

Positions

- **Assistant Professor** College of the Holy Cross
Department of Mathematics and Computer Science Aug. 2023 - present
- **William W. Elliott Assistant Research Professor** Duke University
Department of Mathematics Aug. 2020 - July 2023
- **Nonlinear Algebra Group** Max Planck Institute for Mathematics in the Sciences, Leipzig
Visiting Researcher Aug. 2019 - Sept. 2019
- **Computer Vision Cluster** ICERM at Brown University
Visiting Researcher Feb. 2019
- **Semester Program on Nonlinear Algebra** ICERM at Brown University
Visiting Researcher Sept. 2018 - Dec. 2018

Education

- **University of Notre Dame** Notre Dame, IN
Ph.D. in Applied and Computational Mathematics and Statistics Aug. 2020
– Advisor: Jonathan Hauenstein
– Thesis title: Parameterized Polynomial Systems and their Applications
- M.S. in Applied and Computational Mathematics and Statistics* May 2017
– GPA: 3.86/4.00
- **Swarthmore College** Swarthmore, PA
B.A. Mathematics and Physics (with Honors) June 2014
– GPA: 3.44/4.00.

Publications

Peer-Reviewed:

13. Wenrui Hao, Jonathan D. Hauenstein, **Margaret H. Regan**, and Tingting Tang, “A numerical method for solving elliptic equations on real closed algebraic curves and surfaces.” *Journal of Scientific Computing*, 99(56), 2024. DOI: 10.1007/s10915-024-02516-2
12. Timothy Duff, Viktor Korotynskiy, Tomas Pajdla, and **Margaret H. Regan**, “Using monodromy to recover symmetries of polynomial systems.” *Proceedings of the 2023 International Symposium on Symbolic and Algebraic Computation (ISSAC '23)*, Association for Computing Machinery, 251–259. DOI: 10.1145/3597066.3597106
11. Mirja Rotzoll, **Margaret H. Regan**, Manfred L. Husty, and M. John D. Hayes, “Kinematic geometry of spatial RSSR mechanisms.” *Mechanism and Machine Theory*, 185, 105335, 2023. DOI: 10.1016/j.mechmachtheory.2023.105335
10. Edgar A. Bernal, Jonathan D. Hauenstein, Dhagash Mehta, **Margaret H. Regan**, Tingting Tang, “Machine learning the real discriminant locus.” *Journal of Symbolic Computation*, 115, 409–426, 2023. DOI: 10.1016/j.jsc.2022.08.001
9. Ricardo Fabbri, Timothy Duff, Hongyi Fan, **Margaret H. Regan**, David da Costa de Pinho, Elias Tsigaridas, Charles W. Wampler, Jonathan D. Hauenstein, Peter Giblin, Benjamin Kimia, Anton Leykin, and Tomas Pajdla, “Trifocal relative pose from lines at points.” *IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)*, 1–14, 2022. DOI: 10.1109/TPAMI.2022.3226165
8. Timothy Duff, Viktor Korotynskiy, Tomas Pajdla, and **Margaret H. Regan**, “Galois/monodromy groups for decomposing minimal problems in 3D reconstruction.” *SIAM Journal on Applied Algebraic Geometry*, 6(4), 740–772, 2022. DOI: 10.1137/21M1422872
7. Jonathan D. Hauenstein and **Margaret H. Regan**, “Real monodromy action.” *Applied Mathematics and Computation*, 373, 124983, 2020. DOI: 10.1016/j.amc.2019.124983
6. Ricardo Fabbri, Timothy Duff, Hongyi Fan, **Margaret H. Regan**, David da Costa de Pinho, Elias Tsigaridas, Charles W. Wampler, Jonathan D. Hauenstein, Peter Giblin, Benjamin Kimia, Anton Leykin, and Tomas Pajdla, “TRPLP - Trifocal relative pose from lines at points.” *2020 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 12070–12080, 2020. DOI: 10.1109/CVPR42600.2020.01209

