# Rebecca Morrison

Department of Computer Science
University of Colorado Boulder
1111 Engineering Drive
UCB 430, ECOT 820
Boulder, CO 80309

rebeccam@colorado.edu
CU Boulder
Personal
Github
Google Scholar

## Positions

Assistant Professor, Dept. of Computer Science, University of Colorado Boulder, 2018 – present

Postdoc, Dept. of Aeronautics and Astronautics, Massachusetts Institute of Technology, 2016 – 2018

Intern, Sandia National Laboratories, Albuquerque, NM, 2012

Student Researcher, International Research Experience for Students (IRES), Federal University of Ceará, Fortaleza, Brazil, 2008

Undergraduate Researcher, REU, University of California Davis, 2007

Undergraduate Researcher, Joint Science Department of the Claremont Colleges, 2005

## Education

Ph.D. in Computational Science, Engineering, and Mathematics, The University of Texas at Austin, 2016

M.S. in Computational and Applied Mathematics, The University of Texas at Austin, 2012

B.A. in Physics, Scripps College, Awarded Magna cum Laude, Phi Beta Kappa, 2008

## Grants & Awards

NASA Space Weather with Quantified Uncertainties: *Ensemble Learning for Accurate and Reliable Uncertainty Quantification* (Co-PI), with Dr. Enrico Camporeale (PI) and Dr. Thomas Berger (Co-PI) $2,891,954 (My portion: $469,299), 2020 – 2023

Johnson&Johnson Women in STEM2D Award: *Discovering Dynamic Structure from Data* (PI), $150,000, 2019 – 2022

Association for Women in Mathematics/NSF Travel Grant, $600, 2017

Computational and Applied Mathematics Fellowship, UT Austin, 2009 – 2013

Rudmose Department Fellowship, UT Austin, Physics Department, 2008

Dart/Merritt Award for the Outstanding Student in Engineering or Physics, Joint Science Department of the Claremont Colleges, 2008

## Publications

† (Co-)first author, otherwise listed first; * Graduate student (CU), ** Graduate student (non-CU)

### Journal Articles

1. E. Basor, R. Morrison†. Analytic solutions to nonlinear ODEs via spectral power series. (Submitted) *Linear Algebra and its Applications.*

2. R. Bandy*, R. Morrison. Stochastic model corrections for reduced Lotka-Volterra models exhibiting mutual, competitive, and predatory interactions. (In revision) *Chaos: An Interdisciplinary Journal of Nonlinear Science.*

3. R. Baptista[**†], R. E. Morrison[†], O. Zahm, Y. Marzouk. Learning non-Gaussian graphical models via Hessian scores and triangular transport. (In revision) *Journal of Machine Learning Research.* arxiv.org/abs/2101.03093

4. P. W. Marcy, R. Morrison. "Stochastic Inverse Problems" and Changes-of-Variables. (In review) *Inverse Problems.* arxiv.org/abs/2211.15730

5. R. E. Morrison, R. Baptista[**], E. Basor. Diagonal nonlinear transformations preserve structure in covariance and precision matrices. *Journal of Multivariate Analysis*, 104983 (2022).

6. M. Tosin, E. Dantas, A. Cunha, R. E. Morrison. ARBO: Arbovirus Modeling and Uncertainty Quantification Toolbox. *Software Impacts* 12, 100252 (2022).

7. R. E. Morrison. Exact reduction of the generalized Lotka-Volterra equations via integral and algebraic substitutions. *Computation* 2021 (9)5, 49.

8. R. E. Morrison. Data-driven corrections of partial Lotka-Volterra models. *Entropy* 2020 (22)11, 1313.

9. R. E. Morrison, A. Cunha. Embedded discrepancy operators: A case study of Zika modeling. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 30(5):051103 (2020).

10. R. E. Morrison, T. A. Oliver, R. D. Moser. Representing model inadequacy: A stochastic operator approach. *ASA/SIAM Journal on Uncertainty Quantification* 6 (2), 457-496 (2018).

11. R. E. Morrison, C. M. Bryant, G. Terejanu, S. Prudhomme, K. Miki. Data partition methodology for validation of predictive models. *Computers and Mathematics with Applications*, 66 (10), 2114-2125 (2013).

12. R. E. Morrison, A. S. Landsberg, E. J. Friedman. Combinatorial games with a pass: A geometric approach. *Chaos: An Interdisciplinary Journal of Nonlinear Science* 21, 043108 (2011).

