

## Hiram H. López Valdez

<https://personal.math.vt.edu/hhlopez/>

[hhlopez@vt.edu](mailto:hhlopez@vt.edu)

### Research Interests

Algebraic coding theory, including quantum error correction, coding for post-quantum cryptography, and distributed storage systems. Commutative algebra, including vanishing ideals and Gröbner basis. Network coding, including rank-metric codes and multicast networks. Pattern recognition, including representations of 2D and 3D objects.

### Positions Held

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|------------------------------------------------------------------------------------------------------------|-------------|
| <b>Assistant Professor (tenure-track)</b><br>Department of Mathematics<br>Virginia Tech, USA.              | Aug. 2023 - |
| <b>Assistant Professor</b><br>Department of Mathematics and Statistics<br>Cleveland State University, USA. | 2019 - 2023 |
| <b>Postdoctoral Fellow</b><br>Department of Mathematical Sciences<br>Clemson University, USA.              | 2016 - 2018 |

### Education

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| <b>Ph.D. in Mathematics</b><br>Center for Research and Advanced Studies of the<br>National Polytechnic Institute (Dr. Rafael Villarreal).<br>University of Neuchâtel, Switzerland, visiting scholar (Dr. Elisa Gorla).<br>Thesis: Algebraic Methods for Parameterized and Cartesian Codes. | 2012 - 2016<br><br>2014 - 2015 |
| <b>M.Sc. in Mathematics</b><br>Center for Research and Advanced Studies of the<br>National Polytechnic Institute (Dr. Rafael Villarreal).                                                                                                                                                  | 2008 - 2010                    |
| <b>B.Sc. in Applied Mathematics</b><br>Autonomous University of Aguascalientes, Mexico.<br>National Autonomous University of Mexico, visiting scholar.                                                                                                                                     | 2003 - 2008<br>2007 - 2008     |

### Publications

- 36.- On the affine permutation group of certain decreasing Cartesian codes (with E. Camps-Moreno, I. Soprunov, and E. Sarmiento). Submitted.
- 35.-  The poset of binary CSS-T quantum codes and cyclic codes (with E. Camps-Moreno, G. Matthews, D. Ruano, R. San-José, and I. Soprunov). Submitted.

- 34.-   Experience in Teaching Quantum Computing with Hands-on Programming Labs (with F. Galetto, M. Rahmati, J. Sang, and C. Yu). The Journal of Supercomputing, to appear.
- 33.-  Explicit non-special divisors of small degree and LCD codes from Kummer extensions (with E. Camps and G. Matthews). SIAM Journal on Applied Algebra and Geometry, to appear.
- 32.-    Relative hulls and quantum codes (with S. Anderson, E. Camps-Moreno, G. Matthews, D. Ruano, and I. Soprunov). IEEE Transactions on Information Theory, to appear.
- 31.-   Mathematical LoRE: Local Recovery of Erasures using Polynomials, Curves, Surfaces, and Liftings (with K. Haymaker, B. Malmskog, G. Matthews, and Fernando Piñero). IEEE BITS the Information Theory Magazine, to appear.
- 30.-    Decreasing norm-trace codes (with C. Carvalho and G. Matthews). Designs, Codes and Cryptography, to appear.
- 29.-   On the generalized Hamming weights of hyperbolic codes (with E. Camps-Moreno, I. García-Marco, I. Márquez-Corbella, E. Martínez-Moro, and E. Sarmiento). Journal of Algebra and Its Applications, to appear.
- 28.-    Multivariate Goppa Codes (with G. Matthews). IEEE Transactions on Information Theory, **69**, no. 1, 126–137 (2023).
- 27.-   3D object simplification using chain code-based point clouds (with O. Tapia-Dueñas and H. Sánchez-Cruz). Multimedia Tools and Applications, **82**, 9491–9515 (2023).
- 26.-    Relative generalized Hamming weights of evaluation codes (with D. Jaramillo-Velez and Y. Pitones). São Paulo Journal of Mathematical Sciences, **17**, 188–207 (2023).
- 25.-    Erasures repair for decreasing monomial-Cartesian and augmented Reed-Muller codes of high rate (with G. Matthews and D. Valvo). IEEE Transactions on Information Theory, **68**, no. 3, 1651–1662 (2022).
- 24.-  Secure MatDot codes: a secure, distributed matrix multiplication scheme (with G. Matthews and D. Valvo). 2022 IEEE Information Theory Workshop (ITW), 149–154, (2022).
- 23.-   Coding Theory Package for *Macaulay2* (with T. Ball, E. Camps, H. Chimal-Dzul, D. Jaramillo-Velez, N. Nichols, M. Perkins, I. Soprunov, G. Vera, and G. Whieldon). Journal of Software for Algebra and Geometry, **11**, no. 1, 113–122 (2021).

