CURRICULUM VITA

Joaquín Moraga

Born: March 5th, 1994, Concepción, Chile.
Nationality: Chilean.
Address: UCLA Mathematics Department.
Box 951555, Los Angeles, CA 90095-1555, USA.

Employment:

University of California, Los Angeles **July 2022 - Present**
Assistant Professor.

Princeton University **September 2019 - June 2022**
Instructor in Mathematics.

Education:

University of Utah **August 2015- May 2019**
Ph.D. Mathematics.
Adivsor: Christopher Hacon.

Universidad de Concepción **March 2014- June 2015**
M.S. Mathematics.
Advisors: Antonio Laface and Alvaro Liendo.

Universidad de Concepción **March 2012- November 2013**
B.S. Mathematics.

Research:

(1) Linear systems on the blow-up of $(\mathbb{P}^1)^n$ (with A. Laface). Linear Algebra and its Applications, Volume 492 (2016), Pages 52-67.

(2) On a notion of toric special linear systems. Journal of Pure and Applied Algebra, Volume 223, Issue 8, August 2019, Pages 3225-3237.

(3) On the topology of rational T-varieties of complexity one (with A. Laface and A. Liendo). Moscow Mathematical Journal. 20 (2020), no. 2, 405-404.

(4) Bounding singular surfaces via Chern numbers. Mathematische Zeitschrift. 295 (2020), no. 3-4, 1597-1614.

(5) The fundamental group of a log terminal T-variety (with A. Laface and A. Liendo). European Journal of Mathematics, September 2019, Volume 5, Issue 3, pp 937–957.

(6) Termination of pseudo-effective 4-fold flips. Submitted.

(7) On weak Zariski decompositions and termination of flips (with C. Hacon). To appear in Mathematical Reseach Letters.

(8) Cohen-Macaulay Du Bois singularities with a torus action of complexity one (with A. Laface and A. Liendo). Submitted.

(9) Regularity of structure sheaves of varieties with isolated singularities (with J. Park and L. Song). Communications in Contemporary Mathematics. (2020) 2050039 (25 pages).

(10) On minimal log discrepancies and Kollár components. Proc. Edinb. Math. Soc. (2) 64 (2021), no. 4, 982–1001.

(11) Strong (δ, n)-complements for semistable morphisms (with S. Filipazzi). Documenta Mathematica. 25, 1953-1996 (2020).

(12) A boundedness theorem for cone singularities. To appear in Proceedings of the Edinburgh Mathematical Society.

(13) Bounded deformations of (ϵ, δ)-log canonical singularities. (with J. Han and J. Liu). Journal of Mathematical Sciences (Tokyo). Vol. 27 (2020), No. 1, Page 1-28.

(14) Log canonical 3-fold complements (with S. Filipazzi and Y. Xu). Submitted.

(15) Extracting non-canonical places. Advances in Mathematics. 375 (2020) 107415, 12pp.

(16) Fano type surfaces with large cyclic automorphisms. Submitted. Forum of Mathematics, Sigma. 9 (2021), Paper No. e54, 27 pp.

(17) The Jordan property for local fundamental groups. (with Lukas Braun, Stefano Filipazzi and Roberto Svaldi). Geometry and Topology. 26 (2022), no. 1, 283–319.

(18) Special termination for log canonical pairs. (with Vladimir Lazić and Nikolaos Tsakanikas). Asian J. Math. 27 (2023), no. 3, 423–440.

(19) Kawamata log terminal singularities of full rank. ArXiv:2007.10322. Submitted.

(20) Small quotient minimal log discrepancies. Michigan Math. J. 73 (2023), no. 3, 593–619.

(21) Maximal log Fano manifolds are generalized Bott towers. (with Konstantin Loginov). Journal of Algebra. Volume 612, 15 December 2022, Pages 110-146.

(22) Iteration of Cox rings of klt singularities. (with Lukas Braun). J. Topol. 17 (2024), no. 1, Paper No. e12321, 71 pp.

(23) On a toroidalization for klt singularities. ArXiv:2106.15019. Submitted.

(24) A geometric characterization of toric singularities. (with Roberto Svaldi). ArXiv:2108:01717. Submitted.

(25) Minimal log discrepancies of regularity one. ArXiv:2108:01717. Int. Math. Res. Not. IMRN(2023), no. 18, 15976–16014.