**Peer-Reviewed Conference Papers**

1. T. Price-Broncucia[*], R. Morrison. Ultra-short time batching and unscented Kalman inversion for calibration of expensive chaotic models. *United States National Congress on Computation Mechanics 2023*, Albuquerque, NM. **Invited to submit for student paper competition (1 of 12 slots).**

2. T. Price-Broncucia[*], R. Morrison. Multi-time unscented Kalman inversion for calibration of expensive chaotic models. *14th International Conference on Applications of Statistics and Probability in Civil Engineering 2023*, Dublin, Ireland. **2023 CERRA Student Recognition Award.**

3. R. Bandy[*], R. Morrison. Quantifying model form uncertainty in spring-mass-damper systems. *Proceedings of IMAC-XLI Conference and Exposition 2023*, Austin, TX. **Best Paper Award.**

4. R. E. Morrison, R. Baptista, Y. Marzouk. Beyond normality: Learning sparse probabilistic models in the non-Gaussian setting. *Advances in Neural Information Processing Systems 30 (NeurIPS 2017)*, 11 pages. (Acceptance rate: 21%)

5. R. E. Morrison, C. M. Bryant, G. Terejanu, K. Miki, S. Prudhomme. Optimal data split methodology for model validation. *Proceedings of the World Congress on Engineering and Computer Science 2011*, p1038-1043. (Acceptance rate: 53%) **Best Student Paper Award.**

**Theses**

1. PhD Dissertation: *On the representation of model inadequacy: A stochastic operator approach*, Advisor: Prof. Robert Moser, UT Austin, 2016

2. Honors Senior Thesis: *From geometry to perturbation theory in combinatorial games: A case study of the game of Nim with a pass*, Advisor: Prof. Adam Landsberg, Scripps College, 2008

**Software**

1. TransportMaps. D. Bigoni, A. Spantini, R. Baptista, R. Morrison. `https://transportmaps.mit.edu`
2. ARBO: Arbovirus Modeling and Uncertainty Quantification Toolbox. M. Tosin, E. Dantas, A. Cunha, R. Morrison. `https://americocunhajr.github.io/ARBO`
3. Zika. R. Morrison, A. Cunha. `https://github.com/rebeccaem/zika`
4. Enriched-GLV. R. Morrison. `https://github.com/rebeccaem/enriched-glv`

## Presentations & Other Workshops

**Colloquia & Invited Talks**

Emory University, Mathematics Colloquium, Atlanta, GA, 8/31/23

Institute for Computational and Experimental Research in Mathematics (ICERM), Workshop on Optimal Transport in Data Science, Providence, RI, 5/11/23

Colorado School of Mines, Applied Mathematics and Statistics Colloquium, Golden, CO, 5/5/23

USACM TTA (Technical Thrust Area) on UQ and Probabilistic Modeling Seminar, **First talk of new seminar series**, (Virtual) 2/10/21

Rio de Janeiro State University, Computer Science Colloquium, (Virtual) 8/25/21

Caltech CMX (Computational Mathematics + X) Colloquium, (Virtual) 12/9/20

Potsdam Institute for Climate Impact Research, Workshop on Uncertainties in Data Analysis **Keynote**, (Virtual) 10/1/20

Computing Research Association (CRA) 2020 Virtual Conference Lightning Talk, **Contest winner** (Selected to appear on CRA website)

Argonne National Laboratory, Laboratory for Applied Mathematics, Numerical Software, and Statistics (LANS) Seminar, (Virtual) 5/20/20

CU Boulder, Applied Math Colloquium, Boulder, CO, 9/27/19

Statistical and Applied Mathematical Sciences Institute (SAMSI), Workshop on Statistical Perspectives on Uncertainty Quantification, Research Triangle Park, NC, 5/17/19

Johnson & Johnson Women in STEM2D Scholars Award Symposium, New Brunswick, NJ, 4/24/19

Banff International Research Station, Workshop on Computational Uncertainty Quantification, Banff, Canada, 10/9/17

Stanford, Institute for Computational Mathematics and Engineering, *Talks Seminar, Palo Alto, CA, 5/1/17

CU Boulder, Computer Science Colloquium, Boulder, CO, 4/13/17

MIT, Aerospace Computational Design Laboratory Seminar, Cambridge, MA, 2/26/16

UT Austin, Babuška Forum Seminar Series at The Oden Institute, Austin, TX, 9/28/12

Sandia National Laboratories, Org. 1544 (Validation and UQ) Seminar, Albuquerque, NM, 8/15/12

**Conference Talks**

SIAM Conference on Mathematics of Data Science, San Diego, CA, 9/29/22

SIAM Conference on Uncertainty Quantification, (Virtual) 4/15/22

International Conference of the Engineering Mechanics Institute, (Virtual) 3/24/21