5. Jonathan D. Hauenstein and **Margaret H. Regan**, “Evaluating and differentiating a polynomial using a pseudo-witness set.” *LNCS*, 12097, 61–69, 2020. DOI: 10.7274/r0-0mc0-gt33
4. Jonathan D. Hauenstein and **Margaret H. Regan**, “Adaptive strategies for solving parameterized systems using homotopy continuation.” *Applied Mathematics and Computation*, 332, 19–34, 2018. DOI: 10.7274/R0C53HXK
3. Danielle A. Brake, Jonathan D. Hauenstein, and **Margaret H. Regan**, “polyTop: Software for computing topology of smooth real surfaces.” *LNCS*, 10931, 397–404, 2018. DOI: 10.7274/R0PV6HF4
2. Peter J. Collings, Joshua N. Goldstein, Elizabeth J. Hamilton, Benjamin R. Mercado, Kenneth J. Nieser, **Margaret H. Regan**, “The nature of the assembly process in chromonic liquid crystals.” *Liquid Crystals Reviews* 3(1), 1–27, 2015. DOI: 10.1080/21680396.2015.1025305
1. Elizabeth A. Mills, **Margaret H. Regan**, Vesna Stanic, and Peter J. Collings, “Large Assembly Formation via a Two-Step Process in a Chromonic Liquid Crystal.” *The Journal of Physical Chemistry B* 116(45), 13506–13515, 2012. DOI: 10.1021/jp306135w

Other:

2. **Margaret H. Regan**, “Using data as an input to parameterized polynomial systems.” *To appear in Proceedings of DANGER, International Journal of Data Science in the Mathematical Sciences, World Scientific.*
1. Timothy Duff and **Margaret H. Regan**, “Polynomial systems, homotopy continuation, and applications.” *Notices of the American Mathematical Society*, 70(1), 151–155, 2023. DOI: 10.1090/noti2592

Submitted:

- Timothy Duff, Viktor Korotynskiy, Tomas Pajdla, and **Margaret H. Regan**, “Using monodromy to recover symmetries of polynomial systems.” *Submitted.*

Awards & Grants

- Lewis Blake Award for Excellence in Teaching - Awarded by the Department of Mathematics at Duke University as an annual postdoctoral award given for excellence in teaching (Aug. 2023)
- NSF-AWM Travel Grant for Women (\$3500) for the SIAM Conference on Applied Algebraic Geometry (July 2023)
- The Faculty-Student (FaSt) Math series Grant (\$14,000) through the Faculty Advancement Seed Grant Program in the Office for Faculty Advancement at Duke University (Jan. - Dec. 2022)
- Duke University Outstanding Postdoc Award (2022)
- SIAM Early Career Travel Award for the SIAM Conference on Applied Algebraic Geometry (Aug. 2021)
- AMS Travel Award for the 2021 Mathematical Congress of the Americas (MCA) (July 2021)
- Outstanding Graduate Student Teacher Award (\$100) from ND Learning || Kaneb Center for Teaching Excellence and The Graduate School at the University of Notre Dame (April 2020)
- SIAM Student Travel Award (\$850) for SIAM Conference on Applied Algebraic Geometry (July 2019)
- Graduate Student Professional Development Award (\$500) from ACMS Department at the University of Notre Dame for SIAM Conference on Applied Algebraic Geometry (July 2019)
- NSF Travel Support for MEGA/MEGAR Conference (June 2019)
- SIAM Outstanding Efforts and Achievements Award – University of Notre Dame SIAM Student Chapter (May 2019)
- AMS Travel Award (\$250) for AMS Sectional Meeting (Nov. 2018)
- SIAM Student Travel Award (\$650) for SIAM Annual Meeting (July 2018)
- Graduate Student Professional Development Award (\$500) from ACMS Department at the University of Notre Dame for SIAM Annual Meeting (July 2018)
- SIAM Student Travel Award (\$650) for SIAM Conference on Applied Algebraic Geometry (Aug. 2017)
- Arthur J. Schmitt Leadership Fellowship in Science and Engineering (2016 - 2020)
- National Science Foundation Graduate Research Fellowship Honorable Mention 2016
- Bobby Berman '05 Memorial Prize (\$1000) - Awarded by the Department of Physics and Astronomy at Swarthmore College (June 2014)

