

# JORDY CHEYEM LOPEZ GARCIA

Texas A&M University  
Mathematics  
Blocker 619

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## EDUCATION

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- 2019 – present Ph.D., Mathematics, Texas A&M University.  
Advisor: Frank Sottile and Paulo Lima-Filho  
Dissertation title: *Toric Compactifications of Discrete Periodic Operators*
- 2011 – 2016 B.S.+M.S., Mathematics, Minor in Art, summa cum laude,  
The University of Texas Rio Grande Valley.  
Advisor: Paul-Hermann Zieschang.  
Thesis: *On Hypergroups of Order at Most 6*

## RESEARCH INTERESTS

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Toric varieties; computational and combinatorial algebraic geometry; algebraic, geometric, and combinatorial approaches to spectral theory; algebraic, geometric, combinatorial, and categorical approaches to mathematical biology; quadratic enumerative geometry and its applications

## PUBLICATIONS

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1. **Real solutions to systems of polynomial equations in Macaulay2** (joint with Maluccio, Sottile, Yahl). *Journal of Software for Algebra and Geometry*, **14-1** (2024), 87-95. DOI [10.2140/jsag.2024.14.87](https://doi.org/10.2140/jsag.2024.14.87)

## MANUSCRIPTS ACCEPTED FOR PUBLICATION

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1.  **$\mathbb{A}^1$ -Brouwer Degrees in Macaulay2** (joint with Borisov, Brazelton, Espino, Hagedorn, Han, Louwsma, Ong, and Tawfeek). *Journal of Software for Algebra and Geometry*. [arxiv.org/abs/2312.00106](https://arxiv.org/abs/2312.00106)

## PREPRINTS

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3. **Deficiency of chemical reaction networks: the effect of operations that preserve multistationarity and periodic orbits** (joint with Gutierrez, Leake, Sobie, and Shiu). Submitted. [arxiv.org/abs/2305.19410](https://arxiv.org/abs/2305.19410)
2. **Additive invariants of open Petri nets** (joint with Bumpus, Libkind, Sorkatti, and Tenka). Submitted. [arxiv.org/abs/2303.01643](https://arxiv.org/abs/2303.01643)
1. **Irreducibility of the dispersion polynomial for periodic graphs** (joint with Faust). Submitted. [arxiv.org/abs/2302.11534](https://arxiv.org/abs/2302.11534)

## SOFTWARE

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2. **A1BrouwerDegrees** (joint with Borisov, Brazelton, Espino, Hagedorn, Han, Louwsma, Ong, and Tawfeek). A Macaulay2 package for computing local and global  $\mathbb{A}^1$ -Brouwer degrees.
1. **RealRoots** (joint with Maluccio, Sottile, and Yahl). A Macaulay2 package using symbolic computation to study real solutions to systems of polynomial equations.

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<sup>1</sup>Updated August 23, 2024

## PROFESSIONAL SERVICE

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7. Co-organizer (with C.J. Bott and Frank Sottile) of the mini-symposium *Nonlinear algebra in applications*, at the 7th Annual Meeting of the SIAM Texas-Louisiana Section, 11-13 October 2024, at Baylor University in Waco, TX.
6. Co-organizer (with Taylor Brysiewicz, Luis David Garcia Puente, Nickolas Hein, and Kevin Purbhoo) of the *Workshop on Applied and Computational Enumerative Geometry*, 3-7 June 2024, at the Fields Institute in Toronto, Canada. Supported by the Fields Institute and the U.S. National Science Foundation.
5. Co-organizer (with Julia Lindberg) of the mini-symposium *Nonlinear algebra in applications*, at the 6th Annual Meeting of the SIAM Texas-Louisiana Section, 3-5 November 2023, at University of Louisiana at Lafayette in Lafayette, LA.
4. Local co-organizer (with Gregory Berkolaiko and Matthew Faust) of the conference *Spectral Theory and Applications*, 10-13 October 2023, at Texas A&M University in College Station, TX.
3. Co-organizer (with Josué Tonelli-Cueto and Thomas Yahl) of the mini-symposium *Applications and Computation in Algebraic Geometry*, at the 5th Annual Meeting of the SIAM Texas-Louisiana Section, 4-6 November 2022, at University of Houston.
2. Local co-organizer (with Arpan Pal) of the Spring 2023 *Graduate Algebra Symposium*, 29 April 2023, at Texas A&M University in College Station, TX.
1. Co-organizer (with Mansi Bezbaruah, Agniva Dasgupta, and Valeria Fragiadaki) of the Spring 2022 *Gathering in Graduate Expository Mathematics (GIG'EM)*, April 2022, at Texas A&M University in College Station, TX.

