Timothy Marrinan, PhD

He/Him
2405 East Alder Street, Seattle WA 98122, U.S.A.
timothy.marrinan@pnnl.gov
http://tmarrinan.com/
https://scholar.google.com/citations?user=98T4wnUAAAAJ&hl=en

Summary

I am an **applied mathematician focused on bridging computational mathematics and rigorous machine learning** by advancing the understanding of factorization models, latent representation models, and constrained optimization methods to come up with theory-guaranteed data analytical/computational methods. I am invested in combating racism and sexism in our professional spaces by reducing bias in teaching and mentoring, and challenging research that leads to bias and discrimination.

Research Experience

Manifold Learning, Multimodal Learning/Statistical Detection, Latent representations via factorization (in particular, nonnegative matrix factorization), Dimensionality Reduction, Geometric Data Analysis.

Education

2013–2017 **PhD Mathematics,** Colorado State University.
Thesis title: *Grassmann, flag, and Schubert varieties in applications.*
Advisors: Michael Kirby and Chris Peterson.

2010–2013 **MSc Mathematics,** Colorado State University.
Thesis title: *The flag of best fit as a representative for a collection of linear subspaces.*
Advisors: Michael Kirby and Chris Peterson.

2004–2008 **BA Applied Mathematics,** Whitman College.
Thesis title: *Markov chains: roots, theory, and applications.*
Advisors: Robert Fontenot and Barry Balof.

Employment

2022 – present **Staff Data Scientist.** Math, Stats, and Data Science Group, Pacific Northwest National Laboratory.
Researching mathematical aspects of machine learning, artificial intelligence, remote sensing, and uncertainty quantification.

2021 – 2022 **Postdoctoral Fellow.** Dept. of Elec. Eng. & Comp. Sci., Oregon State University.
Supervisor: Xiao Fu.

2019 – 2021 **Postdoctoral Researcher.** Matrix Theory and Optimization Group, Université de Mons.
Supervisor: Nicolas Gillis.

2017 – 2018 **Postdoctoral Researcher.** Signal and System Theory Group, Universität Paderborn.
Supervisor: Peter Schreier.

2015 **PhD Intern.** National Security Directorate, Pacific Northwest National Laboratory.
Supervisors: Nathan Baker and Emilie Hogan Purvine.

2011 – 2016 **Graduate Research Assistant.** Pattern Analysis Laboratory, Colorado State University.
Supervisors: Michael Kirby and Chris Peterson.

2009 – 2010 **Web Production Associate.** Sports Basement. San Francisco, CA.

2008 – 2009 **Information Technology Intern.** GoLite, LLC. Boulder, CO.

2006 – 2008 **Expedition Canoe Guide and Instructor.** Les Voyaguers, Inc. Sartell, MN.

Teaching and Mentoring

2023 — **NSD Research Intern Mentor.** National Security Directorate, Pacific Northwest National Laboratory.
Mentoring two undergraduate students and one PhD student during the PNNL summer research program.

2022 – 2023 — **Honors Thesis Co-Supervisor.** School of Elec. Eng. & Comp. Sci., Oregon State University.
Co-Supervisor: Prof. Xiao Fu.

2021 – 2022 — **Instructor.** School of Elec. Eng. & Comp. Sci., Oregon State University.
ECE 353: Introduction to Probability & Random Signals - Winter 2022

Undergraduate Research Mentor. School of Elec. Eng. & Comp. Sci., Oregon State University.
Mentoring four undergraduate students in an NSF Research Experience for Undergrads - Summer 2022

PhD Mentor. School of Elec. Eng. & Comp. Sci., Oregon State University.
Supervisor: Xiao Fu.

2017 – 2018 — **Thesis Supervisor.** Department of Elec. Engin., Universität Paderborn.
Supervisor: Peter Schreier.

Lecturer. Department of Electrical Engineering, Universität Paderborn.
Supervisor: Peter Schreier.
Topics in Signal Processing - Summer 2017, Winter 2018

2014 – 2016 — **Graduate TA Mentor.** Department of Mathematics, Colorado State University.
Supervisor: Jennifer Mueller.

2011 – 2016 — **Graduate Teaching Assistant.** Department of Mathematics, Colorado State University.
Supervisors: Ken Klopfenstein, Mary Pilgrim, and Dan Bates.
Calculus for Physical Scientists I - Fall 2011, Spring 2013
Calculus for Physical Scientists III - Spring 2015
Mathematical Algorithms in MATLAB/Maple - Spring 2014, Spring 2016

Publications

Preprints

1. Kuschel, M., Hasija, T., & **Marrinan**, **T.** (2023a). *Complexity regularization combats overfitting in multiview representation learning*. Submitted.
2. Kuschel, M., Hasija, T., & **Marrinan**, **T.** (2023b). *Geodesic-based relaxation for deep canonical correlation analysis*. Submitted.
3. **Marrinan**, **T.**, & Gillis, N. (2022). *On the sufficiently scattered conditions*.
4. **Marrinan**, **T.**, Ibrahim, S., & Fu, X. (2022). *Labeling sequential data from crowdsourced noisy annotations: Identifiability and algorithm*.