Invited Presentations

- *Exploring the real parameter space*, June 2024, Workshop on Computational and Applied Enumerative Geometry, The Fields Institute for Research in Mathematical Sciences, Toronto, Canada.
- *Positive steady states of chemical reaction networks*, May 2024, BIRS-IMAG Workshop on Positive Solutions of Polynomial Systems Arising from Real-Life Applications, Granada, Spain.
- *Using monodromy to recover symmetries of polynomial systems*, April 2024, AMS Special Session on Applications of Algebra and Geometry, AMS 2024 Spring Central Sectional Meeting, Milwaukee, WI.
- *Using numerical algebraic geometry for problems in computer vision*, April 2024, Applied Algebra Seminar, University of Wisconsin – Madison, Madison, WI.
- *Numerical algebraic geometry meets computer vision*, Jan. 2024, AMS Special Session on Mathematics of Computer Vision, Joint Mathematics Meeting (JMM), San Francisco, CA.
- *Exploring the real parameter space*, November 2023, Faculty Seminar – Department of Mathematics and Computer Science, College of the Holy Cross, Worcester, MA.
- *Galois/monodromy groups for decomposing minimal problems in 3D reconstruction*, July 2023, SIAM Conference on Applied Algebraic Geometry, Eindhoven University of Technology, Eindhoven, The Netherlands.
- *Exploring the real parameter space*, Apr. 2023, BIRS Workshop on Random Algebraic Geometry, Banff, Alberta, Canada.
- *Computing presentations for real biparameter persistent homology from fly wing vein splines*, March 2023, AMS Special Session on Topological Persistence: Theory, Algorithms, and Applications, Georgia Institute of Technology, Atlanta, GA.
- *Decomposing minimal problems in computer vision for 3D reconstruction using Galois/monodromy groups*, Feb. 2023, Congreso de Jóvenes Investigadores RSME2023 Special Session on Geometría algebraica II: aplicaciones y computación, León, Spain.
- *Kinematic Geometry of Spatial RSSR Mechanisms*, Jan. 2023, AMS Special Session on Applied Enumerative Geometry, Joint Mathematics Meeting (JMM), Boston, MA.
- *Machine Learning the Real Discriminant Locus*, Sept. 2022, Minisymposium on Algebraic Geometry and Machine Learning, SIAM Conference on Mathematics of Data Science, San Diego, California.
- *Use of homotopy continuation for parameterized polynomial systems*, Sept. 2022, New Connections in Math 2022: Analysis, Probability, PDE, Computation, & Applications, Duke University, Durham, NC.
- *Using data as an input to parameterized polynomial systems*, Aug. 2022, (Virtual) DANGER 2, Data, Numbers, and Geometry.
- *Galois/monodromy groups for decomposing minimal problems in 3D reconstruction*, April 2022, (Virtual) AMS Special Session on Structured Polynomial Systems In Mathematics and Its Applications, Joint Mathematics Meeting (JMM).
- *A complete error analysis on solving an overdetermined system in computer vision using linear algebra*, March 2022, (Virtual) Applied Combinatorics, Algebra, Topology & Statistics Seminar, KTH Royal Institute of Technology Stockholm.
- *Using linear algebra to give a complete error analysis for solving overdetermined systems in computer vision*, Jan. 2022, (Virtual) Meeting of the Royal Spanish Mathematical Society Special Session on Geometría algebraica: la aplicada, la computacional y la numérica, Ciudad Real, Spain.
- *Determining the real discriminant locus using machine learning*, Aug. 2021, (Virtual) SIAM Conference on Applied Algebraic Geometry, Texas A&M University, College Station, TX.
- *A complete error analysis on solving an overdetermined system in computer vision using linear algebra*, July 2021, Special Session on Symbolic and Numerical Computation with Polynomials, (Virtual) Mathematics Conference of the Americas (MCA), Buenos Aires, Argentina.

