

ALLISON L. LEWIS

Department of Mathematical Sciences, Lafayette College ◊ Easton, PA 18042
lewisall@lafayette.edu ◊ (610) · 330 · 5276 ◊ <https://sites.lafayette.edu/lewisall/>

EDUCATION

North Carolina State University Ph.D. in Applied Mathematics Advisor: Dr. Ralph Smith Thesis: <i>Gradient-Free Active Subspace Construction & Model Calibration Techniques for Complex Models</i>	July 2016
North Carolina State University M.S. in Applied Mathematics	December 2013
University of Portland B.S. in Mathematics Magna Cum Laude, Honors Program Graduate	May 2011

RESEARCH INTERESTS

Mathematical modeling and uncertainty quantification with biological applications, including reduced-order modeling, active subspaces, and high-to-low fidelity model calibration using Bayesian inference.

EMPLOYMENT

Associate Professor of Mathematics <i>Lafayette College</i>	July 2024 - Present <i>Easton, PA</i>
Responsibilities include teaching introductory and upper-level mathematics and statistics courses with a 3-2 teaching load, mentoring undergraduate research, providing department and college-wide service, and maintaining an active research program.	
Assistant Professor of Mathematics <i>Lafayette College</i>	July 2018 - June 2024 <i>Easton, PA</i>
Responsibilities include teaching introductory and upper-level mathematics and statistics courses with a 3-2 teaching load, mentoring undergraduate research, providing department and college-wide service, and maintaining an active research program.	
Visiting Assistant Professor of Mathematics <i>St. Mary's College of Maryland</i>	July 2017 - May 2018 <i>St. Mary's City, MD</i>
Teaching introductory and upper-level mathematics and statistics courses with a 3-3 teaching load.	
Senior Professional Staff I <i>The Johns Hopkins University Applied Physics Laboratory</i>	July 2016 - July 2017 <i>Laurel, MD</i>
Development of mathematical models for maneuvering targets, analysis of data, authoring of technical reports, and development of new analysis tools in support of the integration of tracking data from multiple sensors for use by a weapons system.	
Research Assistant <i>North Carolina State University</i>	October 2013 - July 2016 <i>Raleigh, NC</i>
Development of active subspace selection algorithms and Bayesian model calibration methods for the CASL (Consortium for the Advanced Simulation of Lightwater Reactors) initiative.	

Taught two courses as instructor of record and assisted in others by leading recitation sessions and grading.

COURSES TAUGHT

Lafayette College

- MATH161: Calculus I
- MATH162: Calculus II
- MATH186: Applied Statistics
- MATH263: Calculus III
- MATH282: Techniques in Mathematical Modeling
- MATH286: Introduction to Probability and Mathematical Statistics
- MATH287: Introduction to Data Modeling
- MATH301: Case Studies in Math Modeling
- MATH306: Operations Research
- MATH310: Ordinary Differential Equations
- MATH335: Probability
- MATH336: Mathematical Statistics
- MATH383: Numerical Analysis for Math Modeling
- MATH495/496: Senior Thesis

St. Mary's College of Maryland

- MATH151: Calculus I
- MATH255: Vector Calculus
- MATH485: Applied Probability and Statistics

North Carolina State University

- MATH114: Introduction to Finite Mathematics
- MATH131: Calculus for Life Sciences

UNDERGRADUATE RESEARCH MENTORING

Research Experiences for Undergraduates

- Lafayette College REU (Summer 2023)
Students: Grace Brophy '24, Audrey Rips-Goodwin '24, Lucy Wilson '25
- St. Mary's College of Maryland Emerging Scholars REU (Summer 2018)
Students: Kendall Clark '23, Mayleen Cortez '20, Cristian Hernandez '20, Beth Thomas '21

Lafayette College EXCEL Research Program

- Students: Zoey Zou '26, Phuong Nam Vu '25, Anna Zittle '22, Yutian Huang '22

Lafayette College Senior Thesis Advisor

- Students: Zoey Zou '26, Anthony Abenante '25, Yutian Huang '22, Anna Zittle '22

Senior Thesis Committee Member

- Students: Jamie Bryan '25 (Env. Science), Annie Hou '24 (Math), Jessica McDivitt '24 (Physics), Evan Flint '23 (Math/Env. Science), Jordan Lam '23 (Biology), Zhaoyi Ding '21 (Biology), Shutian Wu '21 (Mech. Eng.)

