Timothy Marrinan, PhD

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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

05/13/2017	**PhD Mathematics,** Colorado State University. Thesis title: *Grassmann, flag, and Schubert varieties in applications.* Advisors: Michael Kirby and Chris Peterson.
12/21/2013	**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.
05/18/2008	**BA Applied Mathematics,** Whitman College. Thesis title: *Markov chains: roots, theory, and applications.* Advisors: Robert Fontenot and Barry Balof.

Academic Positions

8/15/21 – · · ·	**Postdoctoral Fellow.** Dept. of Electrical Engineering & Computer Science, Oregon State University. Supervisor: Xiao Fu.
1/1/19 – 8/4/21	**Postdoctoral Researcher.** Matrix Theory and Optimization Group, Université de Mons. Supervisor: Nicolas Gillis.
1/1/17 – 12/31/18	**Postdoctoral Researcher.** Signal and System Theory Group, Universität Paderborn. Supervisor: Peter Schreier.
1/1/11 – 12/31/16	**Graduate Research Assistant.** Pattern Analysis Laboratory, Colorado State University. Supervisors: Michael Kirby and Chris Peterson.

Teaching and Mentoring

2021 – 2022	**Instructor.** School of Electrical Engineering and Computer Science, Oregon State University. ECE 353: Introduction to Probability & Random Signals - Winter 2022
	PhD Mentor. School of Electrical Engineering and Computer Science, Oregon State University. Supervisor: Xiao Fu.
2017 – 2018	**Thesis Supervisor.** Department of Electrical Engineering, Universität Paderborn. Supervisor: Peter Schreier.
	Lecturer. Department of Electrical Engineering, Universität Paderborn. Supervisor: Peter Schreier. Topics in Signal Processing - Summer 2017, Winter 2018

Teaching and Mentoring (continued)

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 Hasija, T., Kuschel, M., **Marrinan, T.**, & Dann, A. (2022). *Overfitting in deep correlation-based multiview networks.*

2 Hasija, T., & **Marrinan, T.** (2022). *A GLRT for estimating the number of correlated components in sample-poor mCCA.*

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 **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.

2 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.

3 **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.

4 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.

5 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.

6 **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.

7 **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.

8 **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

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

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

2021	**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`.
	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.

Additional Experience

2015	**PhD Intern.** National Security Directorate, Pacific Northwest National Laboratory. Supervisors: Nathan Baker and Emilie Hogan Purvine. Researching mathematical aspects of cyber security and visual analytics with staff scientists and mathematicians in the Computational and Statistical Analytics Division.

Additional Experience (continued)

2009 – 2010   **Web Production Associate.** Sports Basement. San Francisco, CA.
Managing Sports Basement's online store, including product photography, photo editing, and copy-writing. Optimizing online sales conversion and user experience.

2008 – 2009   **Information Technology Intern.** GoLite, LLC. Boulder, CO.
Managing PC help-desk for GoLite headquarters. Maintaining point-of-sale computers for direct sales. Deploying cutting-edge customer support system for web sales. Tech support for 40 international sales representatives. Maintained company-wide operations during a server crash.

2006 – 2008   **Expedition Canoe Guide and Instructor.** Les Voyaguers, Inc. Sartell, MN.
Guiding month-long whitewater canoe trips in Canada. Leading staff training, for both hard and soft skills. Teaching wilderness survival skills to participants. Primary medical caregiver in the backcountry.

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.

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.

Selected presentations (continued)

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

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

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

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.

Outreach and Professional Service (continued)

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

Professional Development

2022	▌	**Participant:** OSU College of Engineering Inclusive Teaching Workshop. Virtual.
2021	▌	**Participant:** MSRI Workshop on Mathematics and Racial Justice. Virtual.
2020	▌	**Participant:** AMS Workshop on Advocating for Students of Color: There's More You Can Do Virtual.
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
	▌	Remote Sensing
Conferences	▌	European Signal Processing Conference (EUSIPCO)
	▌	IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)
	▌	IEEE Statistical Signal Processing Workshop (SSP)
	▌	International Conference on Artificial Intelligence and Statistics (AISTATS)
	▌	SIAM Workshop on Low-Rank Models and Applications (LRMA)

Skills

Citizenship	▌	USA
Languages	▌	English (mother tongue), German (A1+), French (A1+).
Coding	▌	MATLAB, Maple, Python, LaTeX.
Misc.	▌	Academic research, teaching, editing, curriculum development.

References

Available by request.