(26) On termination of flips and fundamental groups. ArXiv:2109:05608. Submitted.

(27) Reductive quotients of klt singularities. (with Lukas Braun, Daniel Greb, and Kevin Langlois). To appear in Inventiones mathematicae. ArXiv:2111.02812.

(28) Bounding toric singularities with normalized volume. (with Hendrik Suess). To appear in Bulletin of the London Mathematical Society. ArXiv:2111.01738.

(29) Log canonical thresholds and coregularity. (with Fernando Figueroa and Junyao Peng). To appear in Documenta Mathematica. ArXiv:2204.05408.

(30) On the boundedness of singularities via normalized volume. (with Yuchen Liu and Hendrik Suess). ArXiv:2205.12326. Submitted.

(31) Coregularity of Fano varieties. ArXiv:2206.10834. Geom. Dedicata 218 (2024), no. 2, Paper No. 40.

(32) Index of coregularity zero log Calabi-Yau pairs (with Stefano Filipazzi and Mirko Mauri). ArXiv:2209:02925. To appear in Algebra and Number Theory.

(33) Reductive covers of klt varieties. (with Lukas Braun). ArXiv:2210.10095. To appear in Revista Matemática Iberoamericana. ArXiv:2210.10095.

(34) Complements and coregularity of Fano varieties. (with Fernando Figueroa, Stefano Filipazzi, and Junyao Peng). To appear in Forum of Mathematics, Sigma. ArXiv:2211.09187.

(35) Generalized complexity of surfaces. (with Yoshinori Gongyo). ArXiv:2301.08395. Submitted.

(36) Fundamental groups of low-dimensional lc singularities. (with Fernando Figueroa). ArXiv:2302.11790. Submitted.

(37) Symmetries of Fano varieties. (with Louis Esser and Lena Ji). ArXiv:2308.12958. Submitted.

(38) Fundamental groups of log Calabi-Yau surfaces. (with Cécile Gachet and Zhining Liu). ArXiv:2312.03981. Submitted.

(39) Polarized endomorphisms of Fano varieties with complements. (with José Ignacio Yáñez and Wern Yeong). ArXiv:2401.15506. Submitted.

(40) Birational complexity and dual complexes. (with Mirko Mauri). ArXiv:2402.10136.

(41) Birational complexity and conic fibrations. ArXiv:2403.17251.

(42) Log Calabi-Yau pairs of birational complexity zero. (with Joshua Enwright and Fernando Figueroa). ArXiv:2404.05878.

(43) Birational complexity of log Calabi-Yau 3-folds. ArXiv:2405.18516.

(44) Polarized endomorphisms of log Calabi-Yau pairs. (with José Ignacio Yáñez and Wern Yeong). ArXiv:2406.18092.

(45) Toric models of smooth Fano threefolds. (with Konstantin Loginov and Artem Vasilkov). ArXiv:2407.09420.

Other writings:

(1) Running a Minimal Model Program. Notices Amer. Math. Soc. 71 (2024), no. 1, 17–27.

(2) Fundamental groups of algebraic singularities. Oberwolfach report: Komplexe Analysis – Differential and Algebraic methods in Kähler spaces. (2023).

Distinctions and Awards:

As high-school student:

Universidad de Concepción Mathematical Olympiad. Several prizes: 1 Honorable mention, 1 silver medal, and 3 gold medals.
Chilean Mathematical Olympiad. Several prizes: 1 Honorable mention, 1 bronce medal, 1 silver medal, and 1 gold medal.
Participation in the XX Mathematical Olympiad of the Southern Cone, Brazil 2010.

As undergraduate student:

Second place in the "Youth mathematical talent competition" held by the school of engineers of Chile 2013.
Premio Universidad de Concepción 2014 (highest distinction of the university).

As master student:

National scholarship for master students 2014.
Highest distinction from the Chilean Mathematical Society for master students 2014.

As Ph.D. student:

Rushing Graduate Scholarship Award, Summer 2018.

As a postdoctoral researcher:

Teaching Award, Princeton University, Spring 2020: In recognition of outstanding remote instruction and service.

