

Javier Carvajal-Rojas

PERSONAL & CONTACT INFORMATION Callejón Jalisco S/N 36023 Col. Valenciana Guanajuato, Gto, México ☎ +52 473 732 7155 ✉ javier.carvajal@cimat.mx 🌐 <https://carvajalrojas.github.io/>

OrcID: 0000-0002-5312-6905

Language skills: Spanish (native), English (fluent), French (basic).

RESEARCH INTERESTS Algebraic geometry and commutative algebra in positive and mixed characteristic. My main focus has been on Fano geometry and the geometry of Frobenius endomorphisms: Frobenius actions on Fano-type varieties and their singularities. I am generally interested in objects and concepts defined via Frobenius actions such as F -singularity theory and ordinarity.

EDUCATION University of Utah

Ph.D. in Mathematics, August 2018

Defense date: 26.04.2018

Advisor: Prof. Karl Schwede

Dissertation: Arithmetic aspects of strong F -regularity

Universidad de Costa Rica

B.S. in Mathematics, April 2013

- *Graduación de Honor*
- Minor in Physics

EMPLOYMENT HISTORY CIMAT, Centro de Investigación en Matemáticas

Investigador Titular A (Assistant Professor), October 2023—

KU Leuven

Postdoctoral Fellow, September 2022—September 2023

Mentor: Prof. Wim Veys (Head of the Section of Algebra)

EPFL, The Swiss Federal Institute of Technology in Lausanne

Collaborateur Scientifique (Postdoc), September 2018—September 2022

Mentor: Prof. Zolt Patakfalvi (Chair of Algebraic Geometry)

Universidad de Costa Rica

Profesor interino (Instructor), March 2013—July 2013

PUBLICATIONS

1. J. Carvajal-Rojas, Zs. Patakfalvi, Varieties with ample Frobenius-trace kernel, *Annales Henri Lebesgue*, **8** (2025) 721–767, doi: <https://doi.org/10.5802/ahl.247>
2. J. Carvajal-Rojas, T. Yasuda, On the behavior of stringy motives under Galois quasi-étale covers, *Documenta Mathematica* **30** (2025), no. 3, pp. 709–751, doi: <https://doi.org/10.4171/DM/1012>.
3. J. Carvajal-Rojas, A. Fayolle, On tame ramification and centers of F -purity, *Journal of the London Mathematical Society* (2) **110** (2024), no. 4, Paper No. e12993, 42 pp, doi: <https://doi.org/10.1112/jlms.12993>.
4. J. Carvajal-Rojas, A. Stäbler, J. Kollár, On the local étale fundamental group of KLT threefold singularities, *Algebraic Geometry* **10** (6) (2023), 694–728, doi: <https://doi.org/10.14231/AG-2023-025>.
5. J. Carvajal-Rojas, A. Vilpert, Singularities of determinantal pure pairs, *Bollettino dell’Unione Matematica Italiana* (2023), doi: <https://doi.org/10.1007/s40574-023-00361-z>.
6. J. Carvajal-Rojas, A. Stäbler, Tame fundamental groups of pure pairs and Abhyankar’s lemma, *Algebra & Number Theory* **17** (2023), 309–358, doi: <https://doi.org/10.2140/ant.2023.17.309>.
7. J. Carvajal-Rojas, A. Stäbler, On the behavior of F -signatures, splitting primes, and test modules under finite covers, *Journal of Pure and Applied Algebra* **227** (2023), 107165, doi: <https://doi.org/10.1016/j.jpaa.2022.107165>.
8. J. Carvajal-Rojas, Finite torsors over strongly F -regular singularities, *Épjournal de Géométrie Algébrique* **6** (2022), 1–30, doi: <https://doi.org/10.46298/epiga.2022.7532>.
9. J. Carvajal-Rojas, L. Ma, T. Polstra, K. Schwede, K. Tucker, Covers of rational double points in mixed characteristic, *Journal of Singularities* **23** (2021), 127–150, doi: <http://doi.org/10.5427/jsing.2021.23h>.
10. J. Carvajal-Rojas, K. Schwede, K. Tucker, Bertini Theorems for F -signature and Hilbert–Kunz multiplicity, *Mathematische Zeitschrift* **299** (2021), 1131–1153, doi: <https://doi.org/10.1007/s00209-021-02712-y>.
11. J. Carvajal-Rojas, D. Smolkin, The uniform symbolic topology property for diagonally F -regular algebras, *Journal of Algebra* **548** (2020), 25–52, doi: <https://doi.org/10.1016/j.jalgebra.2019.11.017>.
12. B. Bhatt, J. Carvajal-Rojas, P. Graf, K. Schwede, K. Tucker, Étale fundamental groups of strongly F -regular schemes, *International Mathematics Research Notices* **14** (2019), 4325–4339, rnx253, doi: <https://doi.org/10.1093/imrn/rnx253>.

