Anne M. Dougherty

Department of Applied Mathematics

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Education   Ph.D. in Mathematics, 1994, University of Wisconsin—Madison.
Area of specialization: Analysis and Probability; minor in Chemistry.
Thesis: Averaging and diffusion approximations for stochastic network models.
Advisor: Thomas G. Kurtz.

M.S. in Mathematics, 1985, Oregon State University, Corvallis, Oregon.
Area of specialization: Algebra and Topology.
Thesis: Relative Rigidity in Abstract Witt Rings. Advisor: Bill Jacob.

B.S. in Chemistry and Mathematics, summa cum laude, 1981, Texas Christian University.

Professional Experience

7/17 to present. Senior Instructor, Associate Chair, Teaching Professor of Distinction, and J.R. Woodhull/Logicon Teaching Professor of Applied Mathematics, Department of Applied Mathematics, CU Boulder.

7/12 to 7/17. Senior Instructor, Associate Chair, and J.R. Woodhull/Logicon Teaching Professor of Applied Mathematics, Department of Applied Mathematics, CU Boulder.

7/00 to 6/12. Senior Instructor and Associate Chair, Department of Applied Mathematics, CU Boulder.

8/98 to 6/00. Senior Instructor, Department of Applied Mathematics, CU Boulder.

8/94 to 8/98. Instructor, Department of Applied Mathematics, University of Colorado, Boulder. Courses taught include calculus, junior and graduate-level probability and senior-level statistics classes. Faculty advisor for the undergraduate SIAM chapter. Probability and statistics prelim-exam committee member.

8/84 to 12/93. Teaching Assistant and Research Assistant, University of Wisconsin, Madison. Courses taught include college algebra, business calculus and 3 semesters of calculus.

Grants   PI, NSF grant, EXTREEMS - QED: Directions in Data Discovery (Data Cubed) in
Undergraduate Education, DMS-1407340, Aug 2014-July 2017, extended to July 2019.
ASSETT Development Award for "AMESS Upgrade of online submission tool", 2010. Co-
PI, NSF grant, CCLI-Phase 2: Colorado Momentum: Oral Assessment in the
Mathematical Sciences Classroom, 2008-2010.
Co-PI, NSF grant, MCTP: Colorado Advantage, 2006-2011.
Co-PI, CU-Boulder Outreach Committee grant, Colorado Math Circle for Advanced High
School Students, AY 2006-07 to 2013-14.
Sub-contractor to Boulder Valley School District, Boulder Partnership for Excellence in
Mathematics Education, Colorado Department of Education grant, 2006-2008.
Outreach director for outreach supplement to Applied Math's NSF VIGRE
grant, 2003-2006. (PI: James Meiss.)
University of Colorado at Boulder Outreach Grants, 2001-2004, to support the
Summer Institute in Applied Mathematics for High School Teachers.
University of Colorado at Boulder Outreach Grant, 1999-2000, *Bridging the Gap between
High School and College Mathematics*, with Mary Nelson and James Curry.

Investigator, NSF grant, *Synergistic Visual/Haptic Computer Interfaces*, 1997-1999.

University of Colorado at Boulder Outreach Grant, 1997-98, *Identification of High School Students Likely to have Difficulty with Calculus I.*

Invited participant, NSF sponsored workshop on Mathematical Techniques to Mine Massive Data Sets, 1997.

Undergraduate Excellence Fund Grant, 1996. *Early Identification of Students Likely to have Difficulty with Calculus I.*

Awards

2018 Doug Faires Award, presented by the Consortium for Mathematics and its Applications (COMAP), in recognition of longstanding and continuing efforts to recruit and coach undergraduate teams for the international Mathematical Contest in Modeling (MCM/ICM).

2014 Burton W. Jones Award for Distinguished College or University Teaching of Mathematics. Awarded by the Rocky Mountain Section of the Mathematical Association of America to recognize outstanding teachers who foster student excitement about mathematics.