- 22.-    The dual of an evaluation code (with I. Soprunov and R. Villarreal). Designs, Codes and Cryptography, **89**, no. 7, 1367–1403 (2021).
- 21.-    Polar decreasing monomial-Cartesian codes (with E. Camps, G. Matthews, and E. Sarmiento). IEEE Transactions on Information Theory, **67**, no. 6, 3664–3674 (2021).
- 20.-    Hermitian-lifted codes (with B. Malmskog, G. Matthews, F. Piñero-González, and M. Wootters). Designs, Codes and Cryptography, **89**, no. 3, 497–515 (2021).
- 19.-  Augmented Reed-Muller codes of high rate and erasure repair (with G. Matthews and D. Valvo). 2021 IEEE International Symposium on Information Theory (ISIT), 438–443 (2021). IEEE.
- 18.-    Monomial-Cartesian codes and their duals, with applications to LCD codes, quantum codes, and locally recoverable codes (with G. Matthews and I. Soprunov). Designs, Codes and Cryptography, **88**, no. 8, 1673–1685 (2020).
- 17.-    Rank-Metric Codes and  $q$ -Polymatroids (with E. Gorla, R. Jurrius, and A. Ravagnani). Journal of Algebraic Combinatorics, **52** (2020), 1–19.
- 16.-  Monomial-Cartesian codes closed under divisibility (with E. Camps, G. Matthews, and E. Sarmiento). 2019 14th International Conference on Finite Fields and their Applications, De Gruyter Proceedings in Mathematics, 199–208 (2020). De Gruyter.
- 15.-    Affine Cartesian codes with complementary duals (with F. Manganiello and G. Matthews). Finite Fields and Their Applications, **57** (2019), 13–28.
- 14.-  Coding 3D connected regions with F26 chain code (with O. A. Tapia-Dueñas, H. Sánchez-Cruz, and H. Sossa). 2018 17th Mexican International Conference on Artificial Intelligence, Lecture Notes in Computer Science, **11289**, 3–14 (2019). Springer, Cham.
- 13.-  Visión Computacional (with E. Gómez-Gómez, J. C. Sánchez, and H. Sánchez-Cruz). In El Reconocimiento de Patrones y su Aplicación a las Señales Digitales, 73–106 (2019).
- 12.-    Weight distribution of rank-metric codes (with J. de la Cruz, E. Gorla, and A. Ravagnani). Designs, Codes and Cryptography, **86**, no. 1, 1–16 (2018).
- 11.-   Explicit optimal-length locally repairable codes of distance 5 (with A. Beemer, R. Coatney, V. Guruswami, and F. Piñero). 2018 56th Annual Allerton Conference on Communication, Control, and Computing (Allerton), 800–804 (2018). IEEE.

- 10.-    Projective nested Cartesian codes (with C. Carvalho and V. Lopez). Bulletin of the Brazilian Mathematical Society, New Series, **48** (2017), no. 2, 283–302.
- 9.-   Representations of the Multicast Network Problem (with S. Anderson, W. Halbawi, N. Kaplan, F. Manganiello, E. Soljanin, and J. Walker). 2016 Conference on Algebraic Geometry for Coding Theory and Cryptography, Association for Women in Mathematics Series, **9**, 1–23 (2017). Springer, Cham.
- 8.-  Single chains to represent groups of objects (with H. Sánchez-Cruz and M. Mascorro-Pantoja). Digital Signal Processing, **51**, 73–81 (2016).
- 7.-    Computing the degree of a lattice ideal of dimension one (with R. Villarreal). Journal of Symbolic Computation, **65**, no. 1, 15–28 (2014).
- 6.-    Affine Cartesian codes (with C. Rentería-Márquez and R. Villarreal). Designs, Codes and Cryptography, **71**, no. 1, 5–19 (2014).
- 5.-  Equivalence of chain codes (with H. Sánchez-Cruz). Journal of Electronic Imaging, **23**, no. 1, 1–12 (2014).
- 4.-  A new relative chain code in 3D (with H. Sánchez-Cruz and F. Cuevas). Pattern Recognition, **47**, no. 2, 769–788 (2014).
- 3.-   Complete intersections in binomial and lattice ideals (with R. Villarreal). International Journal of Algebra and Computation, **23**, no. 6, 1419–1429 (2013).
- 2.-    Complete intersection vanishing ideals on degenerate tori over finite fields (with R. Villarreal and L. Zárate). Arabian Journal of Mathematics, Springer, **2**, no. 2, 189–197 (2013).
- 1.-    Parameterized affine codes (with E. Sarmiento, M. Vaz-Pinto, and R. Villarreal). Studia Scientiarum Mathematicarum Hungarica, **49**, no. 3, 406–418 (2012).

## Grants and Awards

- 2022-2025  Evaluation Codes, Duals, and Applications, PI, \$247,013.
- 2023-2024 **Indian Institute of Technology Bombay Industrial Research and Consultancy Centre**, Symmetries and Fundamental Parameters of Linear Error Correcting Codes, Seed funding for Collaboration and Partnership Projects (SCPP) Phase II, PI in USA (Sudhir R. Ghorpade, PI in India), \$12,000.
- 2023-2024 **Office of Undergraduate Research**, BEPUR: Broadening Engagement & Participation in Undergraduate Research, Co-PI, \$10,000.