13. J. Carvajal-Rojas, K. Schwede, K. Tucker, Fundamental groups of F -regular singularities via F -signature, *Annales scientifiques de l'École Normale Supérieure* (4) **51** (2018), no. 4, 993–1016, doi: <https://doi.org/10.24033/asens.2370>.
14. D. Campos-Salas, J. Carvajal-Rojas, M. Villarino, On the monotonicity of the correction term in Ramanujan's factorial approximation, *The Mathematical Gazette* (539) **97** (2013), 274–275, doi: <https://doi.org/10.1017/S002555720000591X>.

SUBMITTED
PAPERS &
PREPRINTS

1. J. Carvajal-Rojas, E. Özavcı, *The geometry of Frobenius on toric varieties*, ArXiv e-prints, 2025. [arXiv2506.02994](https://arxiv.org/abs/2506.02994).

TEACHING
ACTIVITIES

Fall	2025	Instructor , Temas Selectos de Geometría Algebraica I (18SGAL01) Geometría Algebraica II, CIMAT
Spring	2025	Instructor , Geometría Algebraica I (18GAL01/MAT-610), DEMAT-CIMAT
Fall	2024	Instructor , Temas Selectos de Álgebra II (18TSA02) Álgebra Conmutativa II, CIMAT
Spring	2024	Instructor , Temas Selectos de Geometría Algebraica II (90SGAL02) F -Singularidades, CIMAT
Fall	2022	Instructor , Advanced Reading Course, KU Leuven
Spring	2022	Instructor , MATH-679 Group Schemes, EPFL
Fall	2020	Teaching Assistant, MATH-510 Modern Algebraic Geometry, EPFL
Spring	2020	Teaching Assistant, MATH-105(b) Analyse avancée II, EPFL
Fall	2018	Teaching Assistant, MATH-333 Chapitre choisi de géométrie: surfaces minimales, EPFL
Summer	2018	Instructor , MATH 2270 Linear Algebra, University of Utah
Spring	2018	Instructor , MATH 2270 Linear Algebra, University of Utah
Spring	2017	Teaching Assistant, MATH 1210 Calculus I, University of Utah
Fall	2016	Instructor , MATH 1210 Calculus I, University of Utah
Fall	2015	Instructor , MATH 1090 Business Algebra, University of Utah
Spring	2015	Instructor , MATH 1030 Intro. to Quantitative Reasoning, University of Utah
Fall	2014	Teaching Assistant, MATH 1210 Calculus I, University of Utah

TEACHING
ACTIVITIES
(CONTINUED)

Spring	2014	Teaching Assistant, MATH 1310 Engineering Calculus II, University of Utah
Fall	2013	Teaching Assistant, MATH 1310 Engineering Calculus I, University of Utah
I Ciclo	2013	Instructor , MA1004-Álgebra Lineal (two sections), Universidad de Costa Rica

PhD theses Committees:

1. Pedro Ramírez-Moreno, *Symbolic F -splitness of binomial edge ideals*, Fall 2024, CIMAT.

Master theses directed:

1. Emre Özavci, *Positivity of the Frobenius trace kernels on smooth toric varieties*, Spring 2024, EPFL.
2. Maxime Matthéy, *F -splitting numbers of Segre pure pairs*, Spring 2022, EPFL.
3. Anne Fayolle, *Centers of F -purity and their behavior under finite covers*, Spring 2022, EPFL. (Resulted in an article.)
4. Arnaud Vilpert, *Singularities of determinantal pairs*, Fall 2021, EPFL. (Resulted in an article.)

Reader of the master theses:

1. Marvin Ferman Bell, *On Castelnuovo–Mumford regularity and F -thresholds*, Fall 2022, CIMAT.
2. Leen Jacobs, *Reidemeister Growth for Two-dimensional Crystallographic Groups*, Spring 2023, KU Leuven.
3. Tianqi Liu, *On height functions*, Spring 2023, KU Leuven.

