).
- Linear Algebra (**HMC**, Math 073, two sections, Spring 2023).
- Linear Algebra I (**UCR**, Math 131, two sections, Winter 2021).
- Linear Algebra II (**UCR**, Math 132, Winter 2022).
- Topology: Introduction to Topology (**UCR**, Math 145, Winter 2022).

Teacher Preparation Courses

- History of Mathematics (**UCR**, Math 153, Spring 2022).

- Polynomials and number systems (**UCR**, Math 140, Spring 2022).

Graduate Level Courses

- Toric Geometry: Problem and discussion sessions for week-long mini-course in the 2022 Pan-American School in Commutative Algebra (CIMAT, Guanajuato, Mexico, June 2022).
- Sheaf theory: Reading course on sheaf theory (UCR, Math 194, Winter 2021).

Training

- MAA OPEN Math course "Team-based Inquiry Learning," 2023.
- UCR Mathematics Teaching Workshop, UCR, 2021
- UCR Mathematics Teaching Workshop, UCR, 2020
- Instructional Skills Workshop, UBC, 2018.
- Semester-long course: Mathematics Teaching Techniques, UBC, Fall 2015

Mentorship

2024 Summer REU. *June - July 2024*
Harvey Mudd College
10 week long project with two students studying novel combinatorial aspects of moduli spaces in algebraic geometry.

Thesis advisor. *August 2023 - June 2024*
Harvey Mudd College
Directing a senior thesis. The project involved studying novel combinatorial aspects of algebraic-geometric objects (moduli spaces). Outcomes include a research paper submitted for publication at the Journal of Algebraic Combinatorics.

Clinic advisor. *August 2023 - June 2024*
Harvey Mudd College
Faculty mentor for Clinic capstone project. In this role I advice a group of five seniors in solving real-world, technical problems for a company.

Faculty Mentor for the National Science Foundation funded California Alliance for Minority Participation (CAMP) Summer Scholars program. *June - August, 2022*
UC Riverside
The program provided the student a $5,000 stipend to work full time throughout a 10-week program on a research project supervised by me. I am still working with this student. The student was invited to attend the Math Alliance's Fields of Dreams Conference 2022. Outputs of the mentorship are:

- Poster presentation at the Summer Research in Science and Engineering (RISE) Undergraduate Research Symposium at UC Riverside 2022.
- Poster presentation at the Annual Biomedical Research Conference for Minoritized Scientists (ABRCMS) 2022.

Research Mentor - Summer REU (3 students). *June - December, 2022*
UC Riverside
Co-organized with Patricio Gallardo. The project is about the mathematics of machine learning, stemming from our paper "Enumeration of max-pooling responses with generalized permutohedra". A research paper is under preparation.

Research Mentor - Reading course. *January - March, 2022*

Supervised one undergraduate student on a reading course about graduate-level sheaf theory. *UC Riverside*

Awards and scholarships

Excellence in Teaching: Outstanding Visiting Assistant Professor Award, Mathematics Department, UC Riverside. *June 2023*
Yearly recognition to 2 or 3 VAPs for their teaching performance. Award includes a $500 prize.

Candidato al Sistema Nacional de Investigadores (SNI), Consejo Nacional de Ciencia y Tecnología (CONACyT). *November 2022*

Excellence in Teaching: Outstanding Visiting Assistant Professor Award, Mathematics Department, UC Riverside. *June 2022*
Yearly recognition to 2 or 3 VAPs for their teaching performance. Award includes a $500 prize.

Structured Quartet Research Ensembles (SQuaRE) grant. *December 2021*
The American Institute of Mathematics (AIM) provides both the research facilities and the financial support for our research group to spend a week at AIM in San Jose, California. The project originated in the Latinx Mathematicians Research Community (LMRC) Research Workshop and is a collaboration with L. Escobar, P. Gallardo, J.L. González, G. Montúfar, A.H. Morales with name "Neural network polytopes."

Latinx Mathematicians Research Community (LMRC) Research Workshop. *June 2021*
The LMRC, sponsored by AIM and the NSF, is a year long program for early-career Latinx mathematicians which provides tiered mentoring research opportunities, professional development opportunities, and establishes a large research network of Latinx mathematicians.

International Doctoral Scholarship, Consejo Nacional de Ciencia y Tecnología (CONACyT) *September 2015 - August 2019*
Full tuition, medical insurance and a 1,000 CAD monthly stipend.

National Masters Scholarship, Consejo Nacional de Ciencia y Tecnología (CONACyT) *August 2013 - May 2015*

UNAM - UC Semester Abroad Scholarship *August - December 2011*
Full scholarship to study a semester abroad at the Department of Physics at UC Berkeley as part of an exchange program between the University of California and UNAM.