Journal Articles

1. **Marrinan**, **T.**, Absil, P.-A., & Gillis, N. (2021). On a minimum enclosing ball of a collection of linear subspaces. *Linear Algebra and its Applications*, *625*, 248–278.
2. Hasija, T., **Marrinan**, **T.**, Lameiro, C., & Schreier, P. J. (2020). Determining the dimension and structure of the subspace correlated across multiple data sets. *Signal Processing*, *176*, 107613.
3. Draper, B., Kirby, M., Marks, J., **Marrinan**, **T.**, & Peterson, C. (2014). A flag representation for finite collections of subspaces of mixed dimensions. *Linear Algebra and its Applications*, *451*, 15–32. [*authors in alphabetical order*].

Refereed Conference Proceedings

1. Hasija, T., & **Marrinan**, **T.** (2022). A GLRT for estimating the number of correlated components in sample-poor mCCA. In *2022 30th European Signal Processing Conference (EUSIPCO)* (pp. 2091–2095). IEEE.

2. **Marrinan**, **T.**, & Gillis, N. (2021). Hyperspectral unmixing with rare endmembers via minimax nonnegative matrix factorization. In *2020 28th European Signal Processing Conference (EUSIPCO)* (pp. 1015–1019). IEEE.

3. Lameiro, C., Hasija, T., **Marrinan**, **T.**, & Schreier, P. J. (2019). Estimating the number of correlated components based on random projections. In *2019 IEEE International Conference on Acoustics, Speech and Signal processing (ICASSP)* (pp. 5152–5156). IEEE.

4. **Marrinan**, **T.**, Hasija, T., Lameiro, C., & Schreier, P. J. (2018). Complete model selection in multiset canonical correlation analysis. In *2018 26th European Signal Processing Conference (EUSIPCO)* (pp. 1082–1086). IEEE.

5. Santamaria, I., Vía, J., Kirby, M., **Marrinan**, **T.**, Peterson, C., & Scharf, L. (2017). Constrained subspace estimation via convex optimization. In *2017 25th European Signal Processing Conference (EUSIPCO)* (pp. 1200–1204). IEEE.

6. Jurrus, E., Hodas, N., Baker, N., **Marrinan**, **T.**, & Hoover, M. D. (2016). Adaptive visual sort and summary of micrographic images of nanoparticles for forensic analysis. In *2016 IEEE Symposium on Technologies for Homeland Security (HST)* (pp. 1–6). IEEE.

7. **Marrinan**, **T.**, Beveridge, J. R., Draper, B., Kirby, M., & Peterson, C. (2016). Flag-based detection of weak gas signatures in long-wave infrared hyperspectral image sequences. In *Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XXII* (Vol. 9840, 98401N). International Society for Optics and Photonics.

8. **Marrinan**, **T.**, Beveridge, J. R., Draper, B., Kirby, M., & Peterson, C. (2015). Flag manifolds for the characterization of geometric structure in large data sets. In *Numerical Mathematics and Advanced Applications 2013 (ENUMATH)* (pp. 457–465). Springer.

9. **Marrinan**, **T.**, Ross Beveridge, J., Draper, B., Kirby, M., & Peterson, C. (2014). Finding the subspace mean or median to fit your need. In *2014 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)* (pp. 1082–1089). IEEE.

Software available at `http://tmarrinan.com/publications/`

MATLAB code packages

2022 Joint reduced-rank mCCA model-order selection.

2020 Grassmannian minimum enclosing ball.

Minimax nonnegative matrix factorization.

Determining the dimension and structure of the subspace correlated across multiple data sets.

2018 Complete model selection in multiset canonical correlation analysis.

2014 Subspace mean and median toolkit.

Python code packages

2021 Correlation analysis in multi-modal datasets.

Professional Memberships

2022 – · · · **Society of Women Engineers**

2021 – · · · **Society for Advancement of Chicanos/Hispanics & Native Americans in Science (SACNAS).**

2020 – · · · **National Association of Mathematicians (NAM).**

2014 – · · · **Institute of Electrical and Electronics Engineers (IEEE).**

2012 – · · · **Society for Industrial and Applied Mathematics (SIAM).**

Grants and Awards

2023 **Top reviewer at AISTATS 2023**, Society for Artificial Intelligence and Statistics.
Top reviewers were selected based on the feedback from the Area Chairs and comprise the top-10% of AISTATS reviewers. The list of top reviewers is available here: `http://aistats.org/aistats2023/reviewers.html`.