Invited Talks:

Spring 2014: Jornada Matemática de la Zona Sur, Chile, Sesión de Geometria.
Spring 2014: LXXXIII encuentro anual de la sociedad chilena de matemática, Sesión de Geometria.
Spring 2015: Pontificia Universidad Católica de Chile, Seminario de Geometria Algebraica.
Fall 2015: Graduate Student Advisory Commitee at the University of Utah.
Summer 2016: Mathematical Coloquium at Universidad de Concepción.
Fall 2016: Algebraic Geometry Students Seminar at the University of Utah.
Spring 2017: Mathematical Coloquium at Universidad de Concepión.
Spring 2017: Algebraic Geometry Students Seminar at the University of Utah.
Fall 2017: Algebraic Geometry Students Seminar at the University of Utah.
Spring 2018: University of California, Riverside. Algebraic Geometry Seminar.
Fall 2018: Algebraic Geometry Students Seminar at the University of Utah.
Fall 2018: University of Utah, Algebraic Geometry seminar.
Fall 2018: University of California, San Diego. Algebraic Geometry Seminar.
Fall 2018: AMS sectional meeting, Birational Geometry session, Arkansas.
Fall 2018: University of Michigan, Algebraic Geometry seminar.
Spring 2019: Cambridge University, Algebraic Geometry seminar.
Summer 2019: MIPT, Laboratory of Homological Algebra, Moscow.
Fall 2019: John Hopkins University, Algebraic Geometry Seminar.
Fall 2019: Princeton University, Algebraic Geometry Seminar.
Spring 2020: UCLA, Algebraic Geometry Seminar.
Spring 2020: Columbia University, "Talk till your stuck" seminar.
Spring 2020: Rutgers University, Algebraic geometry seminar.
Spring 2020: Moscow Algebraic Geometry Zoom Seminar.
Spring 2020: Coronags Zoom seminar: "The Minimal Model Program".
Spring 2020: Yale Algebraic geometry Zom seminar.
Fall 2020: Zoom Algebraic Geometry Seminar.

Fall 2020: Michigan State University, Algebraic Geometry Seminar.
Spring 2021: Forschungsseminar - Algebra/Algebraische Geometrie.
Spring 2021: Singularities and Topology team of the Department of Mathematics of UFC.
Spring 2021: Algebraic Geometry Seminar, Kansas University.
Summer 2021: Tsinghua University, Workshop on generalized pairs.
Summer 2021: UIC, Algebraic Geometry Seminar.
Fall 2021: Princeton University, Princeton AG Seminar.
Fall 2021: Stanford University, Algebraic Geometry Seminar.
Fall 2021: Columbia University, Algebraic Geometry Seminar.
Fall 2021: UCLA, Mathematics Department Colloquium.
Fall 2021: UCLA, Algebraic Geometry Seminar.
Fall 2021: University of Madrid, Iberoamerican seminar in singularity theory.
Fall 2021: University of Jena, Germany, Algebra Seminar.
Fall 2021: Algebraic Geometry Northeastern Series (AGNES).
Spring 2022: IPAM, Mathematical Science Conference 2022.
Spring 2022: Moscow, HSE, Algebraic Geometry Seminar.
Spring 2022: Higher Dimensional Algebraic Geometry at Simons Foundation.
Spring 2022: University of Pennsylvania, Algebraic Geometry Seminar.
Spring 2022: JAMI Conference: "Higher Dimensional Algebraic Geometry" at JHU in honor of Professor Vyacheslav Shokurov.
Summer 2022: Algebraic Geometry and Singularities Learning Workshop and Conference, University of Washington at Seattle.
Fall 2022: Algebraic Geometry Seminar, University of Utah.
Fall 2022: Algebraic Geometry Seminar, John Hopkins University.
Fall 2022: Algebraic Geometry Seminar, University of Georgia.
Fall 2022: IBS-KAIST, Algebraic Geometry Seminar.
Fall 2022: Birational Geometry Workshop at Tsinghua.
Fall 2022: Western Algebraic Geometry Symposium (WAGS) UC, Riverside.
Fall 2022: Algebraic Geometry Seminar at Saarland University.
Spring 2023: 10 hours mini-course on "Birational Geometry" at Pontificia Universidad Catolica de Chile, Santiago, Chile.
Spring 2023: UT Austin, Algebraic Geometry Seminar.
Spring 2023: HDAG 2023, Lecture Series on "Fano varieties", NCTS, Taiwan.
Spring 2023: Higher Dimensional Algebraic Geometry, Taiwan National University.
Spring 2023: Komplexe Analysis at Overwolfach, Germany.
Spring 2023: SoCalAGS, Southern California Algebraic Geometry Seminar 2023.
Spring 2023: Algebraic Geometry Seminar, UCSB.
Summer 2023: Senior speaker at GAEL XXX: Geométrie Algébrique en Liberté, 30th version.[1]
Summer 2023: Algebraic Geometry Seminar at EPFL, Lausanne.
Fall 2023: 2023 Fields Medal Symposium in Ontario, Canada.
Winter 2023: 8th Iberoamerican Congress on Geometry. Pucón, Chile.
Winter 2024: Conference on Singularities and Birational Geometry, Yonsei University, Seoul, Korea.