CU Parents Association, Marinus Smith Award, Spring 2014, Spring 2016, and Spring 2022. Awarded to faculty and staff members who have had a particularly positive impact on undergraduates.

Boulder Faculty Assembly Excellence in Service Award, Spring 2010.

Outstanding Faculty Advisor Award for the College of Engineering and Applied Science, University of Colorado-Boulder. Awarded September 7, 2007 for the 2006-2007 academic year.

Faculty advisor (with Jim Curry) for the Mathematical Visualization Toolkit (MVP), recipient of the 2003 ICTCM Award for Excellence and Innovation with the use of Technology in Collegiate Mathematics and the 2005 Editor's Choice Award from MERLOT (Multimedia Educational Resource for Learning and Online Teaching).

Residence Life Academic Teaching Award from the Committee on Learning and Academic Support Services, CU-Boulder, fall 2004 and spring 2005.

Minority Engineering Program (MEP) Faculty Appreciation Award, 1995-96.

Publications

B. J. Klingenberg, J. H. Curry, A. M. Dougherty (2009). Non-negative matrix factorization for component analysis: The extreme data property and ill-posedness. *Pattern Recognition*, Volume 42, No. 5, 918-928.

R. B. Corotis, A. M. Dougherty, Wei Xu (2008). Extreme value index and tail probability estimates for mixed distributions. *Probabilistic Engineering Mechanics*, Volume 23, No. 4, 385-392.

S. Wild, J. H. Curry, A. M. Dougherty (2004). Improving Non-Negative Matrix Factorizations through Structured Initialization. *Pattern Recognition*, **37**, 11, 2217-2232.

R. B. Corotis, A. M. Dougherty (2004). Reliable Design Loads for Natural Phenomena: Illustration with Wind Speeds. *Natural Hazards Review, ASCE*, Volume 5, No. 1, 40-47.

Wild S. J. H. Curry, A. M. Dougherty, Motivating Non-Negative Matrix Factorizations. Proceedings of the Eighth SIAM Conference on Applied Linear Algebra, July 15-19, 2003. Available at http://www.siam.org/meetings/la03/proceedings/WILDstef.pdf

A. M. Dougherty, R. B. Corotis, A. Segurson (2003). Design Wind Speed Prediction. *Journal of Structural Engineering, ASCE*, Volume 129, No. 9, 1268-1274.

M. A. Snyder, J. H. Curry, A. M. Dougherty, (2001). Stochastic aspects of one-dimensional discrete dynamical systems: Benford's law. *Phys. Rev. E*, **64**, 026222.

A. M. Dougherty, R. B. Corotis, L. M. Schwartz (2000). Extreme value theory and mixed distributions—Applications. Applications of Statistics and Probability, ICASP8, R. Melchers and M. Stewart, eds., Volume 1, 27-33, Balkema, Rotterdam.

D. A. Lawrence, L. Y. Pao, A. M. Dougherty, M. A. Salada, Y. Pavlou (2000). Rate-Hardness: A new performance metric for haptic interfaces, IEEE Transactions on Robotics and Automation, Volume 16, No. 4, 357-371.

F. Infed, S. W. Brown, C. D. Lee D. A. Lawrence, A. M. Dougherty, L. Y. Pao (1999). Combined visual/haptic rendering modes for scientific visualization, *Proc. ASME Dynamic Systems and Control Division*, DSC-Vol. 67, pp 93-99, at the *Int. Mech. Engr. Cong. & Expo.,* Nashville, TN, Nov. 1999.

Wei Xu, A. M. Dougherty, R. B. Corotis (1998). Extreme value theory—Applications to design wind prediction. *Proc. of the Third International Conference on Computational Stochastic Mechanics*, Santorini.

D. A. Lawrence, L. Y. Pao, A. M. Dougherty, Y. Pavlou, S. W. Brown, S. Wallace (1998). Human Perceptual Thresholds of Friction in Haptic Interfaces. *Proc. ASME Dynamic Systems and Control Division*, DSC-Vol. 64, pp. 287-294, *ASME Int. Mech. Engr. Cong. & Expo.*, Anaheim, CA.