SCHOLARLY PUBLICATIONS

* Indicates undergraduate student

1. H. Zou*, **A.L. Lewis**, "Overcoming global sensitivity limitations: using active subspaces to explore discrepancies between global and local parameter sensitivities", Submitted, 2025.
2. G. Brophy*, A. Rips-Goodwin*, L. Wilson*, **A.L. Lewis**, "Using agent-based modeling to understand the impact of community interactions on voter apathy and election outcome", *PUMP Journal of Undergraduate Research*, Vol. 8, pp. 286-321, 2025.
3. H. Cho, **A.L. Lewis**, K.M. Storey, A.C. Zittle*, "An adaptive information-theoretic experimental design procedure for high-to-low fidelity calibration of prostate cancer models", *Mathematical Biosciences and Engineering*, Vol. 20(10), doi:10.3934/mbe.2023799, 2023.
4. P.N. Vu*, **A.L. Lewis**, "Using dynamic active subspaces to construct surrogate models for calibrating tumor growth models to data", *The PUMP Journal of Undergraduate Research*, Vol. 6, pp. 1-28, 2023.
5. H. Cho, **A.L. Lewis**, K.M. Storey, H.M. Byrne, "Designing experimental conditions to use the Lotka-Volterra model to infer tumor cell line interaction types", *Journal of Theoretical Biology*, Vol. 559(111377), doi:10.1016/j.jtbi.2022.111377, 2023.
6. R.A. Everett, **A.L. Lewis**, A. Kuerbis, A. Peace, J. Li, J. Morgenstern, "Data driven mixed effects modeling of the dual process framework of addiction among individuals with alcohol use disorder", *PLoS ONE*, Vol. 18(8), doi:10.1371/journal.pone.0265168, 2023.
7. Y. Huang*, **A.L. Lewis**, "Predicting tumor response to radiotherapy based on estimation of non-treatment parameters", *Spora: A Journal of Biomathematics*, Vol. 7, pp. 25-35, 2021.
8. H. Cho, **A.L. Lewis**, K.M. Storey, R. Jennings, B. Shtylla, A.M. Reynolds, H.M. Byrne, "A framework for performing data-driven modeling of tumor growth with radiotherapy treatment," In: *Segal, R, Shtylla, B., Sindi, S. (eds) Using Mathematics to Understand Biological Complexity*, Association for Women in Mathematics Series, Vol. 22, Springer, Cham, <https://doi.org/10.1007/978-3-030-57129-0-8>, 2021.
9. A. Henderson, E. Köse, **A.L. Lewis**, E.R. Swanson, "Mathematical modeling of algal blooms due to swine CAFOs in Eastern North Carolina," *Discrete and Continuous Dynamical Systems - S*, doi: 10.3934/dcdss/2021151, 2021.
10. H. Cho, **A.L. Lewis**, K.M. Storey, "Bayesian information-theoretic calibration of patient-specific radiotherapy sensitivity parameters to inform effective scanning protocols in cancer," *Journal of Clinical Medicine, Special Issue: Latest Developments in Mathematical Oncology and Cancer Systems Biology*, Vol. 9, doi:10.3390/jcm9103208, 2020.
11. S. Elliot, E. Köse, **A.L. Lewis**, A. Steinfield*, E. Zollinger, "Modeling the stem cell hypothesis: investigating the effects of cancer stem cells and TGF- β on tumor growth," *Mathematical Biosciences and Engineering, Special Issue: Practical Insights from Cancer Models*, Vol. 16(6), pp. 7177-7194, 2019.
12. K.B. Clark*, M. Cortez*, C. Hernandez*, B.E. Thomas*, **A.L. Lewis**, "Combating tuberculosis: using time-dependent sensitivity analysis to develop strategies for treatment and prevention," *Spora: A Journal of Biomathematics*, Vol. 5(1), pp. 14-23, 2019.