2nd Symposium on Machine Learning and Dynamical Systems, The Fields Institute, (Virtual) 9/21/20

SIAM Conference on Dynamical Systems, Snowbird, UT, 5/20/19

SIAM Conference on Computational Science & Engineering, Spokane, WA, 3/01/19

World Congress on Computational Mechanics, New York City, NY, 7/24/18

SIAM Conference on Uncertainty Quantification, Lausanne, Switzerland, 4/18/18

SIAM Conference on Computational Science & Engineering, Atlanta, GA, 3/01/17

Probabilistic Mechanics and Reliability Conference, Nashville, TN, 5/24/16

SIAM Conference on Uncertainty Quantification, Lausanne, Switzerland, 4/07/16

APS Division of Fluid Dynamics Annual Meeting, Boston, MA, 11/24/15

13th US National Congress on Computational Mechanics, San Diego, CA, 7/27/15

SIAM Workshop Celebrating Diversity, Salt Lake City, UT, 3/16/15

SIAM Conference on Computational Science & Engineering, Salt Lake City, UT, 3/14/15

APS Division of Fluid Dynamics Annual Meeting, San Francisco, CA, 11/25/14

SIAM Conference on Uncertainty Quantification, Savannah, GA, 4/01/14

SIAM Conference on Uncertainty Quantification, Raleigh, NC, 4/05/12

The World Congress on Engineering and Computer Science 2011, Berkeley, CA, 10/20/11

SIAM Conference on Dynamical Systems, Snowbird, UT, 5/19/09

**Posters**

Reducing Dimensions and Cost for UQ in Complex Systems Workshop, Newton Institute, Cambridge, England, 3/5/18

Neural Information Processing Systems (NeuRIPs), Long Beach, CA, 12/4/17

Uncertainty Quantification Workshop, ICERM, Providence, RI, 10/10/12

Uncertainty Quantification Summer School, The University of Southern California, Los Angeles, CA, 8/23/12

Predictive Science Academic Alliance Program (PSAAP) Meeting, University of Michigan, Ann Arbor, MI, 8/9/12

Large-Scale Inverse Problems and Quantification of Uncertainty Workshop, Institute for Mathematics and its Applications (IMA), Minneapolis, MN, 6/8/11

Uncertainty Quantification for Multiphysics and Multiscale Systems Workshop, The University of Southern California, Los Angeles, CA, 3/7/11

**Other Workshops, etc.**

US National Congress on Computational Mechanics, Albuquerque, NM, 7/(23-27)/23

Scientific Machine Learning Workshop, Banff International Research Station, Banff, Canada, 6/(19-23)/23

Space Weather with Quantification of Uncertainty Workshop, MIT, Cambridge, MA, 3/(9-10)/23

Climate Informatics Workshop, National Center for Atmospheric Research, Boulder, CO, 9/(20-21)/18

MIT Statistics and Data Science Center Day (SDSCon 2017), Cambridge, MA, 4/21/17

Uncertainty Quantification and Data-driven Modeling Workshop, Sandia/The Oden Institute, UT Austin, TX, 3/(23-24)/17

Integrated Analysis for Agricultural Management Strategies Workshop, American Institute of Mathematics (AIM), San Jose, CA, 5/(4-8)/15

Large-Scale Inverse Problems and Quantification of Uncertainty: Big Data Meets Big Models Workshop, Santa Fe, NM, 5/(22-24)/13

Association for Women in Mathematics (AWM) Research Symposium, Santa Clara University, CA, 3/(16-17)/13

Uncertainty Quantification School taught by Tony O'Hagan, UT Austin, TX, 10/(3-4)/11

SAMSI/Sandia Summer School on Uncertainty Quantification, Albuquerque, NM, 6/(20-24)/11

Women in Theory Workshop, Princeton, NJ, 6/(19-23)/10

## Student Advising

**PhD**

Noah Peterson, 2023 – present

Rileigh Bandy, 2019 – present

Teo Price-Broncucia, 2019 – present

**Masters**

Sam Kwon (Applied Math), 2023 – present

**Undergraduate**

Daniel Crook, Discovery Learning Apprenticeship (DLA), 2020 – 2021

Michael Donovan, DLA, 2020 – 2021

**As Committee Member**
(Only most recent exam listed, if multiple)

*Phd Thesis:*
Basu Parmar (AERO) 7/17/23; Jingwei Li (CS) 4/10/23; Chou Yi (CS) 7/9/21; Sebastian Laudenschlager (CS) 5/27/21; Felix Newberry (AERO) 4/2/21; Zhiyuan Liu (CS) 4/1/21; Tristan Konolige (CS) 4/2/20; Paul Diaz (AERO) 2/25/20; Eric Peters (AERO) 5/3/19