- *Numerical computation of monodromy action over \mathbb{R}* , June 2021, (Virtual) Workshop on Real Algebraic Geometry and Algorithms for Geometric Constraint Systems, Fields Institute, Toronto, Ontario, Canada.
- *Applications of Parameter Homotopies*, May 2021, (Virtual) Software and Applications of Numerical Nonlinear Algebra (SANNA) Workshop, Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany.
- *Using machine learning to determine the real discriminant locus*, Jan. 2021, (Virtual) Workshop on Algebraic Geometry and Machine Learning, Tsinghua Sanya International Mathematics Forum (TSIMF).
- *Machine Learning the Discriminant Locus*, Jan. 2021, (Virtual) AMS Special Session on Numerical Methods for Solving Polynomial Systems, Joint Mathematics Meeting (JMM).
- *Machine Learning the Discriminant Locus*, Oct. 2020, (Virtual) SIAM TX-LA Sectional Meeting, Texas A&M University, College Station, TX.
- *Using homotopy continuation to solve parametrized polynomial systems in applications*, Sept. 2020, (Virtual) Graduate-Faculty Seminar, Duke University, Durham, NC.
- *Real monodromy action*, Sept. 2020, (Virtual) ICERM Workshop on Monodromy and Galois groups in enumerative geometry and applications, ICERM at Brown University, Providence, RI.
- *Evaluating and differentiating a polynomial using a pseudo-witness set*, July 2020, (Virtual) ICMS Conference, Technische Universität Braunschweig, Braunschweig, Germany.
- *Machine Learning the Discriminant Locus*, May 2020, AMS Spring Western Sectional Meeting, California State University, Fresno, CA. (*Cancelled due to COVID-19.*)
- *Applications of Numerical Algebraic Geometry in Computer Vision*, Nov. 2019, SIAM TX-LA Sectional Meeting, Southern Methodist University, Dallas, TX.
- *Applications of Parameterized Polynomial Systems*, Nov. 2019, Geometry Seminar, Texas A&M University, College Station, TX.
- *Using homotopy continuation to solve parameterized polynomial systems*, Oct. 2019, Undergraduate Lunch Talk, Mount Holyoke College, South Hadley, MA.
- *Applications of Parameterized Polynomial Systems*, Oct. 2019, ACMS Applied Math Seminar, University of Notre Dame, Notre Dame, IN.
- *Structure of Real Algebraic Varieties via Monodromy and Topology*, Sept. 2019, Seminar on Nonlinear Algebra, Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany.
- *Image Reconstruction using Numerical Algebraic Geometry*, Aug. 2019, IMPACT Seminar, Czech Institute of Robotics, Informatics and Cybernetics, Prague, Czech Republic.
- *Structure of Real Algebraic Varieties via Monodromy and Topology*, Aug. 2019, Applied Algebra and Analysis Seminar, Technische Universität Braunschweig, Braunschweig, Germany.
- *Numerical computation of monodromy action over \mathbb{R}* , March 2019, SIAM Conference on Applied Algebraic Geometry, University of Bern, Bern, Switzerland.
- *Real monodromy action*, March 2019, AMS Southeastern Sectional Meeting, Auburn University, Auburn, AL.
- *Numerically solving elliptic PDEs on real algebraic curves and surfaces*, Nov. 2018, AMS Northeastern Sectional Meeting, University of Arkansas, Fayetteville, AR.
- *polyTop: Software for computing topology of smooth real surfaces*, July 2018, SIAM Annual Meeting, Portland, OR.
- *polyTop: Software for computing topology of smooth real surfaces*, July 2018, ICMS Conference, University of Notre Dame, Notre Dame, IN.
- *Homotopies for Overdetermined Systems with Applications in Computer Vision*, Aug. 2017, SIAM Conference on Applied Algebraic Geometry, Georgia Institute of Technology, Atlanta, GA.
- *Homotopies for Overdetermined Systems with Applications in Computer Vision*, May 2017, Graduate COS-JAM, University of Notre Dame, Notre Dame, IN.