Professional Service

Organizer of a special session at the 2024 Joint Mathematics Meetings: "Combinatorial Insights into Algebraic Geometry." *January, 2024*
San Francisco, CA
The meeting featured a roster of 16 speakers from all career stages and diverse backgrounds. Our goal was to help the participants showcase their work, strengthen and widen their professional network.

Co-organizer of the Western Algebraic Geometry Symposium (WAGS) *November, 2022*
UC Riverside

Largest algebraic geometry conference in the Western United States and Canada. Raised a total of $14,000 from different UCR offices in addition to the base $30,000 allocated by the conference's NSF grant. Other duties included inviting speakers, organizing a poster session, publicity, hiring catering services, creating and moderating a Discord channel, etc.

Co-organizer of the Teaching Workshop of UCR's Department of Mathematics *September, 2022*
UC Riverside
Teaching workshop for incoming VAPs and graduate students.

Invited talks and posters

The hidden structure of negative curves, poster presentation. *November 2024*
Western Algebraic Geometry Symposium (WAGS), University of Arizona Tucson, AZ, USA

Moduli spaces of points in flags of affine spaces and polymatroids *October 2024*
2024 Fall Western Sectional Meeting at University of California, Riverside Riverside, CA, USA

Moduli spaces of points in flags of affine spaces and polymatroids *September 2024*
2024 Fall Central Sectional Meeting at University of Texas, San Antonio San Antonio, TX, USA

Moduli spaces through a combinatorial lens *September 2024*
Mathematics Colloquium of the Claremont Colleges Claremont, CA, USA

Blow-ups of weighted projective planes at a point: Exploring the parameter space of triangles and the MDS property. *April 2024*
Commutative Algebra and Algebraic Geometry in TUcSon (CAAGTUS), University of Arizona Tucson, AZ, USA

Higher-dimensional Losev-Manin spaces and their geometry. *March 2024*
AG@PUI Online Seminar Online

What is a moduli space?. *March 2024*
Algebraic Geometry Seminar, UC Riverside Online

Enumerating linearity regions of max-pooling layers in convolutional neural networks. *February 2024*
Pomona College Applied Math Seminar Claremont, CA

Exploring combinatorial aspects of max-pooling layers with undergraduates. *January 2024*
Joint Mathematics Meetings 2024 San Francisco, CA

Higher-dimensional Losev-Manin spaces and their geometry. *January 2024*
Joint Mathematics Meetings 2024 San Francisco, CA

What is a moduli space? *October 2023*
Mathematics Colloquium of the Claremont Colleges Claremont, CA, USA

The hidden structure of negative curves. *November 2023*
Algebra/Number Theory/Combinatorics Seminar of the Claremont Colleges Claremont, CA, USA

Blow-ups of weighted projective planes at a point: Exploring the parameter space of triangles and the MDS property. *February 2023*
Algebraic Geometry Seminar, University of Utah Salt Lake City, UT, USA

The hidden structure of negative curves, poster presentation. *November 2022*
Western Algebraic Geometry Symposium (WAGS), UC Riverside Riverside, CA, USA

The geography of negative curves, poster presentation. *October 2022*
Texas Algebraic Geometry Symposium (TAGS), Texas A&M College Station, TX, USA

Symbolic Rees algebras and negative curves. *September 2022*
Commutative algebra seminar, UN–Lincoln Lincoln, NE, USA

Una breve historia sobre la notación matemática. *September 2022*
Matemáticas en español seminar, UN–Lincoln Lincoln, NE, USA

Introduction to divisors. *January 2022*
Algebraic Geometry Seminar, UC Riverside Online

Negative curves in blowups of weighted projective planes. *December 2021*
Algebraic Geometry Seminar, UC Riverside Online

Curvas negativas en blowups de espacios proyectivos ponderados. *September 2021*
Seminario de Álgebra Conmutativa y Geometría Algebraica, CIMAT Online

The geography of negative curves. *April 2021*
Western Algebraic Geometry Symposium (WAGS) Online

A review of the theory of varieties. *April 2021*
Algebraic Geometry Seminar, UC Riverside Online

Finite generation of symbolic Rees algebras from a geometric perspective. *March 2021*
Commutative Algebra Seminar, UC Riverside Online

Estudiando anillos de Cox mediante una reducción a característica prima. *August 2019*
Seminario Guillermo Torres. Institute of Mathematics, UNAM CU, Mexico City, Mexico

Constructing examples and non-examples of Mori Dream spaces via a prime characteristic method. *June 2019*
Algebraic Geometry Seminar, UC Riverside Riverside, CA, USA

Constructing Mori dream spaces and non-Mori dream spaces via prime characteristic methods. *December 2018*
AG session of the Winter Meeting of the Canadian Math. Soc. Vancouver, BC, Canada

Affiliations

Mentor for the Math Alliance

Programming languages

Python, SageMath, C++