A. M. Dougherty and R. B. Corotis (1997). Extreme wind estimation; theoretical considerations. *Proceedings of the 7th International Conference on Structural Safety and Reliability*, Kyoto.

D. A. Lawrence, L. Y. Pao, M. Salada and A. M. Dougherty (1996). Quantitative experimental analysis of transparency and stability in haptic interfaces. *Proc. ASME Dynamic Systems and Control Division*, DSC-Vol. 58, pp 441-449, *ASME Int. Mech. Engr. Cong. & Expo.*, Atlanta, GA.

H. O. Pamuk, A. M. Dougherty and W. C. Johnson, Jr. (1985). Quantum mechanical theory of circular dichroism for infinite helical polymers. *Biopolymers* **24**, 1337-1363.

A. M. Dougherty, G. C. Causley and W. C. Johnson, Jr. (1983). Flow dichroism evidence for tilting of the bases when DNA is in solution. *Proc. Natl. Acad. Sci. USA***80**, 2193-2195.

D. A. Huckaby, A. M. Dougherty and A. Pekalski (1982). Phase transitions in lattice gases of orientable molecules. *Phys. Rev. A***26**, 3528-3531.

A. M. Dougherty and D. A. Huckaby (1981). Lattice gas of hard-core tetrahedral molecules on a bcc lattice. *J. Chem. Phys.***75**, 875-879.

Students   Brita Schneiders, MS, August 2014

Rachel Danson, MS, 2007

Bradley Klingenberg, MS, 2007

Kristopher Tucker, MS, 2007

Pascal Getreuer, MS, 2006

Richard McNamara, PhD, 2004

Stefan Wild, MS, 2003

Mark Snyder, MS, 2001

Anna (Carlson) Karplus, MS, 1998

Service   7/23 to present. Representative of the Rocky Mountain Section to the Congress of the Mathematical Association of America. Term of office: July 1, 2023 through June 30, 2026.

7/00 to present. Associate Chair for the Department of Applied Mathematics. Service highlights include serving on Applied Math's ARPAC committee (2003, 2010, and 2016-17), serving on multiple instructor and staff search committees, revising the Applied Math minor, creating a five-year BS/MS option for outstanding applied math undergraduates, and supervising approximately 45-50 TAs each year. Together with the Applied Math Undergraduate Committee, created a statistics minor, approved in December 2014. Assisted with the preparation of a proposal for a concurrent BS in Applied Math and MS in Interdisciplinary Telecommunications, with an emphasis in network security; approved December 2016. Assisted with the preparation of a proposal for a BA in Statistics and Data Science, submitted fall 2016, approved fall 2017, and first offered in August 2018. Submitted Bachelor's/Accelerated Master's program for Statistics and Data Science majors summer 2021, approved fall 2021. As of September 2023, the number of Statistics and Data Science majors increased to 182 and the number of Applied Math majors is 134.

8/98 to present. Member of Applied Math's Undergraduate Committee (Chair since July 2000) and undergraduate faculty advisor. Transfer credit evaluator for Applied Math.

1/16 to present. Member of Applied Math's Statistics and Data Science committee.

8/95 to present. Faculty advisor (co-advisor since 2012) for the CU-Boulder undergraduate chapter of SIAM, including coordination of the Mathematical Contest in Modeling teams from 1997 through 2021 resulting in 21 Outstanding ratings (the highest possible), 4 Finalist (top 1%) and 41 Meritorious ratings.

2001 to present. CU representative for the Goldwater Scholarship. During this period, 46 undergraduate CU students have been recipients of the Goldwater Scholarship.

8/00 to present. Applied Math's representative to the Undergraduate Education Council for the College of Engineering.

8/00 to 8/06. Organized the Applied Math Summer Institute, two-week, content-based, professional development workshops in the summer that are designed to provide an in-depth study of content. Courses included: Calculus, Probability and Statistics, Algebra, and Discrete Math.