Javier Carvajal-Rojas

Personal & Contact Information	Callejón Jalisco S/N ☎ +52 473 732 7155 36023 Col. Valenciana ✉ javier.carvajal@cimat.mx Guanajuato, Gto, México 🌑 https://carvajalrojas.github.io/

OrcID: 0000-0002-5312-6905
Language skills: Spanish (native), English (fluent), French (basic).

<small>Research
Interests</small>

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.

<small>Education</small>

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

<small>Employment
history</small>

CIMAT, Centro de Investigación en Matemáticas

Profesor 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. Zsolt Patakfalvi (Chair of Algebraic Geometry)

Universidad de Costa Rica

Profesor interino (Instructor), March 2013—July 2013

PUBLICATIONS

1. 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`

2. 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`.

3. 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`.

4. 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`.

5. J. Carvajal-Rojas, Finite torsors over strongly F-regular singularities, *Épijournal de Géometrie Algébrique* **6** (2022), 1–30, doi: `https://doi.org/10.46298/epiga.2022.7532`

6. 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`

7. 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`

8. 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`

9. 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`

10. 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`

11. 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, A. Fayolle, *On tame ramification and centers of F-purity*, ArXiv e-prints, 2023. `arXiv2308.02660`.

2. J. Carvajal-Rojas, Zs. Patakfalvi, *Varieties with ample Frobenius-trace kernel*, ArXiv e-prints, 2021. `arXiv2110.15035`.

3. J. Carvajal-Rojas, T. Yasuda, *On the behavior of stringy motives under Galois quasi-étale covers*, ArXiv e-prints, 2021. `arXiv2105.05214`.

TEACHING ACTIVITIES

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
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

Master theses directed:

1. Maxime Matthey, *F-splitting numbers of Segre pure pairs*, Spring 2022, EPFL.

2. Anne Fayolle, *Centers of F-purity and their behavior under finite covers*, Spring 2022, EPFL. (Resulted in an article.)

3. Arnaud Vilpert, *Singularities of determinantal pairs*, Fall 2021, EPFL. (Resulted in an article.)

Teaching activities (continued)	**Reader of the master theses:**	

Reader of the master theses:

1. Leen Jacobs, *Reidemeister Growth for Two-dimensional Crystallographic Groups*, Spring 2023, KU Leuven.

2. 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.

Organizational Activities Co-organizer of the *Sesión Especial de Álgebra Conmutativa del 56 Congreso Nacional de la SMM* October 2023

Talks

Coloquio CIMAT-DEMAT, CIMAT: *El problema de conexidad de variedades de Fano.* November 2023

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

TALKS (CONTINUED)	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
	Algebra and Representation Theory Seminar (ARTS), University of Oklahoma: *Fundamental groups of KLT singularities.*	May 2020
	Conference "Singularities and Arithmetics," Tohoku University: *Étale fundamental groups of rational KLT threefold 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

TALKS (CONTINUED)	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
	Commutative Algebra Seminar, University of Utah: *Fundamental groups of strongly F-regular singularities via F-signature.*	September 2016
	Departmental Colloquium, Universidad de Costa Rica: *F-singularidades y grupos fundamentales locales.*	June 2016

CONFERENCE POSTERS

1. *Finite torsors over strongly F-regular singularities* (PDF), presented at:

   - 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.

2. *Fundamental groups of strongly F-regular singularities via F-signature* (PDF), presented at:

- 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.

Refereeing Service
Proceedings of the 2015 AMS Summer Institute, Nagoya Mathematical Journal, IMRN, Astérisque, Bulletin of the Belgian Mathematical Society, Bulletin of the London Mathematical Society, EPIGA.

Prizes and fellowships

August	2012	*Diploma de Excelencia Académica*—awarded to the student with the best grades in the section.
March	2012	*Beca de excelencia académica*—awarded to students with an average above 9/10, waives tuition for the academic year.
August	2011	*Diploma de Excelencia Académica*
March	2011	*Beca de excelencia académica*
March	2010	*Beca de excelencia académica*
March	2009	*Beca de excelencia académica*