# Douglas A. Torrance

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## Employment

Principal Research Scientist, Georgia Institute of Technology, Atlanta, GA (2026–present)

Associate Professor, Piedmont University, Demorest, GA (2019–2026)

Assistant Professor, Piedmont University, Demorest, GA (2015–2019)

Visiting Assistant Professor, Monmouth College, Monmouth, IL (2013–2015)

Graduate Teaching Assistant, University of Idaho, Moscow, ID (2006–2013)

## Education

Ph.D., mathematics, University of Idaho, Moscow, ID (2013)

*Advisor:* Hirotachi Abo

*Thesis:* Nondefective secant varieties of varieties of completely decomposable forms

M.S., mathematics, University of Idaho, Moscow, ID (2008)

B.A., mathematics, Northwestern University, Evanston, IL (2003)

## Research Interests

Computational algebraic geometry and commutative algebra

## Grants

*Scientific Software Research Faculty Award* (2026–2031)

Simons Foundation, Mathematics & Physical Sciences, SFI-MPS-SSRFA-00012695

Principal Investigator, $946,170

## Papers

*Terracini loci of tangential varieties of Veroneseans*, arXiv:2610.27625, submitted.

*A Macaulay2-Lean interface for bridging proof and computation*, (with Matthew Ballard, Anton Leykin, Michael E. Stillman, Damiano Testa, and Jay Yang), to appear in *Lect. Notes Comput. Sci.*

*Implementing p-adic numbers in Macaulay2 using its foreign function interface and FLINT*, arXiv:2604.16799, to appear in *Lect. Notes Comput. Sci.*

*Properties of regular Tangles*, arXiv:2405.20793, (with Rebecca Bowen and Sadie Pruitt), submitted.

*ForeignFunctions package for Macaulay2*, arXiv:2405.12365, *J. Softw. Algebra Geom.* 15-1 (2025), 1-9.

*Geometry of first nonempty Terracini loci*, arXiv:2311.09067, (with Francesco Galuppi, Pierpaola Santarsiero, and Ettore Teixeira Turatti), *Commun. Contemp. Math.* 28 (2026), no. 4, Paper No. 2550053.

*Probability package for Macaulay2*, arXiv:2212.09793, *J. Softw. Algebra Geom.* 14 (2024), no. 1, 51–57.

*Almost all subgeneric third-order Chow decompositions are identifiable*, arXiv:2112.06980, (with Nick Vannieuwenhoven), *Ann. Mat. Pura Appl.* (4) 201 (2022), no. 6, 2891–2905.

*All secant varieties of the Chow variety are nondefective for cubics and quaternary forms*, arXiv:2005.12436, (with Nick Vannieuwenhoven), *Trans. Amer. Math. Soc.* 374 (2021), no. 7, 4815-4838.

*Enumeration of planar Tangles*, arXiv:1906.01541, *Proc. Math. Sci.* 130, 50 (2020).

*Generic forms of low Chow rank*, arXiv:1508.05546, *J. Algebra Appl.* 16 (2017), no. 3, 1750047, 10 pp.

*Castelnuovo-Mumford regularity and arithmetic Cohen-Macaulayness of complete bipartite subspace arrangements*, arXiv:1209.2075, (with Zach Teitler), *J. Pure Appl. Algebra* 219 (2015), no. 6, 2134–2138.

*Nondefective secant varieties of varieties of completely decomposable forms*, arXiv:1306.1293, Ph.D. thesis, University of Idaho (2013)

## Software Experience

Macaulay2 (2010–present)

- Software for research in algebraic geometry and commutative algebra.
- Member, "M2internals" group, which meets monthly on Zoom to discuss Macaulay2 development.
- Active contributor, focusing on maintenance and improvement of the interpreter and build system.
- Release manager, reviewing and merging pull requests and preparing binary releases.
- Course release for 2023–2024 and 2025–2026 academic years, funded by the NSF through SLMath, for Macaulay2 development.
- Author of ForeignFunctions, JSON, JSONRPC, Probability, Python, RInterface, TerraciniLoci, and Visualize packages.
- Maintainer of Macaulay2 website.
- Maintainer of PPA (personal package archive) for users to easily download and install Macaulay2 packages for Debian/Ubuntu systems.