## CONFERENCE GRANTS

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3. NSF conference grant, *Workshop on Applied and Computational Enumerative Geometry*, DMS-2419363, PI Luis David Garcia Puente, Co-PI Nickolas Hein, Co-PI Taylor Brysiewicz, 3-7 June 2024.
2. Fields Institute logistical and funding support, (with Taylor Brysiewicz, Luis David Garcia Puente, Nickolas Hein, and Kevin Purbhoo) *Workshop on Applied and Computational Enumerative Geometry*, 3-7 June 2024.
1. AMS Student chapter grant (with Mansi Bezbaruah, Agniva Dasgupta, and Valeria Fragiadaki), *GIG'EM Conference*, 23 April 2022.

## TALKS AND POSTER PRESENTATIONS

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### Invited talks

18. *Algebraic geometry in spectral theory*. [Mathematical Pathways to an Excellent Future](#) workshop, University of California, Riverside, 24 May 2024.
17. *Algebraic Fermi curves*. [AMS student chapter GIG'EM conference](#), Texas A&M University, 20 April 2024.
16. *Algebraic geometry in spectral theory*. Algebra and Combinatorics Seminar, The University of Texas at Dallas, 17 April 2024.
15. *Algebraic geometry in spectral theory*. [Eleventh Discrete Geometry and Algebraic Combinatorics Conference](#), The University of Texas Rio Grande Valley, 24-25 February 2024.

14. *Operators, polytopes and toric geometry*. [AMS Special session on Combinatorial Insights into Algebraic Geometry](#), Joint Mathematics Meetings in San Francisco, CA, 3-6 January 2024.
13. *Operators, polytopes, and toric geometry*. Mini symposium *Discrete and Continuous Schrödinger Operators* at the [6th Annual Meeting of SIAM Texas-Louisiana Section](#), University of Louisiana at Lafayette, 3-5 November 2023.
12.  $\mathbb{A}^1$ -*Brouwer degrees in Macaulay2*. Mini symposium *Combinatorial and Computational Algebraic Geometry* at the [6th Annual Meeting of SIAM Texas-Louisiana Section](#), University of Louisiana at Lafayette, 3-5 November 2023.
11. *Discrete periodic operators and algebraic geometry*. [AMS Southeastern Regional Meeting](#), Georgia Institute of Technology, 18-19 March 2023.
10. *Functors on open Petri nets*. [AMS Special Session on Applied Category Theory \(A Mathematics Research Communities session\)](#), Joint Mathematics Meetings in Boston, MA, 4-7 January 2023.
9. *Discrete periodic operators and algebraic geometry*. [MSRI \(SLMath\) Special Session on The MSRI Undergraduate Program \(MSRI-UP\)](#), Joint Mathematics Meetings in Boston, MA, 4-7 January 2023.
8. *Extending Irreducibility of Bloch varieties*. Mini symposium *Applications and Computation in Algebraic Geometry* at the [5th Annual Meeting of SIAM Texas-Louisiana Section](#), University of Houston, 4-6 November 2022.
7. *Functors on open Petri nets*. [Mathematics Research Communities on Applied Category Theory](#), Java Center, NY, 29 May-4 June 2022.
6. *Using Macaulay2 to count real roots of univariate polynomials*. Fall 2021 *Graduate Algebra Symposium*, The University of North Texas, 12 November 2021.
5. *Using Macaulay2 to count real roots of univariate polynomials*. Mini symposium *Algorithmic Algebra and Geometry* at the [4th Annual Meeting of SIAM Texas-Louisiana Section](#), The University of Texas Rio Grande Valley, 5 November 2021.
4. *What is a scheme?*. AMS student chapter GIG'EM Conference, Texas A&M University, 27 April 2021.
3. *Hypergroups and buildings 2*. Pure mathematics seminar, The University of Texas at Brownsville, April 2015.
2. *Hypergroups and buildings 1*. Pure mathematics seminar, The University of Texas at Brownsville, April 2015.
1. *On Galois theory*. Algebra Day, The University of Texas at Brownsville, February 2013.