- 2023-2024 **Commonwealth Cyber Initiative Southwest Virginia**, CryptoQuest, Co-PI, \$4,000.
- Jan. 2023 *Diverse: Issues in Higher Education's* [Emerging Scholars for 2023](#).
- 2020-2023 **AMS-Simons**, Theory and applications of Cartesian codes and network coding, PI, \$5,000.
- 2017-2023 **CONACyT** (Mexican NSF), Member of the Mexican National System of Researchers ([SNI](#)), Level I.
- 2020-2022  [Macaulay2 workshop at Cleveland State University](#), Co-PI, \$19,973.
- 2019-2022 **AIM SQuaRE**, LoRE: Local Recovery of Erasures, Co-PI, grant for group research visits at [AIM](#).
- Aug. 2022 **Collaborate@ICERM**, Quantum error correction, Co-PI, grant for a group research visit at [ICERM](#).
- Jun. 2022 **CSU**, Undergraduate Summer Research Award: Uncovering matrices for cryptography, PI, \$4,000.
- Sep. 2020 **Lathisms**, Mathematician of the day: [September 17, 2020](#). More info [here](#).
- Aug. 2020 **CSU**, Merit Recognition Award.
- Jun. 2020 **CSU**, Undergraduate Summer Research Award: Storing information using mathematics, PI, \$4,000.
- Aug. 2019 Fellow **Project NExT**.
- 2016-2018 **CONACyT**, 2-year postdoctoral grant: Network Codes, PI, USD 50,000.
- 2014-2015 **Swiss Government** Excellence Scholarship, 1-year doctoral research visit: Coding Theory, PI, USD 25,000. Research under the direction of Prof. Elisa Gorla at the University of Neuchâtel, Switzerland.
- 2012-2016 **Autonomous University of Aguascalientes**, Complementary Ph.D. grant, PI, USD 30,000.

## Ph.D. Students

- In progress Nart Shalqini (co-advised), Virginia Tech, Topics on quantum error-correcting codes.
- Summer 2023 Osvaldo A. Tapia Dueñas (co-advised), Autonomous University of Aguascalientes, Thesis: *Artificial Intelligence Techniques and Applied Mathematics for Object Recognition in 2D and 3D*.
- Spring 2023 [Eduardo Camps-Moreno](#) (co-advised), National Polytechnic Institute of Mexico, Thesis: *Algebraic coding theory for three models of communication: decreasing codes, sum-rank metric codes, and hulls of linear codes*.

## M.Sc. Students

- Spring 2023 Kyle Traum, Cleveland State University, Senior project: *Code-based crypto using multivariate Goppa codes.*
- Fall 2020 Matthew Perkins, Cleveland State University, Senior project *App. of Graph Theory and Macaulay2 on Recent Families of Linear Codes.* After graduation: instructor at CSU.
- Spring 2018 Osvaldo A. Tapia Dueñas (co-advised), Autonomous University of Aguascalientes, Thesis: *A formal system that allows binary object descriptors to be recognized.* After graduation: Ph.D. program.

## Undergraduate Students

- Fall 2023 M. Durishetti, R. George, S. Harkness, A. Klee, G. Mullin, Y. Tunchanok, and A. Zhang (co-advised), Virginia Tech, Undergraduate Research Project on Coding Theory.
- Summer 2023 Taylor Vidmar, Cleveland State University, Undergraduate Summer Research Award: *Multiplying huge matrices and storing massive data sets.*
- Summer 2023 Justin White, Cleveland State University, Undergraduate Summer Research Award: *Multiplying huge matrices and storing massive data sets.*
- Spring 2023 Vandan Patel, Cleveland State University, Senior project: *Applications of Coding Theory.*
- Fall 2022 Joseph Grega, Cleveland State University, Senior project: *Error-correcting codes.*
- Fall 2022 Harsh Shah, Cleveland State University, Senior project: *Using linear algebra to reliably and securely transmit and store information.*
- Summer 2022 James Iler, Cleveland State University, Undergraduate Summer Research Award: *Uncovering matrices for cryptography.*
- Spring 2022 Riley Daykin, Cleveland State University, Senior project: *Introduction to coding theory and its applications.*
- Spring 2022 Gregory Phillips, Cleveland State University, Senior project: *Introduction to Error-Correcting Codes and their Applications.*
- Spring 2022 Shaya Reyes, Cleveland State University, Senior project: *Coding Theory.*
- Fall 2021 Kyle Traum, Cleveland State University, Senior project: *An introduction to coding theory and the McEliece cryptosystem.*
- Spring 2021 Molly Walsh, Cleveland State University, Senior project: *Utilizing Coding Theory to Store and Detect Information.*
- Fall 2021 Elisabeth Helmick, Cleveland State University, Undergraduate Summer Research Award: *Application of coding theory to distributed storage systems.*

- Fall 2020 Destinee Lashley, Cleveland State University, Senior project: *Error-Correcting Codes*.
- Spring 2020 Andriy N Klek, Cleveland State University, Senior project: *Introduction to Coding Theory and Error-Correcting Codes*.

## Professional Experience

### Editorial board

- Since 2022 Associate Editor for Coding and Design Theory, Journal of Algebra Combinatorics Discrete Structures and Applications.

### Guest editor

- 2023-2024 Guest Editor for the Special Issue on Recent Advances in Algebraic Geometry, Coding Theory, and Combinatorics in the Journal of Algebra and Its Applications. This Special Issue is dedicated to Professor Sudhir Ghorpade on the occasion of his sixtieth birthday.