Poster Presentations

- *Real monodromy action*, Aug. 2020, (Virtual) Workshop on Symmetry, Randomness, and Computations in Real Algebraic Geometry, ICERM at Brown University, Providence, RI.
- *Real monodromy action*, April 2020, Meeting on Applied Algebraic Geometry, Georgia Institute of Technology, Atlanta, GA. (*Cancelled due to COVID-19.*)
- *Real monodromy action*, June 2019, MEGA and MEGAR Conference, Universidad Complutense de Madrid, Madrid, Spain.
- *Solving elliptic PDEs on real algebraic curves and surfaces*, April 2019, Meeting on Applied Algebraic Geometry, Georgia Institute of Technology, Atlanta, GA.
- *Solving elliptic PDEs on real algebraic curves and surfaces*, Nov. 2018, Nonlinear Algebra and Applications, ICERM at Brown University, Providence, RI.
- *Applications of Homotopies for Overdetermined Systems*, Sept. 2018, Core Computational Methods, ICERM at Brown University, Providence, RI.
- *polyTop: Software for computing topology of smooth real surfaces*, June 2018, TCU CBMS Conference: Applications of Polynomial Systems, TCU, Fort Worth, TX. (Also contributed to a software demonstration.)
- *polyTop: Software for computing topology of smooth real surfaces*, April 2018, Meeting on Applied Algebraic Geometry, Georgia Institute of Technology, Atlanta, GA.
- *Applications of Homotopies for Overdetermined Systems*, June 2017, Polynomials, Kinematics, and Robotics Conference, University of Notre Dame, Notre Dame, IN. Awarded second place prize.
- *Study and Analysis of Pinacyanol Acetate, a Chromonic Liquid Crystal*, Oct. 2012, Sigma Xi Poster Presentation, Swarthmore College, Swarthmore, PA.

Teaching Experience

- **Department of Mathematics and Computer Science** College of the Holy Cross
Instructor of Record Aug. 2023 - present
 - MATH 136 - Calculus 2 (Fall 2023, 2024)
 - MATH 135 - Calculus 1 (Spring 2024)
 - MATH 244 - Linear Algebra (Spring 2024)
 - MATH 351 - Modern Algebra 1 (Fall 2024)
- **Department of Mathematics** Duke University
Instructor of Record Aug. 2020 - July 2023
 - MATH 371 - Combinatorics (Fall 2020)
 - MATH 221/721 - Linear Algebra and its Applications (Fall & Spring 2021, Fall 2022, Spring 2023)
 - MATH 490 - Topics in Mathematics - Numerical Algebraic Geometry (Spring 2022)
 - MATH 353 - Ordinary and Partial Differential Equations (Summer 2022 Term 2 – Duke Pratt in Costa Rica Program)
 - MATH 502 - Algebraic Structures II (Spring 2023)
- **Applied and Computational Mathematics and Statistics Department** University of Notre Dame
Instructor of Record Jan. 2019 - May 2019
 - Teaching ACMS 20620 - Applied Linear Algebra to undergraduate students at the University of Notre Dame.
- **Westville Education Initiative** Holy Cross College
Adjunct Professor May 2017 - Aug. 2017
 - Taught Math 113 - College Algebra to inmates at the Westville Correctional Facility working to complete their Associates Degree with Holy Cross College through the Westville Education Initiative.
- **Department of Mathematics** University of New Hampshire
Teaching Assistant Jan. 2015 - May 2015
 - Held bi-weekly recitations for students and assisted them in understanding the concepts and problems better, while also grading assignments/exams and clarifying mistakes to the students.
- **Ridley High School** Ridley, PA
Student Teacher Sept. 2013 - Dec. 2013
 - Taught math and physics classes to freshman and sophomore high school students.
 - Coordinated class activities, wrote lesson plans, and created assessments for the material in the curriculum.