Debian (2013–present)

- Debian Developer with full uploading rights to the Debian archive (2021–present)
- Team membership: Debian Math Team (founding member), Debian Science Team, Debian Python Team, Debian R Team, Debian JavaScript Team
- Maintainer of a wide variety of mathematics packages, including 4ti2, Csdp, FFLAS-FFPACK, Gfan, Givaro, LinBox, Macaulay2, mpmath, nauty, Normaliz, PHCpack, and TOPCOM

## Talks Given

*Moment varieties of local mixtures and Terracini loci*, AMS Fall Southeastern Sectional Meeting, Kennesaw State University, October 11, 2026

*An introduction to computer algebra with Macaulay2*, Undergraduate Seminar, Georgia Tech, September 3, 2026

*Implementing p-adic numbers in Macaulay2 using its foreign function interface and FLINT*, International Congress on Mathematical Software 2026, Wilfrid Laurier University, July 23, 2026

*Tangles and computational algebraic geometry*, MAA Southeastern Section Meeting, University of North Alabama, March 27, 2026

*The Gauss-Bonnet theorem and triangular Tangles*, MAA Southeastern Section Meeting, High Point University, February 28, 2025

*Semiregular Tangles*, MAA Southeastern Section Meeting, University of Tennessee, March 15, 2024

*RInterface package*, M2internals, December 18, 2023

*Installing and using Macaulay2*, MAAG, Georgia Tech, April 16, 2023

*An exponential bound for nondefective secant varieties of Chow varieties*, AMS Southeastern Section Spring Meeting, Georgia Tech, March 18, 2023

*Triangular and hexagonal Tangles*, MAA Southeastern Section Meeting, Coastal Carolina University, March 10, 2023

*Induction and secant varieties to Chow varieties*, AGATES: Geometry of secants workshop, IMPAN, Warsaw, Poland, October 26, 2022

*Best of Macaulay2 crashes*, M2internals, Virtual, September 2, 2021

*The Chow-Waring problem*, University of Idaho Mathematics Colloquium, Virtual, April 15, 2021

*Enumeration of planar Tangles*, MAA Southeastern Section Meeting, Virtual, March 6, 2021

*All secant varieties of the Chow variety are nondefective for cubics and quaternary forms*, Contributed Paper Session, AMS Fall Southeastern Sectional Meeting, Virtual, October 10, 2020

*Macaulay2 in Debian*, M2internals #2, Virtual, June 26, 2020

*Biconal subspace arrangements*, MAA Southeastern Section Meeting, Lee University, March 8, 2019

*Toy trains and polyplets*, MAA Southeastern Section Meeting, Clemson University, March 23, 2018

*The Chow-Waring problem*, AMS Central Section Spring Meeting, The Ohio State University, March 18, 2018

*Generic forms of low Chow rank*, Joint Mathematics Meetings, Atlanta, GA, January 6, 2017

*Generic forms of low Chow rank*, AMS Southeastern Section Spring Meeting, University of Georgia, March 5, 2016

*Connect the Dots: An introduction to graph theory and its applications to algebraic geometry*, Piedmont College Department of Mathematics and Physics Colloquium, Demorest, GA, October 5, 2015

*Properties of complete bipartite codimension two subspace arrangements*, Joint Mathematics Meetings, Baltimore, MD, January 15, 2014

*Nondefective secant varieties of varieties of completely decomposable forms*, Ph.D. defense, University of Idaho, Moscow, ID, April 30, 2013

*Nondefective secant varieties of varieties of completely decomposable forms*, University of Idaho Innovation Showcase, Moscow, ID, April 23, 2013

*Nondefective secant varieties of split varieties*, Mathematics section, AAAS Pacific Division 93rd Annual Meeting, Boise, ID, June 25, 2012

*Regularity of* $(n-2)$*-plane arrangements in* $\mathbb{P}^n$ *with a complete bipartite incidence graph*, Special Session on Algebraic Geometry and Graded Commutative Algebra, AMS Fall Central Sectional Meeting, University

of Nebraska-Lincoln, October 16, 2011

*Regularity of* $(n-2)$*-plane arrangements in* $\mathbb{P}^n$ *with a complete bipartite incidence graph*, University of Idaho Department of Mathematics Graduate Student Colloquium, Moscow, ID, September 20, 2011

*Bounds on the degrees of generators of Bruns ideals*, AMS Special Session on Commutative Algebra (Mathematics Research Communities session), Joint Mathematics Meetings, New Orleans, LA, January 7, 2011

*Graphs and Posets in Macaulay2*, University of Idaho Department of Mathematics Graduate Student Colloquium, Moscow, ID, November 9, 2010

*Bounds on the degrees of generators of Bruns ideals*, University of Idaho Department of Mathematics Graduate Student Colloquium, Moscow, ID, October 19, 2010

*The combinatorics of plane arrangements in* $\mathbb{P}^4$, University of Idaho Department of Mathematics Graduate Student Colloquium, Moscow, ID, 2010

*Classification of nonsingular surfaces in* $\mathbb{P}^4$, University of Idaho Department of Mathematics Graduate Student Colloquium, Moscow, ID, 2010