### TPC member

- Cloud2Things 2022
- Cloud2Things 2021
- SIoTEC 2020

### Reviewer (alphabetical order)

- AMS Mathematical Reviews
- Computational and Applied Math.
- Conferences: ISIT and WCC
- Cryptography and Communications
- Designs, Codes, and Cryptography
- Discrete Mathematics
- Engineering Analysis with Boundary Elements
- Foundations and Trends® in Comm. and Information Theory
- IEEE Communications Letters
- Int. Electronic Journal of Algebra
- IEEE Transactions on Information Theory
- Journal of Algebra and its App.
- Journal of Algebraic Combinatorics
- Journal of Visual Communication and Image Representation
- Mathematica Slovaca
- Pattern Recognition
- São Paulo Journal of Mathematical Sciences
- SIAM Journal on Discrete Math.
- Zentralblatt MATH

## Organizer

- Jul. 2025 Special session on Coding Theory (with H. Chimal-Dzul, M. Chara, and L. Quoos). Mathematical Congress of the Americas 2025. Miami, FL, USA.
- Jul. 2024 Coding Theory and Cryptography Summer School and Collaboration Workshop (with G. Cotardo, J. LeGrow, G. Matthews, F. Manganiello, and W. Santos). Virginia Tech Steger Center for International Scholarship. Riva San Vitale, Switzerland.
- Apr. 2024 Special Session on Coding Theory and its Applications. 2024 Spring Eastern Sectional Meeting. Howard University. Washington, DC, USA.
- Apr. 2024 ACTiV(T), Algebraic Coding Theory in Virginia (Tech) (with G. Cotardo, E. McMillon, E. Camps Moreno, G. Matthews, and P. Soto). Virginia Tech, VA, USA.
- Feb. 2024 Conference Algebraic Applications to Coding Theory and Crypto (with Y. Pitones). Casa Rafael Galván, Universidad Autónoma Metropolitana. CDMX, Mexico.
- Jan. 2024 Special session on Coding Theory for Modern Applications (with A. Beemer and Rafael G. L. D'Oliveira). 2024 Joint Mathematics Meetings. San Francisco, CA, USA.
- Spring 2024 Applied Algebra Seminar (with G. Matthews). Virginia Tech, Blacksburg, VA, USA.
- 2024 ACCESS: Algebraic Coding and Cryptography Seminar Series (with J. F. Bisse, F. Manganiello, G. Matthews, and E. Persichetti). A twice-a-month online seminar.
- Oct. 2023 Special session on Coding Theory and its Applications (with Y. Pitones and Elías García Claro). 56 National Congress of the Mexican Mathematical Society. Autonomous University of San Luis Potosi, Mexico.
- Fall 2023 Applied Algebra Seminar (with G. Matthews). Virginia Tech, VA, USA.
- Jul. 2023 Minisymposium Algebraic coding theory (with F. Salizzoni). 2023 SIAM Conference on Applied Algebraic Geometry (AG 23). Eindhoven University of Technology, The Netherlands.
- Jul. 2023 Workshop on Coding Theory & Cryptography (with G. Cotardo, J. LeGrow, G. Matthews, F. Manganiello, and W. Santos). Virginia Tech Steger Center. Riva San Vitale, Switzerland.
- Jan. 2023 Special session on Coding Theory for Modern Applications (with A. Beemer and Rafael G. L. D'Oliveira). 2023 Joint Mathematics Meetings. Boston, MA, USA.
- Spring 2023 TAG (Topology, Algebra, and Geometry) Seminar (with F. Galetto). Cleveland State University, OH, USA.

- 2023 ACCESS: Algebraic Coding and Cryptography Seminar Series (with J. F. Bissasse, F. Manganiello, G. Matthews, and E. Persichetti). A twice-a-month online seminar.
- Fall 2022 TAG (Topology, Algebra, and Geometry Seminar) (with F. Galetto). Cleveland State University, OH, USA.
- Jun. 2022 Co-leader (with W. Santos) of the “Tensor Products of Generalized Reed-Solomon Codes” project in the Rethinking Number Theory Workshop. (Online)
- Apr. 2022 Workshop Algebraic Methods in Coding Theory and Communication (with E. Gorla and F. Manganiello). BIRS-CMO. Casa Matemática Oaxaca, Mexico. (Hybrid)
- Jan. 2022 Special session on Advances in Coding Theory (with K. Haymaker and B. Malmeskog). 2022 Joint Mathematics Meetings. Seattle, WA, USA.
- Spring 2022 TAG (Topology, Algebra, and Geometry) Seminar (with F. Galetto). Cleveland State University, OH, USA.
- Oct. 2021 Special Session on Coding Theory and Their Applications (with E. Camps). 54 National Congress of the Mexican Mathematical Society. Meritorious Autonomous University of Puebla, Mexico. (Online)
- Aug. 2021 Minisymposium Rank-Metric and Subspace Codes (with A. Ravagnani). 2021 SIAM Conference on Applied Algebraic Geometry (AG 21). Texas A&M University, College Station, Texas, US. (Online)
- Fall 2021 TAG (Topology, Algebra, and Geometry) Seminar (with F. Galetto). Cleveland State University, OH, USA.
- Jun. 2021 Special session on Theory and Applications of Coding Theory (with C. Carvalho, R. Podesta, and R. Villarreal). Mathematical Congress of the Americas 2021. Buenos Aires, Argentina. (Online)
- May 2020 Co-leader (with G. Whieldon) of the project “Coding Theory Package for Macaulay2” in the Macaulay2 workshop at Cleveland State University. (Online)
- May 2020 Macaulay2 workshop at Cleveland State University (with F. Galetto, C. Gibbons, and B. Stone). Cleveland State University, OH, US. (Online)
- Jan. 2019 Special session on Coding Theory and Applications (with F. Manganiello and G. Matthews). 2019 Joint Mathematics Meetings. Baltimore, MD, USA.
- Oct. 2018 Special session on Coding Theory, Cryptography, and Related Topics (with H. Tapia-Recillas). 51 National Congress of the Mexican Mathematical Society. Juárez Autonomous University of Tabasco, Mexico.