13. K.D. Coleman, **A.L. Lewis**, R.C. Smith, B.J. Williams, M. Morris, B. Khuwaileh, “Gradient-free construction of active subspaces for dimension reduction in complex models with applications to neutronics,” *SIAM/ASA Journal on Uncertainty Quantification*, Vol. 7(1), doi:10.1137/16M1075119, 2018.
14. **A.L. Lewis**, R.C. Smith, B.J. Williams, “Bayesian model calibration on active subspaces,” *Proceedings of the American Control Conference*, 2017.
15. **A.L. Lewis**, R.C. Smith, B.J. Williams, “Gradient-free active subspace construction using Morris screening elementary effects,” *Computers and Mathematics with Applications*, Vol. 72(6), pp.1603-1615, 2016.
16. **A.L. Lewis**, R.C. Smith, B.J. Williams, V. Figueroa, “An information theoretic approach to use high-fidelity codes to calibrate low-fidelity codes,” *Journal of Computational Physics*, Vol. 324, pp. 24-43, 2016.
17. **A.L. Lewis**, R.C. Smith, B.J. Williams, M. Morris, B. Khuwaileh, “Gradient-free construction of active subspaces for dimension reduction in complex models,” *CASL Technical Report*, 2015.
18. V. Cuff, **A.L. Lewis**, S.J. Miller, “The Weibull distribution and Benford’s Law,” *Involve: A journal of mathematics*, Vol. 8(5), pp. 859-874, doi:10.2140/involve.2015.8.859, 2015.
19. **A.L. Lewis**, R.C. Smith, B.J. Williams, V. Figueroa, “An information theoretic approach to use high-fidelity codes to calibrate low-fidelity codes,” *CASL Technical Report: CASL-U-2014-0197-000*, 2014.
20. **A.L. Lewis**, J.A. McMahan, R.C. Smith, “Model calibration for beam models in the presence of model discrepancy,” *Proceedings of the ASME 2014 Smart Materials, Adaptive Structures, and Intelligent Systems (SMASIS)*, doi:10.1115/SMASIS2014-7722, pp. V001T03A041, 2014.
21. B.J. Williams, L.P. Swiler, R. Hooper, **A.L. Lewis**, J.A. McMahan, R.C. Smith and B.M. Adams, “User guidelines and best practices for CASL VUQ analysis using DAKOTA,” *CASL Technical Report: CASL-U-2014-0038-000 (SAND2014-SAND2864 517358)*, 2014.

PEDAGOGICAL PUBLICATIONS

1. **A.L. Lewis**, “In a world of great complexity, less is more: model reduction using the active subspace”, *In: A.J. Quijano, A.L. Lewis, A. Wootton (eds.) Mathematics Research in Data Science, Machine Learning, and Cybersecurity, Foundations for Undergraduate Research in Mathematics*, Birkhauser, Cham, To Appear, 2025.
2. **A.L. Lewis**, “Facilitating inclusivity and student engagement through use of pre-class activities”, *The Journal for Research and Practice in College Teaching*, Vol. 8(2), 2023.
3. A. Clifton, **A.L. Lewis**, “But who *should* have won? Simulating outcomes of judging protocols and ranking schemes”, *In: E.E. Goldwyn, S. Ganzell, A. Wootton (eds.) Mathematics Research for the Beginning Student, Volume 1, Foundations for Undergraduate Research in Mathematics*, Birkhauser, Cham, doi: 10.1007/978-3-031-08560-4-6, 2022.
4. **A.L. Lewis**, “6-029-S-TumorGrowth”, SIMIODE Mathematical Modeling Resources, <https://www.simiode.org/resources/8496>, 2021.

OTHER ARTICLES

1. **A.L. Lewis**, “Bridging the Gap by Building Lasting Mentoring Relationships”, *Notices of the American Mathematical Society, Early Career Section*, Vol. 70(4), doi: <https://dx.doi.org/10.1090/noti2667>, 2023.
2. G. Gordon, **A.L. Lewis**, J. Zhou, “Teaching Lunches at Lafayette College: Don’t Talk With Your Mouth Full”, *MAA Focus*, Vol. 40(4), 2020.