## Poster presentations

2. *Extending irreducibility of Bloch varieties*. [Texas Algebraic Geometry Symposium](#), Texas A&M University, College Station, 30 September-2 October 2022.
1. *Using Macaulay2 to count real roots of univariate polynomials*. Notre Dame Future Faculty Workshop, Notre Dame University, 2-4 May 2022.

## AWARDS AND FELLOWSHIPS

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15. AMS Travel Award to attend the [Fall Central Sectional Meeting](#) at The University of Texas, San Antonio (2024).
14. DAC Scheme Travel Award to attend two workshop of the program [New equivariant methods in algebraic and differential geometry](#) at the Isaac Newton Institute for Mathematical Sciences in Cambridge, UK (2024). The workshops are:

- [Equivariant methods in geometry](#), and
  - [Applied and computational algebraic geometry](#).
13. [The Guseman Prize](#), Texas A&M University (2023).
  12. SIAM Travel Award to attend the [6th Annual Meeting of SIAM Texas-Louisiana Section](#) at The University of Louisiana at Lafayette (2023).
  11. AMS Mathematical Research Communities Travel Award to attend the 2022 Joint Mathematics Meetings in Boston, MA (2022).
  10. Houston A&M Mother's Club Outstanding TA Award, Texas A&M University (2022).
  9. Scorpion Scholar Fellowship that covered undergraduate tuition and fees, and partially covered graduate tuition and fees, The University of Texas at Brownsville/Texas Southmost College (2011-2016).
  8. Scholastic Excellence Award in Mathematics, The University of Texas at Brownsville (2014).
  7. Student Juried Show Exhibitor, The University of Texas at Brownsville (2014).
  6. President's List. The University of Texas at Brownsville/Texas Southmost College (2011-2013).
  5. Dean's List. The University of Texas at Brownsville/Texas Southmost College (2012).
  4. Provost Essay Finalist. The University of Texas at Brownsville/Texas Southmost College (2012).
  3. Paul Hanson Memorial Spiritual Leadership Award. Valley Christian High School (2011).
  2. Valedictorian. Valley Christian High School (2011).
  1. Distinguished Lecture Series essay finalist. The University of Texas at Brownsville/Texas Southmost College (2011).

## MENTORING

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**Graduate Student Panels.** Description: I served by answering questions regarding life in graduate school.

2. [Mathematical Pathways to an Excellent Future](#). University of California, Riverside, 24 May 2024.
1. [Bolstering the Advancement of Masters in Mathematics](#), Zoom, 14 April 2023.

**American Women in Mathematics.** Description: Mentored first and second year graduate students in their transition to graduate school.

1. Mentor for 2 graduate students:

Mentee: Pooja Joshi (Fall 2023)

Mentee: Zeytoon Kazemimoghaddam (Spring 2023)

**Texas A&M Directed Reading Program.** Description: The [Directed Reading Program](#) at Texas A&M “gives undergraduates the opportunity to work one-on-one with a graduate mentor for the semester, learn an area of mathematics not covered in any course, and gain valuable presentation skills”. Graduate mentors prepare undergraduate students for a 12-15 minute talk about their reading topic at the end of the semester.

2. Co-organizer (since Fall 2021) with professors Anne Shiu and Matthias Maier, and graduate students Angelique Morvant and Crystal Farris.
1. Mentor for 2 undergraduate students:

Mentee: Arthur Mayo III, Topological reduction in chemical reaction networks, Spring 2024.

Mentee: Tessoro Stefan, Topological Proof of the Infinitude of Primes, Spring 2021.

Description: Teach the basics of Precalculus and of the `Sympy` library of Python to a select group of incoming Texas A&M undergraduates.

1. Teacher Assistant (Summer 2023 and Summer 2024).

**Twoples Directed Reading Program.** Description: Free online mentoring program for undergraduate mathematics students.

1. Mentor for undergraduate students

Mentee: Jasmine Arredondo Torres (University of California, Riverside), Introduction to manifolds by Tu, Fall 2022.

**2022 MSRI Undergraduate Program:** [Algebraic methods in mathematical biology](#). Description: The (SLMath) MSRI Undergraduate Program is an REU that identifies talented students from underrepresented groups to conduct research and be part of a community of peers and mentors to support them through a successful graduate program.