Master projects supervised:

1. Anne Fayolle, *The test ideal and other measures of singularities in positive characteristic*, Fall 2020, EPFL.
2. Arnaud Vilpert, *The Frobenius endomorphism and singularities in positive characteristic*, Fall 2020, EPFL.

Bachelor projects supervised:

1. Emre Özavci, *Local Cohomology*, Spring 2022, EPFL.
2. Marco Cavaleri, *Ring completions and the Cohen’s structure theorem*, Spring 2020, EPFL.

Summer in the Lab Program:

1. Emre Özavci, *On the positivity of the Frobenius-trace kernel on toric and Hibi varieties*, Summer 2022, EPFL.

EVENTS ORGANIZED	Co-organizer of the <i>Seminario Chichimeca de Álgebra</i> , UA-Aguascalientes	October 2025
	Co-organizer of the <i>Workshop “Notions of Singularity in Different Characteristics,”</i> BIRS-Banff	October 2025.
	Co-organizer of the <i>Seminario Chichimeca de Álgebra</i> , UA-Zacatecas	May 2025
	Co-organizer of the <i>Escuela de Álgebra y Singularidades</i> , CIMAT-Guanajuato	November 2024
	Co-organizer of the <i>Sesión Especial de Álgebra Conmutativa del 57 Congreso Nacional de la SMM</i> , UJ-Durango	October 2024
	Co-organizer of the <i>Seminario Chichimeca de Álgebra</i> , CUCEI-Guadalajara	September 2024
	Co-organizer of the <i>Sesión Especial de Álgebra Conmutativa del 56 Congreso Nacional de la SMM</i> , UA San Luis Potosí	October 2023
TALKS	MCA 2025, Session 30 - Birational Geometry and Singularities, Miami: <i>The Frobenius geometry of toric varieties.</i>	July 2025
	MCA 2025, Session 56 - Recent Developments in Commutative Algebra, Miami: <i>Pulling back Cartier modules along regular maps.</i>	July 2025
	Conference “ p -adic and Characteristic p Methods in Algebraic Geometry” Bernoulli Center Lausanne: <i>The Geometry of Frobenius on Toric Varieties.</i>	June 2025
	Birational Geometry Seminar, UCLA: <i>On the positivity of Frobenius pushforwards on toric varieties.</i> Recording	September 2024
	VII CLAM, Session: Commutative Algebra and its Interactions, Joao Pessoa: <i>On the positivity of Frobenius pushforwards on toric varieties.</i>	August 2024
	Conference “Resolution of singularities, valuation theory and related topics, A celebration of the 63rd birthday of Mark Spivakovsky” CCM-UNAM-Morelia: <i>On the positivity of Frobenius pushforwards on toric varieties.</i>	August 2024
	Seminario Nacional de Geometría Algebraica, en línea: <i>Sobre la positividad de la imagen directa de Frobenius en variedades tóricas.</i>	Febrero 2024
	Coloquio CIMAT-DEMAT, CIMAT: <i>El problema de conexidad de variedades de Fano.</i>	November 2023

TALKS
(CONTINUED)

- Seminario CA/GA, CIMAT: *On tame ramification and F -singularities.* October 2023
- Conference “Singularities,” CIRM Luminy: *On tame ramification and F -singularities.* September 2023
- Geometry and Arithmetic Colloquium, Johannes Gutenberg-Universität Mainz: *Centers of F -purity and their behavior under finite covers.* June 2023
- Cibercoloquio Latinoamericano de Matemáticas, *Grupos de clases de singularidades F -regulares.* Recording May 2023
- Algebraic and Arithmetic Geometry Seminar, Universität Bielefeld: *Centers of F -purity and their behavior under finite covers.* May 2023
- Number Theory and Algebraic Geometry Seminar, KU Leuven: *Singularities of determinantal pairs.* January 2023
- Commutative Algebra Seminar, Purdue University: *Centers of F -purity and finite extensions.* November 2022
- 55 Congreso Nacional de la SMM, Universidad de Guadalajara: *Centros de F -pureza y extensiones finitas.* Recording October 2022
- Commutative Algebra Seminar, University of Michigan: *F -singularities of determinantal pairs.* April 2022
- Algebraic Geometry Seminar, Princeton University: *Varieties with ample Frobenius-trace kernel: in the search of a Frobenius-theoretic characterization of projective spaces.* Recording January 2022
- 11-th Swiss-French workshop in Algebraic Geometry, Charmey Switzerland: *Varieties with ample Frobenius-trace kernel: in the search of a Frobenius-theoretic characterization of projective spaces.* January 2022
- Groups, Arithmetic & Algebraic Geometry Seminar, EPFL: *On the behavior of stringy motives under Galois quasi-étale covers.* May 2021
- Online Algebraic Geometry Seminar, Yale University: *On the fundamental group of KLT threefold singularities in positive characteristic.* May 2020