## Talks

- Jul. 2024 A link between (commutative) algebra and coding theory (course with Y. Pitones). Summer School in Applied Algebraic Geometry in Colombia. An EMALCA Summer School, Bogota, Colombia.
- Apr. 2024 Decreasing norm-trace codes. Special Session on Commutative Algebra and its Applications. 2024 Spring Eastern Sectional Meeting. Howard University. Washington, DC, USA.
- Apr. 2024 The dual of evaluation codes. ACTiV(T). Virginia Tech, USA.
- Feb. 2024 Finite Fields and Quantum Computing. The Autonomous University of Aguascalientes. Aguascalientes, Mexico.
- Jan. 2024 High-rate norm-trace codes. Special Session on Advances in Coding Theory. 2024 Joint Mathematics Meetings. San Francisco, CA, USA.
- Nov. 2023 Monomial norm-trace codes. Minisymposium on Coding Theory and Cryptography. SIAM Texas-Louisiana Sectional Meeting. University of Louisiana at Lafayette, USA.
- Oct. 2023 Algebraic applications to coding theory and cryptography. University of Alabama in Huntsville, USA.
- Jul. 2023 Mathematics: a powerful tool to protect our information. Occidental College. Los Angeles, CA, USA.
- Jul. 2023 Relative hulls and quantum codes. Minisymposium on Coding Theory and Galois Geometries. 2023 SIAM Conference on Applied Algebraic Geometry (AG 23). Eindhoven University of Technology, The Netherlands.
- Jul. 2023 Multivariate Goppa Codes. Workshop on Coding Theory & Cryptography. Virginia Tech Steger Center, Riva San Vitale, Switzerland.
- Jun. 2023 Recent results on the dual of an evaluation code. 14th National Colloquium on Codes, Cryptography, and related topics. Mexico.
- Jun. 2023 Relative hulls and quantum codes. Minisymposium on Discrete Mathematics in Quantum Information Processing. CanaDAM. Universities of Manitoba and Winnipeg, Canada.
- May 2023 Data privacy using cryptography and coding theory. Monterrey Institute of Technology and Higher Education, Mexico. (Online)
- Apr. 2023 Mathematics: a powerful tool to protect our information. The 35th Annual Eastern Kentucky University Symposium in Mathematics and Statistics. Eastern Kentucky University, USA.
- Mar. 2023 On the automorphism group of tensor products of Reed-Solomon codes. Special Session on Public Key Cryptography and Applications. SIAM Southeastern Atlantic Section Annual Meeting. Virginia Tech, USA.

- Mar. 2023 Algebraic applications to coding theory and cryptography. The Autonomous University of Aguascalientes. Aguascalientes, Mexico.
- Jan. 2023 On the automorphism group of tensor products of Reed-Solomon codes. Special Session on Rethinking Number Theory. 2023 Joint Mathematics Meetings. Boston, Massachusetts, USA.
- Nov. 2022 Recent results on evaluation codes. ACTiV(T) Week. Virginia Tech, USA.
- Oct. 2022 Multivariate Goppa Codes. 55 National Congress of the Mexican Mathematical Society. The Autonomous University of Guadalajara, Mexico. (Online)
- Jul. 2022 Using monomials to define codes. REU: Combinatorics and Coding Theory in the Tropics. East Tennessee State University/Universidad Puerto Rico in Ponce. (Online)
- Jun. 2022 High-rate norm-trace codes. Recent Trends in Algebra, Geometry, and Arithmetic. Vlora, Albania. (Online)
- May 2022 Decoding Multivariate Goppa Codes. International Workshop on Code-Based Cryptography. Trondheim, Norway. (Online)
- Nov. 2021 Augmented Reed-Muller Codes of High Rate and Erasure Repair. III Argentine Meeting on Finite Fields and Related Topics. National University of Córdoba, Argentina. (Online)
- Nov. 2021 Introduction to evaluation codes. Research Seminar in Algebra and Combinatorics. Industrial University of Santander, Colombia. (Online)
- Oct. 2021 Dual of evaluation codes. Seminar in coding theory and cryptography. Universities of Neuchatel and Zurich, Switzerland. (Online)
- Oct. 2021 Hermitian-lifted codes. Special Session on Coding, Storage, and Related Applications. 2021 Fall AMS Central Sectional Meeting. Creighton University, Omaha, NE, USA. (Online)
- Sept. 2021 Dual of evaluation codes. II Workshop on Finite Fields and Applications In memory of Fernando Torres. University of Brasilia, Brazil. (Online)
- Apr. 2021 Polynomials that protect: points, lines, and curves. Spring 2021 MAA Southern California-Nevada Sectional Meeting. Riverside City College, Riverside, CA, USA. (Online)
- Dec. 2020 Applications of coding theory. Seminar for graduate students. Autonomous University of Aguascalientes, Mexico. (Online)
- Nov. 2020 Rank-metric codes (Part II). Athens Algebra seminar. Ohio University Center of Ring Theory and its Applications, Athens, OH, USA. (Online)
- Nov. 2020 Rank-metric codes (Part I), Athens Algebra seminar. Ohio University Center of Ring Theory and its Applications, Athens, OH, USA. (Online)