PROFESSIONAL DEVELOPMENT

Converting Modeling Problems Over to Student Experiences (COMPOSTE) Workshop <i>Math Modeling Hub</i>	Fall 2023 <i>Virtual</i>
Workshop on Computational Modeling of Cancer Biology and Treatment <i>Centre de recherches mathématiques (CRM)</i>	July 2021 <i>Virtual</i>
Inclusive Instructors Academy <i>Center for Integration of Teaching and Learning, Lafayette College</i>	Fall 2021 <i>Easton, PA</i>
SIMIODE Differential Equations Model and Resource Creators Workshop <i>Systemic Initiative for Modeling Investigations & Opportunities with DEs</i>	July 2021 <i>Virtual</i>
SIMIODE Model Instructors in Differential Equations Workshop <i>Systemic Initiative for Modeling Investigations & Opportunities with DEs</i>	July 2019 <i>Newberg, OR</i>
Collaborative Workshop for Women in Mathematical Biology <i>Institute for Pure and Applied Mathematics</i>	June 2019 <i>Los Angeles, CA</i>
Teaching Squares Program <i>Center for Integration of Teaching and Learning, Lafayette College</i>	Spring 2019 <i>Easton, PA</i>
MAA Project NExT Fellow <i>Mathematical Association of America</i>	2018 - 2019

AWARDS AND GRANTS

MAA EPaDel Section Early Career Award <i>Mathematical Association of America</i> Awarded jointly with colleague Joy Zhou for excellence in teaching and mentoring.	April 2024
Faculty Research Grant <i>Lafayette College</i> Funding to support developing research in data-driven mathematical oncology projects for the 2021-2023 academic years.	June 2021
James A. Crawford Award Recipient <i>Lafayette College</i> Awarded for the establishment of a mentoring program in the mathematics department to support female and non-binary mathematics students (shared with colleague Joy Zhou.)	June 2021
Adaptive Interventions Grant <i>National Institute on Alcohol Abuse and Alcoholism</i> Funding to support continued analysis and publication of a project identifying mechanisms of behavior change among individuals with alcohol use disorder.	December 2020
Convergence Accelerator Program Grant <i>NSF-Simons Center for Multiscale Cell Fate Research</i> Funding to support a follow-up visit with collaborators from 2019 Women in Math Biology Workshop. <i>Postponed due to COVID-19.</i>	August 2020 <i>UC Irvine</i>

MAA Tensor Women and Mathematics Grant <i>MAA Tensor Foundation</i>	March 2020
Funding to support the ongoing Lafayette Math Department Kovalevsky Society Mentoring Program.	
MAA Tensor Women and Mathematics Grant <i>MAA Tensor Foundation</i>	March 2019
Funding to initialize the Lafayette Math Department Kovalevsky Society Mentoring Program.	

SELECTED LEADERSHIP AND SERVICE

Chair, SIAM Applied Math Education Activity Group <i>Society for Industrial and Applied Mathematics</i>	2025 - Present
Advocacy and Coordination Council Committee Member <i>Lafayette College Faculty Governance</i>	2024– 2025 <i>Easton, PA</i>
Minisymposium Organizer “Moving Beyond Traditional Grading in the Applied Mathematics Classroom” <i>SIAM Conference on Applied Math Education</i>	July 2024 <i>Spokane, WA</i>
Minisymposium Organizer “Research by Undergraduate Students in Applied Mathematics” <i>SIAM NNP Annual Meeting</i>	October 2023 <i>Newark, NJ</i>
Co-Organizer, Mid-Atlantic Mathematical Biology (MAMBio) Day <i>Brin Mathematics Research Center</i>	April 2024 <i>College Park, MD</i>
Student Affairs Committee Member <i>Lafayette College Faculty Governance</i>	2023 - 2025 <i>Easton, PA</i>
Organizing Committee Member, SIAM Applied Math Education Conference ‘24 <i>Society for Industrial and Applied Mathematics</i>	2023 - 2024 <i>Spokane, WA</i>
Secretary, SIAM Applied Math Education Activity Group <i>Society for Industrial and Applied Mathematics</i>	2023 - 2024
Lafayette College Team Advisor, COMAP MCM & ICM Contests <i>Consortium for Mathematics and its Applications</i>	2021 - Present
Grader for COMAP Mathematical Contest in Modeling <i>Consortium for Mathematics and its Applications</i>	2020 - 2024
Minisymposium Organizer “Verification, Validation, and Uncertainty Quantification in the Medical Sciences” <i>SIAM Conference on Computational Science and Engineering</i>	March 2021 <i>Virtual</i>
Curriculum and Educational Policy Committee Member <i>Lafayette College Faculty Governance</i>	2021 - 2022 <i>Easton, PA</i>