[1]This is a conference organized by graduate students and postdocs. Each year, three senior speakers are invited to give a 4 hours mini-course on their research.

Spring 2024: Algebraic Geometry Seminar, Boston College.
Spring 2024: Algebraic Geometry Seminar, Stanford University.
Summer 2024: Algebraic Geometry Seminar, Tsinghua University.
Summer 2024: Plenary Speaker at V ELGA, Cabo Frio, Brazil.

Teaching:

Universidad de Concepción:

Spring 2012: Teaching assistant, Introduction to Mathematics.
Spring 2012: Teaching assistant, Vector calculus.
Fall 2012: Teaching assistant, Vector calculus.
Spring 2013: Teaching assistant, Vector calculus.
Fall 2013: Teaching assistant, Vector calculus.
Spring 2014: Teaching assistant, Vector calculus.
Fall 2014: Teaching assistant, Vector calculus.

Mathematical Olympiad Training:

Summer 2013: Instructor, Summer school of Mathematics, Training for the chilean mathematical olympiad.
Summer 2014: Instructor, Summer school of Mathematics, Training for the chilean mathematical olympiad.

University of Utah:

Fall 2015: Teaching assistant, MATH 1311, Accelerated engineering calculus.
Spring 2016: Teaching assistant, MATH 1321, Accelerated engineering calculus.
Fall 2016: Instructor, MATH 1030, Introduction to quantitative reasoning.
Fall 2017: Instructor, MATH 1220, Calculus 2.
Fall 2018: Instructor, MATH 1210, Calculus 1.

Princeton University:

Fall 2019: Instructor, MAT201, Section C0A1, Multivariable Calculus.
Spring 2020: Instructor, MAT202, Section C0A1 and C0B2, Linear Algebra.
Fall 2020: Instructor, MAT201, Section C04A.
Spring 2021: Instructor, MAT202, Section C04A
Fall 2021: Instructor, MAT 201, Section C04A and C03C.
Spring 2022: Instructor, Riemann Surfaces, MAT 531.

UCLA:

Fall 2022: Instructor, MATH 115 AH: Honors Linear Algebra.
Spring 2023: Instructor, MATH 214b: Introduction to Algebraic Geometry II.

Profesional Activities:

Students supervised:

Daigo Ito, junior student at Princeton University, Summer Research Project 2020 on Deformation Theory.
Paper title: Algebraic Geometry of Flag Varieties.
Daigo Ito, second reader for senior thesis and thesis defense.
Thesis title: The Minimal Model Program and Resolution of cDV Singularities.
Fernando Figueroa, Ph.D. student at Princeton University, co-advised with János Kollár.
Papers: On the topology of lc singularities.
Talon Stark, Ph.D. student at UCLA, co-advised with Burt Totaro.
Papers: Kawamata-Morrison cone conjecture in relative dimension 2.
Max Lind, undergraduate student at Princeton University, co-advised with June Huh.
Reading: Hartshorne and Riemann Surfaces.
Peter Sun, undergraduate student at UCLA.
Reading: Beauville's "Algebraic Surfaces" and Kollár's "Lectures on resolutions of singularities".

Postdocs mentored:

José Yáñez, Hedrick Assistant Adjunct Professor at UCLA starting Fall 2023. Ph.D. from the University of Utah 2023. Ph.D. Advisor: Christopher Hacon.
Wern Yeong, Assistant Adjunct Professor at UCLA starting Fall 2023. Ph.D. from Notre Dame University 2023. Ph.D. Advisor: Eric Riedl.