- Jun. 2020 Applications of Cartesian codes, SINGACOM, and the Spanish-Colombian seminars SC3 of coding theory and cryptography. University of the North (Colombia) and University of Valladolid (Spain). (Online)
- Mar. 2020 Applications of the trace function and vanishing ideals to storage systems. Mid-Atlantic Seminar On Numbers IV. Gettysburg College, Gettysburg, PA, USA.
- Jan. 2020 Monomial-Cartesian codes, their duals, and some applications. Special Session on Coding Theory and Applications. 2020 Joint Mathematics Meetings. Denver, CO, USA.
- Sept. 2019 Algebraic Methods for Coding Theory. 7th Heidelberg Laureate Forum. Heidelberg, Germany.
- Sept. 2019 How computers communicate using math. Hispanic Heritage Month Colloquium Series. Youngstown State University, OH, USA.
- Jul. 2019 Basic commutative algebra and combinatorics tools for coding theory. Algebra meets combinatorics in Neuchatel. University of Neuchatel, Switzerland.
- Jul. 2019 Explicit optimal-length locally repairable codes of distance 5. Minisymposium Coding theory and cryptography. 2019 SIAM Conference on Applied Algebraic Geometry (AG19). University of Bern, Switzerland.
- Mar. 2019 Explicit optimal-length locally repairable codes of distance 5. Special Session on Mathematical Coding and Information Theory. 2019 Spring AMS Central and Western Joint Sectional Meeting. University of Hawaii at Manoa, HI, USA.
- Jan. 2019 Rank metric codes and  $q$ -polymatroids. 2019 Joint Mathematics Meetings. Baltimore, MD, USA.
- Nov. 2018 Coding theory and commutative algebra. Commutative algebra/Algebraic geometry seminar. CIMAT, Guanajuato, Mexico.
- Oct. 2018 Rank metric codes. Special Session on Coding Theory, Cryptography, and Related topics. 51 National Congress of the Mexican Mathematical Society. Juárez Autonomous University of Tabasco, Mexico.
- Jul. 2018 LCD codes from Cartesian codes. Commutative Algebra with Applications to Statistics and Coding Theory CIMPA research school. Autonomous University of Zacatecas, Mexico.
- Jun. 2018 An introduction to Cartesian codes. REU program. Clemson University, SC, USA.
- Apr. 2018 Affine Cartesian codes with Complementary duals. Sixth Code-Based Cryptography Workshop. Florida Atlantic University, FL, USA.
- Oct. 2017 Lattice ideals and coding theory. Algebra and Discrete Math Seminar. Clemson University, SC, USA.

- Oct. 2017 An introduction to rank-metric codes. Coding Theory, Cryptography, and Number Theory Seminar. Clemson University, SC, USA.
- Sept. 2017 Repairing Reed-Solomon codes, Coding Theory, Cryptography, and Number Theory Seminar. Clemson University, SC, USA.
- Mar. 2017 Examples of evaluation codes. Special Session on Coding Theory, Cryptography, and Number Theory. 2017 Spring AMS Southeastern Sectional Meeting. College of Charleston, SC, USA.
- Jan. 2017 Evaluation codes: codes using commutative algebra. Special Session on Coding Theory for Modern Applications. 2017 Joint Mathematics Meetings. Atlanta, Georgia, USA.
- Sept. 2016 Linear codes using basic tools of commutative algebra. Coding Theory, Cryptography, and Number Theory Seminar. Clemson University, SC, USA.
- Jul. 2016 Evaluation Codes. V Latino-American Congress of Mathematicians. University of the North, Barranquilla, Colombia.
- Apr. 2016 Algebra applied to codes. Seminar of Applied Mathematics. Autonomous University of Aguascalientes, Mexico.
- Oct. 2015 Projective nested Cartesian codes. Special Session on Algebra. XLVIII National Congress of the Mexican Mathematical Society. University of Sonora, Mexico.
- Sept. 2015 Rank distribution of Delsarte codes, Applied Algebra seminar. University of Neuchatel, Switzerland.
- Sept. 2015 Evaluation Codes. Early-career workshop. University of Murcia, Spain.
- Jul. 2015 Evaluation Codes. 7th Workshop on Coding and Systems. University of Salamanca, Spain.
- Jun. 2015 Projective Nested Cartesian Codes (poster presentation). 2015 Effective Methods in Algebraic Geometry (MEGA) conference. University of Trento, Italy.
- Jun. 2015 Lattice Ideals, Mathematics Mini-Talks. University of Neuchatel, Switzerland.
- Mar. 2015 Commutative Algebra and Linear Codes. Applied Algebra seminar. University of Zurich, Switzerland.
- Feb. 2015 Affine Cartesian codes. Swiss Graduate Colloquium. Federal Polytechnic School of Lausanne, Switzerland.
- Dec. 2013 Lattice Character Ideals. Seminar for graduate students. Federal University of Uberlandia, Brazil.
- Oct. 2013 Affine Cartesian Codes. Special Session on Algebra. XLVI National Congress of the Mexican Mathematical Society. Autonomous University of Yucatan, Mexico.
- Mar. 2012 Equivalences between the chain codes proposed in the literature. Congress of Exact Sciences. Autonomous University of Aguascalientes, Mexico.