Grader for SIMIODE Challenge Using Differential Equations Modeling <i>Systemic Initiative for Modeling Investigations & Opportunities with DEs</i>	October 2020
Minisymposium Co-organizer “Incorporating Community-Client Projects into Applied Math Courses” <i>SIAM Conference on Applied Math Education</i> <i>Note: Cancelled due to COVID-19.</i>	July 2020 Philadelphia, PA
Minisymposium Co-organizer “Women in Mathematical Biology: Recent Advances in the Field” <i>SIAM Conference on the Life Sciences</i>	June 2020 Garden Grove, CA
Co-Director, Kovalevsky Society Mentoring Program <i>Lafayette College Mathematics Department</i>	2019 - Present Easton, PA
Speaker, “Taking Charge of Our Own Narrative” <i>Women in STEM Week, Lafayette College</i>	April 2019 Easton, PA
Minisymposium Co-organizer “Building Interdisciplinary Bridges” <i>Joint Mathematics Meetings</i>	January 2019 Baltimore, MD
Panelist on Women in STEM <i>Women in Computing Group, Lafayette College</i>	November 2018 Easton, PA
Minisymposium Co-organizer “Math and Social Justice in the Classroom” <i>SIAM Conference on Applied Math Education</i>	July 2018 Portland, OR
Southern Maryland Math Circle Contributor <i>Lexington Park Library</i>	October 2017 Lexington Park, MD
SIAM Student Chapter Faculty Co-Advisor <i>St. Mary’s College of Maryland</i>	2017 - 2018 St. Mary’s City, MD
AWM Student Chapter Faculty Co-Advisor <i>St. Mary’s College of Maryland</i>	2017 - 2018 St. Mary’s City, MD
SIAM Student Chapter President <i>North Carolina State University</i>	2015 - 2016 Raleigh, NC
Applied Mathematics Graduate Student Seminar Organizer <i>North Carolina State University</i>	2014 - 2016 Raleigh, NC
SIAM Student Chapter Treasurer <i>North Carolina State University</i>	2014 - 2015 Raleigh, NC
NC State SIAM Student Chapter Representative <i>SIAM Computational Science and Engineering Conference</i>	March 2015 Salt Lake City, UT

INVITED PRESENTATIONS

Addressing Parameter Non-Identifiability Using Bayesian Calibration on the Active Subspace <i>SIAM Conference on Uncertainty Quantification</i>	March 2026 Minneapolis, MN
Designing Open-Ended Modeling Projects to Balance Skill Assessment and Student Creativity <i>SIAM Conference on Applied Math Education</i>	July 2024 Spokane, WA
Inferring Tumor Cell Line Interaction Types Using the Lotka-Volterra Model with Various Experimental Designs <i>Joint Mathematics Meetings</i>	January 2024 San Francisco, CA
Inferring Tumor Cell Line Interaction Types Using the Lotka-Volterra Model with Various Experimental Designs <i>SIAM NNP Annual Meeting</i>	October 2023 Newark, NJ
Curing Cancer—Mathematicians Want a Piece of That! <i>Mathematics Colloquium Series, Moravian University</i>	October 2023 Bethlehem, PA
Analyzing Parameter Identifiability Using a Dimension Reduction Approach to Model Calibration for Applications in Mathematical Oncology <i>SIAM Conference on Applications of Dynamical Systems</i>	May 2023 Portland, OR
Curing Cancer—Mathematicians Want a Piece of That! <i>Marquis Scholars and Fellows Faculty Talk Series, Lafayette College</i>	April 2023 Easton, PA
Mixing it Up: Alternative Assessment Strategies for Supporting Diverse Learners <i>Institute for Future PUI Faculty, Lafayette College</i>	April 2023 Easton, PA
Applying Model Reduction Techniques to Enable Efficient Parameter Estimation in Tumor Growth Models <i>Biomathematics Seminar, Virginia Commonwealth University</i>	March 2023 Virtual
An Undergraduate Research Program in Data-Driven Mathematical Oncology <i>Joint Mathematics Meetings</i>	January 2023 Boston, MA
Connecting the Dots Between Math Modelers and Clinical Oncologists <i>MAA MathFest</i>	August 2022 Philadelphia, PA
Curing Cancer—Mathematicians Want a Piece of That! <i>Research Experience for Undergraduates, Clarkson University</i>	July 2022 Potsdam, NY
Mixing it Up: Alternative Assessment Strategies for Supporting Diverse Learners <i>Institute for Future PUI Faculty, Lafayette College</i>	April 2022 Easton, PA
Harnessing the Power of Tumor Dynamics Modeling to Assist with Clinical Decision-Making <i>Mathematics Colloquium Series, Clarkson University</i>	November 2021 Potsdam, NY