Grants and Awards (continued)

2022 **Top reviewer at AISTATS 2022**, Society for Artificial Intelligence and Statistics.
Top reviewers were selected based on the feedback from the Area Chairs and comprise the top-10% of AISTATS reviewers. The list of top reviewers is available here: `https://virtual.aistats.org/Conferences/2022/Reviewers`.

2021 **50th Jubilee Research Grant ($3,500)**, Paderborn University.
Awarded to 5 early-career researchers working on the technical, socio-technical or scientific foundations of digitalization, the social upheavals currently taking place as a result of the digitalization processes, and/or the way that the industrial and working worlds, lifestyles, and cultural practices are changing.

2016 **Calvin A. Rodgers Award ($1,000)**, College of Natural Sciences, Colorado State University.
Awarded to a PhD student in mathematics for high academic achievement and leadership.

PCMI Travel Grant ($800), Institute for Advanced Study/Park City Mathematics Institute.
Support for the 2016 IAS/PCMI summer research program on the mathematics of data.

2015 **3rd Heidelberg Laureate Forum Participant**, Heidelberg Laureate Forum Foundation.
One of 200 researchers in math and computer science selected to meet the winners of the Abel prize, Fields medal, Turing award, and IMU Abacus Medal.

NSF Travel Grant ($2,000), National Science Foundation & Oak Ridge Association of Universities.
Support for the American delegation to the 3rd Heidelberg Laureate Forum.

IMA/IAS Travel Grant ($3,500), Institute for Mathematics and its Applications & Institute for Advanced Study.
Support for the 2015 IAS Program on Statistics/Computational Interface to Big Data at HKUST.

2014 **SIAM Outstanding Service Award**, Society for Industrial and Applied Mathematics.
For outstanding efforts and accomplishments on behalf of the SIAM Chapter at the Colorado State University.

Selected presentations

Lectures

2021 **Low-dimensional models for pattern recognition & signal processing.**
Factorization Machines Seminar, Oregon State University, USA.

Subtropical matrix factorization.
COLORAMAP Seminar, Université de Mons, Belgium.

Practical verification of identifiability for nonnegative matrix factorizations.
SIAM Conference on Applied Linear Algebra, New Orleans, USA.

Improved sufficient conditions for identifiable nonnegative matrix factorization.
AMS/MAA 2021 Joint Mathematics Meetings, USA.

Hyperspectral unmixing with rare endmembers via minimax nonnegative matrix factorization.
28th European Signal Processing Conference, Netherlands.

2020 **Extracting rare materials from hyperspectral images via minimax NMF.**
COLORAMAP Seminar, Université de Mons, Belgium.

Identifiability and detection of multiset correlation structure.
Applied Math Seminar, UCLouvain, Belgium.

2019 **An optimal rank Grassmannian minimum enclosing ball.**
SIAM Conference on Applied Algebraic Geometry, University of Bern, Switzerland.

Identifying low-dimensional structure with geometric analysis and statistical signal processing.
COLORAMAP Seminar, Université de Mons, Belgium.

2018 **Robustly identifying dependency in multiple high-dimensional data sets based on few observations.**
Coupled Effects Meeting, Technische Universität Darmstadt, Germany.

2017 **An introduction to optimization on Grassmann manifolds.**
Signal and System Theory Seminar, Universität Paderborn, Germany.

Flag-based detection of weak gas signatures in long-wave infrared hyperspectral image sequences.
Signal and System Theory Seminar, Universität Paderborn, Germany.

Selected presentations (continued)

2016 **Grassmann, flag, and Schubert varieties in applications.**
Oak Ridge National Laboratory, USA.

Hyperspectral signal detection via Grassmannian averaging.
Park City Math Institute, USA.

Flag-based detection of weak gas signatures in long-Wave infrared hyperspectral image sequences.
SPIE Defense + Security Conference, USA.

Grassmann, flag, and Schubert varieties in applications.
Greenslopes Seminar, Colorado State University, USA.

2015 **Geometric adaptive visualization/Dynamic cyber graph analysis via subspace representations.**
National Security Directorate Symposium, Pacific Northwest National Lab, USA.

Detecting weak signals in hyperspectral images and videos by spanning variation.
Algorithms for Threat Detection Workshop, National Science Foundation, USA.

2014 **Pattern recognition via linear subspace models and the flag mean.**
Applied Math Seminar, Whitman College, USA.

The flag mean: An average representation for subspaces of different dimensions.
Discrete Math and Combinatorics Seminar, Pacific Northwest National Lab, USA.

Pattern recognition via linear subspace models and the flag mean.
Signature Discovery Initiative Seminar, Pacific Northwest National Lab, USA.