## Outreach

I maintain strong connections to **universities in Mexico**. I create specific links for graduate students and faculty members to opportunities for research visits or to give research talks at American universities.

I do informal advising to the **Latino community** about funding opportunities to attend STEM events, such as congresses, meetings, and conferences, or pursue STEM degrees, like undergraduate, graduate, and postgraduate studies.

I am one of the developers of the **Coding theory package** for *Macaulay2*, an open-source computer algebra system supporting research in algebraic geometry and commutative algebra. This package allows students and faculty without access to paid computational software to do computational algebraic research on coding theory.

I worked closely with the **STEM Peer Teachers** (SPTs) at CSU, a group whose primary goal is to help increase students' interests, abilities, and confidence to excel in STEM courses.

I was the official advisor of the **Association of Latin Professionals For America**, an organization at CSU dedicated to advancing the Latino community's success and progression and preparing them for future professions.

## Research Visits

Sept. 2014 - Sept. 2015 University of Neuchâtel, Switzerland, visiting scholar.

Nov. 2014 - Dec. 2014 Federal University of Uberlândia, Brazil.

## Teaching Experience

I have ample undergraduate and graduate teaching experience in a large variety of courses, including more than 60 classes (traditional, online, or hybrid) for groups as small as 10 students and as large as 100 students. My teaching journey started during my graduate studies, where I taught at the Autonomous University of Aguascalientes and the Open and Distance University of Mexico. The experience continued at Clemson University from 2016 to 2018, at Cleveland State University from 2019 to 2023, and at Virginia Tech since 2023.

(**At VT**) Cryptography.

(**At CSU**) Coding theory and its applications, cryptography (2023), quantum computing, topics in algebraic coding theory, multivariate Goppa codes and their applications, abstract algebra I, linear algebra, introduction to discrete mathematics, integral calculus, and differential calculus.

(**Not at CSU**) For mathematicians, engineers, and scientists: algebra, linear algebra, differential calculus, integral calculus, calculus of several variables, differential equations, and complex variables. For non-scientific careers: elementary algebra, financial mathematics, and optimization. For online studies (mathematicians, engineers, and scientists): algebra, linear algebra, abstract algebra I (groups and rings), abstract algebra II (fields and modules), discrete mathematics, differential calculus, integral calculus, differential equations, basic statistic, and combinatorial analysis.

“Overall, the instructor is an effective teacher” on the scale of 1 (Not at all) - 5 (Very much).

- Average of evaluations as an instructor at Cleveland State University:  $> 4.70$ .

- Average of evaluations as an instructor not at Cleveland State University: 4.51.

## Additional Scholarships and Fellowships

- Aug. 2021    **SIAM** early career travel award. 2021 SIAM Conference on Applied Algebraic Geometry (AG21). Texas A&M University, College Station, Texas, US. (Online)
- Jul. 2021    **AMS** travel grant. Mathematical Congress of the Americas. Buenos Aires, Argentina (online).
- Sept. 2019    **SAP** travel grant. 7th Heidelberg Laureate Forum. Heidelberg, Germany.
- Jul. 2019    **SIAM** early career travel award. 2019 SIAM Conference on Applied Algebraic Geometry (AG19). University of Bern, Switzerland.
- Apr. 2019    **ICERM** financial support. Optimization Methods in Computer Vision and Image Processing workshop. ICERM, Providence, RI, USA.
- Aug. 2018    **IMPA, SBM, IMU** open arms travel grant. International Congress of Mathematicians. Rio de Janeiro, Brazil.
- Nov. 2018    **ICERM** financial support. Nonlinear algebra in applications workshop. ICERM, Providence, RI, USA.
- Jul. 2018    **CIMPA** and **UAZ** financial support. Commutative Algebra with Applications to Statistics and Coding Theory CIMPA research school. Autonomous University of Zacatecas, Mexico.
- Jul. 2017    **AMS** travel award. Mathematical Congress of the Americas. Montreal, Canada.
- Jul. 2016    **MSRI** financial support. Summer school Chip Firing and Tropical Curves. MSRI, Berkeley, CA, USA.
- Jul. 2016    **CIMPA, SMC** travel grant. V Latino-American Congress of Mathematicians. University of the North, Barranquilla, Colombia.
- Feb. 2016    **IPAM** financial support. Algebraic Geometry for Coding Theory and Cryptography. IPAM, Los Angeles, CA, USA.
- Nov. 2015    **Banff** and **CMO** financial support. Sandpile Groups workshop. Casa Matemática Oaxaca, Mexico.
- Jul. 2015    **COST Action: IC1104** financial support. 7th Workshop on Coding and Systems. University of Salamanca, Salamanca, Spain.
- Jun. 2015    **MEGA 2015** financial support. 2015 Effective Methods in Algebraic Geometry (MEGA) conference. University of Trento, Italy.
- Aug. 2014    **CONACyT** (Mexican NSF) travel grant. International Congress of Mathematicians. Seoul, South Korea.