Bayesian Information-Theoretic Calibration of Tumor Models for Informing Effective Scanning Protocols <i>Society of Mathematical Biology Annual Meeting</i>	June 2021 <i>Virtual</i>
Bayesian Information-Theoretic Calibration of Radiotherapy Sensitivity Parameters for Informing Effective Scanning Protocols in Cancer <i>SIAM Conference on Computational Science and Engineering</i>	March 2021 <i>Virtual</i>
Bayesian Information-Theoretic Calibration of Radiotherapy Sensitivity Parameters for Informing Effective Scanning Protocols in Cancer <i>Joint Mathematics Meetings</i>	January 2021 <i>Virtual</i>
Bayesian Information-Theoretic Calibration of Radiotherapy Sensitivity Parameters for Informing Effective Scanning Protocols in Cancer <i>Applied Statistics Colloquium Series, Lawrence Livermore National Laboratory</i>	October 2020 <i>Virtual</i>
Using Mutual Information to Select Optimal Data Collection Times for Tumor Model Calibration <i>MAA MathFest</i> <i>Note: Canceled due to COVID-19.</i>	August 2020 <i>Philadelphia, PA</i>
A True Team Effort: Full-Class Collaboration to Address a Community Client Question <i>SIAM Conference on Applied Math Education</i> <i>Note: Canceled due to COVID-19.</i>	July 2020 <i>Philadelphia, PA</i>
Using Mutual Information and Bayesian Experimental Design to Determine Optimal Data Collection for Cancer Model Calibration <i>SIAM Conference on the Life Sciences</i> <i>Note: Canceled due to COVID-19.</i>	June 2020 <i>Garden Grove, CA</i>
A Framework for Data-Driven Modeling of Tumor Growth and Treatment <i>Math Department Research Colloquium Series, Lehigh University</i>	March 2020 <i>Bethlehem, PA</i>
Curing Cancer—Mathematicians Want a Piece of That! <i>Math Department Student Colloquium Series, Bucknell University</i>	February 2020 <i>Lewisburg, PA</i>
Why Haven't We Cured Cancer? (Modeling the Effects of Cancerous Stem Cells on Tumor Growth) <i>Mathematical Adventures and Diversions Series, Lafayette College</i>	February 2019 <i>Easton, PA</i>
Investigating the Effects of Cancerous Stem Cells on Tumor Growth <i>Joint Mathematics Meetings</i>	January 2019 <i>Baltimore, MD</i>
Answering the Question, "When Are We Ever Going to Use This?"; Arming Our Students With the Tools Needed to Change the World For the Better <i>SIAM Conference on Applied Math Education</i>	July 2018 <i>Portland, OR</i>
Adaptive Morris Techniques for Active Subspace Construction <i>SIAM Conference on Applied Linear Algebra</i>	October 2015 <i>Atlanta, GA</i>

Gradient-Free Construction of Active Subspaces
for Dimension Reduction in Complex Models
NC State Applied Mathematics Graduate Student Seminar

October 2015
Raleigh, NC

An Information Theoretic Approach to Use
High-Fidelity Codes to Calibrate Low-Fidelity Codes
SIAM Conference on Computational Science and Engineering

March 2015
Salt Lake City, UT

An Information Theoretic Approach to Use
High-Fidelity Codes to Calibrate Low-Fidelity Codes
NC State Applied Mathematics Graduate Student Seminar

October 2014
Raleigh, NC

Theory and Applications of Benford's Law
Joint Mathematics Meetings

January 2011
New Orleans, LA

Theory and Applications of Benford's Law
SUMS Conference, James Madison University

October 2010
Harrisonburg, VA

Why Groups are Fundamental
University of Portland Mathematics Colloquium

December 2009
Portland, OR