Chemical signature detection using flag representations in hyperspectral images.
Algorithms for Threat Detection Workshop, National Center for Atmospheric Research, USA.

Detecting weak signals in subspace data using the flag mean.
10th Annual Front Range Applied Math Conference, University of Colorado at Denver, USA.

2013 **The flag of best fit as a representative for a collection of linear subspaces.**
SIAM Annual Meeting 2013, USA.

2012 **Cluster purity and the 2-flag mean.**
DARPA Mind's Eye Project Evaluation, Colorado State University, USA.

Posters

2018 **Complete Model Selection in Multiset Canonical Correlation Analysis.**
26th European Signal Processing Conference, Italy.

2014 **Detecting Weak Signals in Linear Subspace Data.**
2nd Annual Signature Discovery Workshop, University of Washington, USA.

Finding the Subspace Mean or Median to Fit Your Need.
IEEE Conference on Computer Vision and Pattern Recognition, USA.

Outreach and Professional Service

Organization

2023 **Organizer:** Special Session on *Multiview representation learning for machine learning and data fusion.*
2023 IEEE Machine Learning for Signal Processing workshop, Italy.

Author/Organizer: Deep learning workshop.
Pacific Northwest National Laboratory, Washington, USA.

2022 **Faculty Committee Member:** Student Success Committee, Mental Health sub-committee.
Oregon State University, USA.

2020 – 2021 **Founder:** Race and Gender-based Bias Action Group.
Université de Mons, Belgium.

Founder: COLORAMAP Reading Group.
Université de Mons, Belgium.

Outreach and Professional Service (continued)

2019
- **Local Committee:** Workshop on Low-Rank Models and Applications.
  Université de Mons, Belgium.
- **Local Committee:** Structured Low-Rank Matrix/Tensor Approximation Retreat.
  Université de Mons, Belgium.

2018
- **Organizer:** Special Session on *Geometry in Signal Processing and Machine Learning.*
  2018 IEEE Statistical Signal Processing Workshop, Germany.
- **Graphic Designer:** Technical Program, Logos, and Branding.
  2018 IEEE Statistical Signal Processing Workshop, Germany.
- **Webmaster:** Conference website - `https://ssp2018.org/`.
  2018 IEEE Statistical Signal Processing Workshop, Germany.

2017 – 2018
- **Founder:** *Tea with Tim* statistical signal processing discussion group.
  Universität Paderborn, Germany.

2016
- **Organizer:** Job-hunt support group.
  Colorado State University, USA.

2013 – 2014
- **President:** SIAM Student Chapter.
  Colorado State University, USA.

2012 – 2013
- **Liaison Officer:** SIAM Student Chapter.
  Colorado State University, USA.

Professional Development

2022
- **Participant:** OSU College of Engineering Inclusive Teaching Virtual Workshop.

2021
- **Participant:** OSU Center for Teaching and Learning Virtual Sparkshop – Engaging Students through effective questioning: Strategies and tips.
- **Participant:** MSRI Virtual Workshop on Mathematics and Racial Justice.

2020
- **Participant:** AMS Virtual Workshop on Advocating for Students of Color: There's More You Can Do

2015 – 2016
- **Participant:** History of Mathematics Seminar.
  Colorado State University, USA.
- **Participant:** Front Range Mathematics Education Seminar (FRaMES).
  Colorado State University, Northern Colorado University, & University of Colorado at Denver.

Presentations

2014
- **The CSU LaTeX Thesis Class.**
  SIAM Student Chapter Technical Workshop Series, Colorado State University, USA.

2013
- **Designing an Academic Website.**
  SIAM Student Chapter Technical Workshop Series, Colorado State University, USA.
- **An Introduction to MATLAB.**
  SIAM Student Chapter Technical Workshop Series, Colorado State University, USA.

2012
- **An Introduction to LaTeX.**
  SIAM Student Chapter Technical Workshop Series, Colorado State University, USA.

Peer Reviews

Journals
- Computational Optimization and Applications
- International Journal of Geo-Information
- Neural Computing and Applications
- SIAM Journal on Matrix Analysis and Applications
- Signal Processing
- Remote Sensing

Conferences
- European Signal Processing Conference (EUSIPCO)

Outreach and Professional Service (continued)

- IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)
- IEEE Statistical Signal Processing Workshop (SSP)
- International Conference on Artificial Intelligence and Statistics (AISTATS) – Top Reviewer 2022, 2023
- SIAM Workshop on Low-Rank Models and Applications (LRMA)

Skills

Citizenship	USA
Languages	English (mother tongue), German (A1+), French (A1+).
Coding	MATLAB, Python, LaTeX, PyTorch, TensorFlow, Julia, Maple, Slurm JAX.