## Posters Presented

*Nondefective secant varieties of split varieties*, University of Idaho College of Science Student Research Exposition, Moscow, ID (2012)

*Using graph theory to classify arrangements of four planes in projective 4-space*, University of Idaho College of Science Student Research Exposition, Moscow, ID (2009)

## Awards

Readers' Choice Award, Best College Professor, *Northeast Georgian* (2025, 2026)

Excellence in Teaching Award, University of Idaho (2008, 2009, 2010, 2011, 2012, 2013)

Honorable Mention, AAAS Pacific Division 93rd Annual Meeting (2012)

Sigma Xi Research Award, University of Idaho College of Science Student Research Exposition (2009)

## Teaching

Piedmont University (2015–2026)

- CSCI 1301 (Programming Principles I) – Fall 2019, Fall 2020, Fall 2021, Fall 2022
- CSCI 1302 (Programming Principles II) – Spring 2020, Spring 2021, Spring 2022, Spring 2023
- CSCI 2900 (Data Structures) – Fall 2020
- CSCI 3200/4200 (Algorithm Analysis) – Spring 2022
- CSCI 3400 (Software Development) – Spring 2021
- CSCI 4000 (Programming Languages) – Fall 2022
- MATH 1000/2050 (Mathematics for the Liberal Arts) – Spring 2016, Fall 2016
- MATH 1005 (Intermediate Algebra) – Spring 2020, Fall 2020, Fall 2025
- MATH 1100 (College Algebra) – Fall 2016

MATH 1113 (Precalculus) – Fall 2015, Spring 2016, Fall 2016, Spring 2017, Fall 2017, Fall 2018, Spring 2020, Spring 2021, Spring 2024, Spring 2025

MATH 1300/2100 (Elementary Statistics) – Fall 2015, Summer 2016, Summer 2017, Spring 2018, Summer 2018, Spring 2019, Summer 2019, Fall 2019, Summer 2020, Fall 2020, Summer 2021, Fall 2021, Summer 2022, Summer 2023, Fall 2023, Spring 2026

MATH 2300/2700 (Discrete Mathematics) – Spring 2021, Spring 2023, Summer 2024

MATH 2450 (Calculus I) – Fall 2018, Spring 2019, Fall 2022

MATH 2460 (Calculus II) – Spring 2016, Spring 2017, Spring 2018, Spring 2019, Spring 2023, Spring 2024

MATH 2470 (Calculus III) – Fall 2015, Fall 2016, Fall 2017, Fall 2022, Fall 2023, Fall 2024, Fall 2025

MATH 2480 (Differential Equations) – Spring 2022

MATH 2600/3550 (Linear Algebra) – Fall 2017, Fall 2018, Fall 2020

MATH 3300 (Probability) – Fall 2017, Spring 2019, Fall 2019, Fall 2021

MATH 3310 (Mathematical Statistics) – Spring 2020, Spring 2022, Spring 2024, Spring 2026

MATH 3400 (Number Theory) – Fall 2016

MATH 3500 (Numerical Methods) – Fall 2015, Spring 2018, Spring 2025

MATH 3600 (Abstract Algebra) – Spring 2018

MATH 4100 (Mathematical Modeling) – Spring 2017

MATH 4350 (Advanced Studies in Mathematics, Cryptography) – Spring 2019

MATH 4950 (Senior Capstone I) – Fall 2016, Fall 2017, Spring 2018, Spring 2019, Fall 2023, Fall 2024, Fall 2025

MATH 4960 (Senior Capstone II) – Spring 2017, Spring 2018, Spring 2020, Spring 2023, Spring 2024, Spring 2025, Spring 2026

MATH 6500 (Special Topics, Algebraic Geometry) – Fall 2023

MATH 6900 (Probability and Statistics for Teachers) – Fall 2021

PDMT 1101 (Introduction to University Life and Liberal Arts Tradition) – Fall 2018, Fall 2019

Monmouth College (2013–2015)

INTR 112/MATH 114 (Quantitative Reasoning) – Spring 2014, Fall 2014, Spring 2015

MATH 104 (Mathematics for the Liberal Arts) – Spring 2015

MATH 141 (Elementary Functions) – Fall 2013, Spring 2014

MATH 253 (Calculus III) – Fall 2014

MATH 254 (Differential Equations) – Spring 2015

MATH 311 (Introduction to Modern Algebra) – Spring 2014

MATH 350 (Topics in Mathematics, Graph Theory) – Fall 2013

MATH 410 (Research in Mathematics) – Spring 2014

MATH 420 (Independent Study and Seminar, Algebraic Geometry) – Spring 2015

University of Idaho (2006–2013)

MATH 130 (Finite Mathematics) – Spring 2013

MATH 143 (Pre-calculus Algebra and Analytic Geometry) – Fall 2006, Spring 2007, Summer 2007, Summer 2012