- 2013    **CONACyT** (Mexican NSF) travel grant. Research stay at Federal University of Uberlandia, Brazil.
- 2013    **CONACyT, IMPA** travel grant. Summer of Research. IMPA, Rio de Janeiro, Brazil.
- Sept. 2012    **CIMPA** financial support. School of Algebra for Secure and Reliable Communication Modeling CIMPA research school. Michoacan University of Saint Nicholas of Hidalgo, Morelia, Mexico.
- Jun. 2010    **MSRI** and **SMM** financial support. International Meeting of the AMS and SMM. University of California, Berkeley, CA, USA.
- 2007-2008    **Santander Bank** scholarship. Visiting scholar at the National Autonomous University of Mexico.
- 2007    **AMC** scholarship, Summer of Science. Institute of Astronomy, National Autonomous University of Mexico, Mexico.

## Conference, Workshop and School Participation

- Nov. 2020    Broadening Participation: 2020 MPS Workshop for New Investigators, online.
- Jul. 2020    MAA Project NExT. (Online)
- Aug. 2019    MAA MathFest 2019. Cincinnati, USA.
- Jul. 2019    MAA Project NExT. Cincinnati, USA.
- Apr. 2019    Optimization Methods in Computer Vision and Image Processing. ICERM, Providence, RI, USA.
- Nov. 2018    Nonlinear algebra in applications workshop. ICERM, Providence, RI, USA.
- Aug. 2018    International Congress of Mathematicians. Rio de Janeiro, Brazil.
- Jun. 2018    Early Career Research Workshop. Clemson University, SC, USA.
- Jul. 2017    Mathematical Congress of the Americas 2017. McGill University, Montreal, Canada.
- 2016    Summer school Chip Firing and Tropical Curves. MSRI, Berkeley, CA, USA.
- Feb. 2016    Algebraic Geometry for Coding Theory and Cryptography. IPAM, Los Angeles, USA.
- Nov. 2015    Sandpile Groups workshop. Casa Matemática Oaxaca, Mexico.
- Oct. 2015    Conferences of Algebra. National Autonomous University of Mexico, Mexico.
- Mar. 2015    Graduate School Let's Matroid. University of Neuchâtel, Switzerland.
- Dec. 2014    Expanders Everywhere! University of Neuchâtel, Switzerland.

- Aug. 2014    International Congress of Mathematicians. Seoul, Korea.
- Aug. 2013    Mathematical Congress of the Americas 2013. Guanajuato, Mexico.
- Jan. 2013    Summer of research (Lecture in Comm. Algebra). IMPA, Rio de Janeiro, Brazil.
- Oct. 2012    XLV National Congress of the Mexican Mathematical Society. Autonomous University of Queretaro, Mexico.
- Sept. 2012    School of Algebra for Secure and Reliable Communication Modeling CIMPA School. Michoacan University of Saint Nicholas of Hidalgo, Morelia, Mexico.
- Jun. 2010    International Meeting of the AMS and the Mexican Mathematical Society. University of California, Berkeley, United States.
- Feb. 2008    Regional Congress of Probability and Statistic, Juárez Autonomous University of Tabasco, Mexico.
- Oct. 2007    XL National Congress of the Mexican Mathematical Society. Autonomous University of Nuevo Leon, Monterrey, Mexico.
- 2007        Lagrange orbits in a galactic disk. Summer of Science. Institute of Astronomy, National Autonomous University of Mexico, Mexico.
- Jun. 2007    Summer School in Mathematics. Autonomous University of the State of Morelos, Cuernavaca, Mexico.
- Jun. 2007    School of Modeling and Numerical Methods. CIMAT, Guanajuato, Mexico.
- Jan. 2007    International Congress of Numerical Methods in Engineer and Applied Sciences. Michoacan University of Saint Nicholas of Hidalgo, Morelia, Mexico.
- Oct. 2006    XXXIX National Congress of the Mexican Mathematical Society. Juárez Autonomous University of Tabasco, Mexico.
- Aug. 2006    National Congress of Probability. Autonomous U. of Aguascalientes, Mexico.
- Jul. 2006    School of Numerical Methods in Engineer and Applied Sciences. CIMAT, Guanajuato, Mexico.

## Computational Skills

Borland, C, Latex, Scientific WorkPlace, MatLab, Mathematica, Maple, Derive, Win Qsb, Minitab, Statistica, R, Pascal, Autocad, Rhinoceros, Singular, CoCoA, Macaulay2, SAGE and Magma.

## Languages

- **English:** Fluent.
- **Spanish:** Native.

## References

- Elisa Gorla, University of Neuchâtel, elisa.gorla@unine.ch,  
<http://members.unine.ch/elisa.gorla/>
- Felice Manganiello, Clemson University, manganm@clemson.edu  
<http://www.math.clemson.edu/~manganm/>
- Joachim Rosenthal, University of Zurich, rosenthal@math.uzh.ch,  
<http://user.math.uzh.ch/rosenthal/>
- Rafael H. Villarreal Rodríguez, CINVESTAV-IPN, vila@math.cinvestav.mx,  
<http://www.math.cinvestav.mx/vila/>