TALKS
(CONTINUED)

- Algebra and Representation Theory Seminar (ARTS), May 2020
University of Oklahoma: *Fundamental groups of KLT singularities.*
- Conference “Singularities and Arithmetics,” Tohoku University: *Étale fundamental groups of rational KLT three-fold singularities in positive characteristic.* February 2020
- FACARD 2019 Workshop, Institut de Matemàtica Universitat de Barcelona: *Tame fundamental groups of purely F -regular pairs.* January 2019
- SFB/TRR45 Kolloquium, Johannes Gutenberg-Universität Mainz: *The USTP property and diagonal F -regularity.* December 2018
- Intercity BeNeFri Seminar, Université de Neuchâtel: *The USTP property and diagonal F -regularity.* November 2018
- Basel-Dijon-EPFL Joint Seminar, Institut de Mathématiques de Bourgogne-Dijon: *Towards a purity-for-torsors theorem for F -regular singularities.* October 2018
- Groups, Arithmetic & Algebraic Geometry Seminar, EPFL: *Arithmetic aspects of strong F -regularity.* October 2018
- Grupo de Trabajo en Geometría y Topología, Universidad de Costa Rica: *Aspectos aritméticos de la F -regularidad fuerte.* August 2018
- Commutative Algebra Seminar, University of Michigan: *Finite torsors over strongly F -regular singularities.* October 2017
- Algebra Seminar, Universität Osnabrück: *Finite torsors over strongly F -regular singularities.* October 2017
- SFB/TRR45 Colloquium, Johannes Gutenberg-Universität Mainz: *Finite torsors over strongly F -regular singularities.* September 2017
- FRAGMENT Seminar, Colorado State University: *Fundamental groups of F -regular schemes and singularities.* April 2017
- Algebraic Geometry Seminar, University of Illinois at Chicago: *Fundamental groups of F -regular schemes and singularities.* March 2017

TALKS (CONTINUED)	Commutative Algebra Seminar, University of Utah: <i>Fundamental groups of strongly F-regular singularities via F-signature</i> . Departmental Colloquium, Universidad de Costa Rica: <i>F-singularidades y grupos fundamentales locales</i> .	September 2016 June 2016
CONFERENCE POSTERS	<ol style="list-style-type: none"> 1. <i>Finite torsors over strongly F-regular singularities</i> (PDF), presented at: <ul style="list-style-type: none"> • Western Algebraic Geometry Symposium, University of California at Los Angeles, October 2017. • Local Cohomology in Commutative Algebra and Algebraic Geometry Conference in honor of Gennady Lyubeznik's 60th birthday, University of Minnesota, August 2017. • <i>Fundamental groups of strongly F-regular singularities via F-signature</i> (PDF), presented at: <ul style="list-style-type: none"> • Western Algebraic Geometry Symposium, Colorado State University, October 2016. • KUMUNU Conference, University of Kansas, October 2016. • Summer School and Conference in Higher Dimensional Algebraic Geometry, University of Utah, July 2016. • Commutative Algebra Conference in honor of Craig Huneke's 65th birthday, University of Michigan, July 2016. 	
REFEREING SERVICE	<p>Proceedings of the 2015 AMS Summer Institute, Nagoya Mathematical Journal, IMRN, Astérisque, (*) Bulletin of the Belgian Mathematical Society, JPAA, Bulletin of the London Mathematical Society, Épijournal de Géométrie Algébrique (EPIGA), Compositio Mathematica, Algebra & Number Theory, Mathematical Research Letters, (*) Crelle's Journal.</p> <p>(*) = Quick Opinion Only.</p>	
PRIZES AND FELLOWSHIPS	<p>August 2012 <i>Diploma de Excelencia Académica</i>—awarded to the student with the best grades in the section.</p> <p>March 2012 <i>Beca de excelencia académica</i>—awarded to students with an average above 9/10, waives tuition for the academic year.</p> <p>August 2011 <i>Diploma de Excelencia Académica</i></p> <p>March 2011 <i>Beca de excelencia académica</i></p> <p>March 2010 <i>Beca de excelencia académica</i></p> <p>March 2009 <i>Beca de excelencia académica</i></p>	