*PhD Area/Comprehensive Exam:*
Leila Ghaffari (CS) 5/15/23; Ren Stengel (CS) 11/17/22; Mike McCabe (CS) 4/30/21; Sarah Gage (CS) 11/8/19

*Senior Thesis:*
Saurabh Totey (PHYS) 5/4/23

## Courses Taught & Developed

CSCI 2820: Linear Algebra with Computer Science Applications (S19 Redesign, F19, F22)

CSCI 4802/5802: Data Science Team (F20, S21)

CSCI 5646: Numerical Linear Algebra (F23)

CSCI 5822: Probabilistic Models of Human and Machine Intelligence (S21, S23)

CSCI 4830/7000: The Writing of Science (Graduate Writing Workshop) (F21 New Course)

CSCI 7000: Validation and Uncertainty Quantification for Computational Models (F18 New Course, S20)

Faculty Sponsor for UPSCALE (Uncertainty, Probability, Scientific Computing And LEearning) Reading Group (F19 – present)

Independent Study (F18, F19, S21)

## Teaching & Professional Development

Fall 2020 Diversity and Inclusion Summit, CU Boulder, 11/10/20

"What's Your Plan? A Symposium on Education for Fall 2020," College of Engineering and Applied Science, CU Boulder, 7/27/20

2020 Career Mentoring Workshop, Computing Research Association (CRA), Washington DC, 2/(27-28)/20

Introductory Leadership Training Workshop, Leadership Education for Advancement & Promotion (LEAP), CU Boulder, 1/(8-9)/20

New Assistant Professor Program Certificate, Faculty Teaching Excellence Program (FTEP), CU Boulder, 2018-19

Kaufman Teaching Certificate Program (Intensive 2-Week Course), MIT, 5/29 – 6/15/18

NSF CISE CAREER Proposal Writing Workshop, Washington, DC, 4/(9-10)/18

## Professional Service

"Lunch Mentor" at USNCCM17 Mentoring Event, Albuquerque, NM, 7/24/23

Faculty Mentor with Peak to Peak Charter School (Lafayette, CO), 2023

NSF Reviewer, 2023

Reviewer for NCWIT 2020, 2021, 2023 Award for Aspirations in Computing

Secretary for SIAM UQ Activity Group, 2021 – 2022

Poster Judge at SIAM Mathematics of Data Science, San Diego, CA, 9/28/22

Organizer for the Workshop Celebrating Diversity (SIAM), 2019 and 2020

"Breakfast Mentor" at Rocky Mountain Celebration of Women in Computing, 11/2/18

Volunteer Tutor for 8th grade math, with Austin Partners in Education (APIE), 2013 – 2014

Reviewer for Journals:
Advances in Neural Information Processing Systems (NeurIPS), Chaos, Computer Methods in Applied Mechanics and Engineering, Discrete Applied Mathematics, Entropy, Games of No Chance, IEEE/ACM Transactions on Networking, International Conference on Machine Learning (ICML), International Journal of Uncertainty Quantification, Machine Learning: Science and Technology, Mathematical Reviews, Mathematics, Nature Computational Science, Nonlinear Dynamics, Pattern Recognition Letters, Physica D, SIAM Journal on Scientific Computing, SIAM/ASA Journal on Uncertainty Quantification, Space Weather

Co/Organizer for Minisymposia at:
ECCOMAS (2022), SIAM UQ (2022), USNCCM (2021), SIAM Annual (2020), SIAM CSE (2019)

## University Service

CEAS NSF GRFP Introductory Workshop (Overview, writing exercises, and faculty insight), 7/10/23

CS Faculty Search Committee Member, 2022 – 2023

AB Nexus Reviewer, 2023

Representative for the CS Junior Faculty Assembly, 2022

CS Graduate Curriculum Committee Member, 01/2020 – 12/2021

ECEE Faculty Search Committee Member, 2020 – 2021

Reviewer for Johnson&Johnson WiSTEM2D 2020 and 2021 Awards (Internal review)

Faculty Mentor for the BOLD Center RedShirt S-STEM Program, 2019 – 2020

Covid-19 CEAS Working Group Member, Summer 2020

CS Undergraduate Curriculum Committee Member, 08/2018 – 12/2019

School of Computing Task Force Member, Spring 2019

Organizer for Babuška Forum Series, with Professor Ivo Babuška, 2013 – 2014

## Membership

Association for Women in Mathematics (AWM)

Mathematical Association of America (MAA)

Society for Industrial and Applied Mathematics (SIAM)

United States Association for Computational Mechanics (USACM)