1. Graduate Research Assistant for 18 REU students.

Organizers: Federico Ardila (Lead), Duane Cooper, Maria Mercedes Franco, Rebecca Garcia, Candice Price, and Anne Shiu (Research director).

### Undergraduate Capstone Projects.

1. Co-advisor (with Oleg Musin) for 9 undergraduate students during their capstone project at The University of Texas Rio Grande Valley. Each student presented a poster at the end of the semester in the mathematics department's end-of-the-school-year ceremony.

Mentee: Alexandra Castillo, Minimum network problems, Spring 2019.

Mentee: Andrea Lerma, Robin and Lagarias criteria, Spring 2019.

Mentee: Brenda Lee Garcia, Four Color Theorem, Spring 2019.

Mentee: Armando Silva, License plates recognition using neural networks, Spring 2019.

Mentee: Estefania Sierra, Voronoi diagrams and Delaunay triangulations, Spring 2019.

Mentee: Monica Muñoz, Kepler's conjecture, Spring 2019.

Mentee: Ana Gabriela Gutierrez, The cake-cutting problem, Spring 2019.

Mentee: Aldo Gonzalez, The isoperimetric problem of polyhedra, Fall 2018.

Mentee: Jessica Juarez, Two-distance sets, Fall 2018.

## EMPLOYMENT

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13. Graduate Teaching Assistant, Texas A&M University (August 2019 – present).
12. Graduate Research Assistant, MSRI Undergraduate Program (June 2022 – July 2022).
11. Lecturer I, The University of Texas Rio Grande Valley (September 2016 – May 2019).
10. High school teacher, Valley Christian High School in Brownsville, TX, USA (August 2016 – May 2019).
9. Adjunct Instructor, Texas Southmost College (February 2017 – May 2017).
8. Graduate Teaching Assistant, The University of Texas Rio Grande Valley (September 2015 – May 2016).
7. College of Sciences Graduate Assistant, The University of Texas at Brownsville (June 2015 – August 2015).

6. Teaching Assistant, The University of Texas at Brownsville (September 2014 - May 2015).
5. College of Sciences Undergraduate Assistant, The University of Texas at Brownsville (July 2014 – August 2014).
4. Title V Calculus tutor, The University of Texas at Brownsville (January 2014 – May 2014).
3. Learning Enrichment tutor, The University of Texas at Brownsville (August 2013 – December 2013).
2. Teaching Assistant, The University of Texas at Brownsville (August 2012 – May 2013).
1. Instructor Assistant, The University of Texas at Brownsville (March 2012 – May 2012).

## SELECTED CONFERENCES AND WORKSHOPS

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19. IAS Park City Mathematics Institute, Research Topic: *Motivic Homotopy Theory*, Park City, Utah, USA, 20-27 July 2024.
18. Fields Institute, *Workshop on Applied and Computational Enumerative Geometry*, Toronto, Canada, 3-7 June 2024.
17. University of California, Riverside, Workshop *Mathematical Pathways to an Excellent Future*, Riverside, California, USA, 24 May 2024.
16. Isaac Newton Institute for Mathematical Sciences, *New Equivariant Methods in Algebraic and Differential Geometry*, Cambridge, UK, 8-27 January 2024.
15. Joint Mathematics Meetings, San Francisco, California, USA, 3-6 January 2024.
14. 6th Annual Meeting of SIAM Texas-Louisiana Section, Lafayette, Louisiana, USA, 3-5 November 2023.
13. Simons Laufer Mathematical Sciences Institute, Summer School *Introduction to Derived Algebraic Geometry*, Berkeley, California, USA, 26 June - 7 July 2023.
12. *Macaulay2 Workshop & Mini-school*, Twin Cities, Minnesota, USA, 3-9 June 2023.
11. *AMS Southeastern Regional Meeting*, Atlanta, Georgia, USA, 18-19 March 2023.
10. Institute for Computational and Experimental Research in Mathematics, Workshop *Algebraic Geometry in Spectral Theory*, Providence, Rhode Island, USA, 24-26 February 2023.
9. Joint Mathematics Meetings, Boston, Massachusetts, 4-7 January 2023.
8. *5th Annual Meeting of SIAM Texas-Louisiana Section*, Houston, Texas, USA, 4-6 November 2022.
7. *SACNAS NDiSTEM conference*, San Juan, Puerto Rico, 27-29 October 2022.
6. *Modern Math Workshop*, San Juan, Puerto Rico, 26-27 October 2022.
5. Mathematical Sciences Research Institute, *MSRI-UP 2022: Algebraic Methods in Mathematical Biology*, Berkeley, California, USA, 11 June - 23 July 2022.
4. AMS Mathematics Research Communities, Workshop *Applied Category Theory*, Java Center, New York, USA, 29 May-4 June 2022.
3. *Western Algebraic Geometry Symposium*, Fort Collins, Colorado, USA, 22-24 April 2022.
2. *4th Annual Meeting of SIAM Texas-Louisiana Section*, South Padre Island, Texas, USA, 5 November 2021.
1. IAS PCMI, Research Topic: *Motivic Homotopy Theory*, Online, 12-16 July 2021.