Seminars organized:

Spring 2020: CORONA Geometry Seminar (with S. Makarova and E. Elmanto).
Spring 2020: Princeton Algebraic Geometry preprint seminar.
Summer 2020: Princeton Algebraic Geometry preprint seminar.
Fall 2020: Princeton Algebraic Geometry Seminar (with C. Xu).
Fall 2020: Princeton Algebraic Geometry preprint seminar (with D. Villalobos Paz).
Spring 2021: Princeton Algebraic Geometry Seminar (with C. Xu).
Spring 2021: Princeton Algebraic Geometry preprint seminar (with D. Villalobos Paz).
Spring 2021: Minimal Model Program Learning Seminar.
Topics: Kollár-Mori "Birational geometry of algebraic varieties" and Multiplier Ideals.[2]
Summer 2021: Princeton Algebraic Geometry Seminar (with C.Xu).
Summer 2021: Princeton Algebraic Geometry preprint seminar (with F. Figueroa).
Summer 2021: Minimal Model Program Learning Seminar.
Topics: The work of Hacon and McKernan.
Fall 2021: Princeton Algebraic Geometry Seminar (with C. Xu).
Fall 2021: Princeton Algebraic Geometry preprint Seminar (with F. Figueroa).
Fall 2021: Minimal Model Program Learning Seminar.

[2]This seminar aims to train young graduate students on the techniques of the Minimal Model Program. It runs over zoom and has attendees from many universities around the world.

Topics: Existence of minimal models for varieties of general type.
Spring 2022: Princeton Algebraic Geometry Seminar (with C. Xu).
Spring 2022: Princeton Algebraic Geometry preprint Seminar (with F. Figueroa).
Spring 2022: Minimal Model Program Learning Seminar.
Topics: Ascending chain condition for log canonical thresholds.
Spring 2022: Organized Poster Session for MPS Conference: Higher Dimensional Algebraic Geometry 2022.
Summer 2022: Algebraic Geometry Seminar, UCLA.
Topics: Nash Valuations, singularities, and arc spaces.
Fall 2022: Minimal Model Program Learning Seminar.
Topics: Boundedness of Fano varieties and applications to klt singularities.
Fall 2022: Algebra Seminar, UCLA.
Topics: Tropical Geometry and toric degenerations.
Spring 2023: Birational Geometry Seminar.
Fall 2023: Birational Geometry Seminar.

Refereed for journals:

European Journal of Mathematics, International Mathematics Research Notices, Journal of Algebra and Number Theory, Compositio Mathematica, International Journal of Mathematics, American Journal of Mathematics, Manuscripta Mathematica, Mathematische Annalen, Mathematische Zeitschrift, Proceeding of the London Mathematical Society, Bulletin of the London Mathematical Society, Springer Proceedings of Moscow-Shanghai-Pohang conference, and Beiträge zur Algebra und Geometrie. Gave opinions on papers for Inventiones Mathematichae.

Reviewed for journals:

Zentralblatt MATH and Mathematical Reviews (AMS).

Outreach:

Founder and instructor at the Community Park Elementary School "Math Club"[3].
Spring 2021: Hanoi towers and inductive puzzles.
Summer 2021: Bridges and graphs.
Fall 2021: Numbers and geometry: Fibonacci sequence and golden ratio.
Spring 2022: Rubik cubes.

Fall 2022: Instructor at *Olga Radko Math Circle* (OMRC) at UCLA.
Class: Advanced 3.
Topics: Introduction to groups, fields, and rings.

Spring 2023: Instructor at *Olga Radko Math Circle* (OMRC) at UCLA.
Class: Advanced 3.

[3]The aim of this Math Club is to show the beauty of mathematics to 4th and 5th year elementary school students.

Topics: Introduction to Algebraic Geometry.

Fall 2023: Instructor at *Olga Radko Math Circle* (OMRC) at UCLA.
Class: Advanced 3.
Topics: Elements of finite fields.

Spring 2024: Instructor at *Olga Radko Math Circle* (OMRC) at UCLA.
Class: Advanced 3.
Topics: Elements of Cryptography.