Service, Outreach, and Broader Impacts

- **ISSAC 2024** Raleigh, NC
Short Communications Chair July 2024
- **CRIC Course Coding** College of the Holy Cross
Volunteer June 2024
- **Incoming Student June Advising** College of the Holy Cross
Advisor June 2024
- **Weiss Summer Research Scholars** College of the Holy Cross
Selection Committee Member Spring 2024
- **Department of Mathematics and Computer Science** College of the Holy Cross
Hiring Committee Member – Visiting Assistant Professor Position Spring 2024
- **Joint Math Meetings – MAA Project NExT Session** San Francisco, CA
Co-Organizer: Panel on Setting a New Standard: Implementing Standards-Based Grading Jan. 2024
- **Center for Inclusive Excellence in Teaching** College of the Holy Cross
Modeling Team Committee Member Oct. 2023 - May 2024
- **Justice, Equity, Belonging, and Inclusion Foundations Certificate Program** College of the Holy Cross
Cohort Member Fall 2023
- **Pi Mu Epsilon – Department of Mathematics and Computer Science** College of the Holy Cross
Coordinator Aug. 2023 - present
- **Department of Mathematics and Computer Science** College of the Holy Cross
Library Liason Aug. 2023 - present
- **MAA Project NExT** MAA MathFest 2023 & 2024 and JMM 2024
Fellow Aug. 2023 - present
- **MAA MathFest Student Poster Session** Tampa, FL
Judge Aug. 2023
- **Joint Math Meetings** Boston, MA
Co-Organizer: Short Course on Polynomial Systems, Homotopy Continuation, and Applications Jan. 2023
- **Joint Math Meetings** Boston, MA
Co-Organizer: AMS Special Session on Polynomial Systems, Homotopy Continuation, and Applications Jan. 2023
- **Diversity, Equity, and Inclusion Committee** Duke University Department of Mathematics
Member Aug. 2022 - July 2023
- **AMS Spring Southeastern Sectional Meeting** University of Virginia
Co-Organizer: Special Session on Multiparameter persistence in theory and practice March 2022
- **Teaching for Equity Fellows Program** Duke University
Fellow Aug. 2021 - April 2022
- **(Virtual) SIAM Conference on Applied Algebraic Geometry** Texas A&M University
Co-Organizer: Minisymposium on New trends in polynomial system solving Aug. 2021
- **Duke Math Circles** Duke University/Durham Children’s Initiative/Central Park School for Children
Organizer/Instructor Jan. 2021 - July 2023
- **VLearn** Duke University
Faculty Member Jan. 2021 - July 2023
- **Association for Women in Mathematics** Duke University
Mentor Oct. 2020 - July 2023
- **SIAM Student Chapter** University of Notre Dame
President Dec. 2017 - Aug. 2019
- **Expanding Your Horizons at Notre Dame** University of Notre Dame
Volunteer March 2019, April 2020
- **University of Notre Dame Pi Day 5k** University of Notre Dame
Fundraising Committee Oct. 2017 - Mar. 2018, February 2020
- **ACMS Graduate Student Organization/SIAM Student Chapter** University of Notre Dame
Treasurer May 2017 - Dec. 2017
- **Schmitt Leadership Conference** University of Notre Dame
Mentor/Organizer April 2017 - Oct. 2017

- **Graduate Student Union**
ACMS Department Representative
- **Alumni Association**
Class Agent

University of Notre Dame
Aug. 2016 - May 2017

Swarthmore College
2015 - 2018

Professional Memberships

- Society for Industrial and Applied Mathematics (SIAM)
- Association for Women in Mathematics (AWM)
- American Mathematical Society (AMS)
- Association of Mathematics Teacher Educators (AMTE)
- Mathematical Association of America (MAA)