## TEACHING

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### Texas A&M University

19. Teaching Assistant, Math 150. Functions, Trigonometry and Linear Systems (Fall 2024).
18. Help Session tutor, Engineering Mathematics III (Summer II 2024).
17. No teaching duties. Supported by NSF Grant DMS-1752672 of Anne Shiu (Summer I 2024).
16. No teaching duties. Supported by NSF Grant DMS-2201005 of Frank Sottile (Spring 2024).
15. Grader, Math 696. Mathematical Communication and Technology (Fall 2023).
14. No teaching duties. Supported by NSF Grant DMS-2201005 of Frank Sottile (Summer II 2023).
13. Grader, Math 304. Linear Algebra (Summer I 2023).
12. Teaching Assistant, Math 152. Engineering Mathematics II (Spring 2023).
11. Teaching Assistant, Math 150. Functions, Trigonometry and Linear Systems (Fall 2022).
10. No teaching duties. Supported by a Texas A&M Fellowship (Summer 2022).
9. Teaching Assistant, Math 147. Calculus I for Biological Sciences (Spring 2022).
8. Teaching Assistant, Math 150. Functions, Trigonometry and Linear Systems (Fall 2021).
7. Help Session tutor, Math 409. Advanced Calculus (Summer II 2021).
6. Instructor of Record, Math 140. Math for Business and Social Sciences (Summer 2021).
5. Teaching Assistant, Math 152. Engineering Mathematics II (Spring 2021).
4. Teaching Assistant, Math 150. Functions, Trigonometry and Linear Systems (Fall 2020).
3. Grader, Math 430. Applied Algebra (Summer 2020).
2. Grader, Math 300. Foundations of Mathematics (Spring 2020).
1. Grader, Math 431. Structures and Methods in Combinatorics (Fall 2019).

### The University of Texas Rio Grande Valley

8. Instructor of Record, Math 1342 Elementary Statistical Methods, Math 1351 Fundamentals of Mathematics II, Math 2412 Pre Calculus (Spring 2019).
7. Instructor of Record, Math 1314 College Algebra, Math 1350 Fundamentals of Mathematics I, Math 1351 Fundamentals of Mathematics II, Math 1342 Elementary Statistical Methods, Math 4390 Math Project (Fall 2018).
6. Instructor of Record, Math 0330 Pre Statistics Jumpstart (Summer II 2018).
5. Instructor of Record, Math 2412 Pre Calculus, Math 1342 Elementary Statistical Methods, Math 1332 Contemporary Mathematics (Spring 2018).
4. Instructor of Record, Math 1314 College Algebra, Math 1351 Fundamentals of Mathematics II, Math 2412 Pre Calculus (Fall 2017).
3. Instructor of Record, Math 1314 College Algebra, Math 2414 Calculus II (Summer II 2017).
2. Instructor of Record, Math 2412 Precalculus, MATH 2413 Calculus I, Math 1342 Elementary Statistical Methods, (Spring 2017).
1. Instructor of Record, Math 1314 College Algebra, Math 1332 Contemporary Mathematics, Math 1351 Fundamentals of Mathematics II, Math 2412 Pre Calculus (Fall 2016).

## **Texas Southmost College**

Instructor of Record, College Algebra (Spring 2017).

## **Valley Christian High School**

3. Instructor of Record, Advanced Mathematics (Fall 2018).
2. Instructor of Record, Advanced Mathematics (Fall 2017).
1. Instructor of Record, Advanced Mathematics (Fall 2016).