MATH 144 (Analytic Trigonometry) – Summer 2011, Summer 2013

MATH 160 (Survey of Calculus) – Fall 2007

MATH 170 (Analytic Geometry and Calculus I) – Spring 2008, Fall 2008, Spring 2012

MATH 175 (Analytic Geometry and Calculus II) – Spring 2011, Fall 2011

MATH 275 (Analytic Geometry and Calculus III) – Summer 2009, Fall 2009, Fall 2010, Summer 2012, Summer 2013

MATH 310 (Ordinary Differential Equations) – Summer 2008, Spring 2009, Summer 2010

MATH 330 (Linear Algebra) – Spring 2010, Fall 2012

Tutor, Polya Mathematics Center (2006–2008, 2011–2012)

## Conferences and Workshops

MAAG 2027, Georgia Tech, Atlanta, GA (April 2027) *(co-organizer)*

Macaulay2 at Auburn, Auburn University, Auburn, AL (February 2027)

Simons MPS Annual Meeting, New York, NY (October 2026)

AMS Fall Southeastern Sectional Meeting, Kennesaw State University, Kennesaw, GA (October 2026)

Macaulay2 Micro-Workshop: Refactoring the Macaulay2 Engine, Cornell University, Ithaca, NY (September 2026)

ICMS 2026, Wilfrid Laurier University, Waterloo, ON (July 2026)

Macaulay2 Workshop, University of Warwick, Coventry, UK (June 2026)

The Future of Macaulay2, Georgia Tech, Atlanta, GA (May 2026) *(co-organizer)*

MAAG 2026, Clemson University, Clemson, SC (April 2026)

MAA-SE 2026, University of North Alabama, Florence, AL (March 2026)

Macaulay2 Workshop, University of Wisconsin, Madison, WI (June 2025)

MAA-SE 2025, High Point University, High Point, NC (February 2025)

Micro-workshop on Internal Workings of Macaulay2, Fields Institute, Toronto, ON (February 2025)

MAA-SE 2024, University of Tennessee, Knoxville, TN (March 2024)

Macaulay2: expanded functionality and improved efficiency, American Institute of Mathematics, Pasadena, CA (September 2023)

MAAG 2023, Georgia Tech, Atlanta, GA (April 2023)

AMS Spring Southeastern Sectional Meeting, Georgia Tech, Atlanta, GA (March 2023)

MAA-SE 2023, Coastal Carolina University, Conway, SC (March 2023)

AGATES: Geometry of secants workshop, IMPAN, Warsaw, PL (October 2022)

M2internals meeting and Macaulay2 conference, Cleveland State University, Cleveland, OH (May 2022)

MAA-SE 2021, Virtual (March 2021)

Macaulay2 Workshop, Virtual (June 2020)

MAA-SE 2019, Lee University, Cleveland, TN (March 2019)

MAA-SE 2018, Clemson University, Clemson, SC (March 2018)

AMS Spring Central Sectional Meeting, The Ohio State University, Columbus, OH (March 2018)

Joint Mathematics Meeting, Atlanta, GA (January 2017)

AMS Spring Southeastern Sectional Meeting, University of Georgia, Athens, GA (March 2016)

Joint Mathematics Meetings, Baltimore, MD (January 2014)

AAAS Pacific Division 93rd Annual Meeting, Boise State University, Boise, ID (June 2012)

Mathematical Research Communities: Geometry and Representation Theory Related to Geometric Complexity and Other Variants of P v. NP, Snowbird, UT (June 2012)

AMS Fall Central Section Meeting, University of Nebraska, Lincoln, NE (October 2011)

Joint Mathematics Meetings, New Orleans, LA (January 2011)

Macaulay2 Workshop, Colorado College, Colorado Springs, CO (August 2010)

Mathematical Research Communities: Commutative Algebra, Snowbird, UT (June 2010)

Joint Mathematics Meetings, San Francisco, CA (January 2010)

## Professional Service

Interdisciplinary Problem Solving Community of Practice, Piedmont University (2024–2026)

Center for Teaching and Learning Committee, Piedmont University (2023–2026)

Department Chair, Department of Mathematical Sciences, Piedmont University (2022–2026)

Faculty Senate, Piedmont University (2018–2021, 2023–2026)

Instructional Technology Committee, Piedmont University (2016–2017)

Library Committee, Piedmont University (2015–2018)

Reviewer, Mathematical Reviews (2017–present)

Referee, *The Journal of Software for Algebra and Geometry* (2013–present)

Supervisor, Putnam Mathematical Competition Team, Monmouth College (2013, 2014)

Web designer, online calculus modules, University of Idaho (2008)