LAURA BALZANO

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Ann Arbor, MI
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EMPLOYMENT HISTORY

Associate Professor of Electrical Engineering and Computer Science
University of Michigan, September 2019 – present.

Visiting Scholar and Member
Institute for Advanced Study, Princeton NJ, September 2019 – present.

Assistant Professor of Electrical Engineering and Computer Science
University of Michigan, January 2013 – August 2019.

Visiting Researcher
University of Wisconsin, Madison and Duke University, June - December 2012.

Graduate Research Assistant
University of Wisconsin, Madison, January 2008 – May 2012.

Visiting Researcher
École Polytechnique Fédérale de Lausanne (EPFL), June – December 2007.

Graduate Research Assistant
University of California, Los Angeles, September 2004 – June 2007.

Software Developer
Applied Signal Technology, Inc, June 2002 – June 2004.

EDUCATION

05/2012 **University of Wisconsin, Madison**

PhD in Electrical and Computer Engineering

Thesis title: "Handling Missing Data in High-Dimensional Subspace Modeling."
Thesis advisers: Robert Nowak (ECE) and Benjamin Recht (CS)

Major Area: Signal Processing Minor Area: Mathematics

03/2007 **University of California, Los Angeles**

Master of Science in Electrical Engineering

Major Area: Communications Minor Areas: Optimization, Statistics

12/2001 **Rice University**

Bachelor of Science in Electrical and Computer Engineering

Major Area: Computer Engineering Minor Areas: Signal Processing, Networking

RESEARCH FUNDING

Laura Balzano. Fulbright Commission Portugal: New Regularizers for Low-Dimensional Modeling of High-Dimensional Data. €10,250, May-July 2020. (Postponed.)

Laura Balzano. National Science Foundation (NSF) CAREER: Robust, Interpretable, and Efficient Unsupervised Learning with K-set Clustering. $596,792, May 2019-April 2024.

Laura Balzano, Yuekai Sun, and Sonja Starr. University of Michigan MCubed: Fairness and Legality in Algorithmic Decision Making. $60,000, January 2019-December 2020.

Laura Balzano. Air Force Office of Scientific Research (AFOSR) YIP: Non-convex Optimization Algorithms and Theory for Matrix Factorization with Dynamic Massive Data. $450,000, January 2019-December 2021.

Clay Scott, Jeff Fessler, Mert Pilanci, and Laura Balzano. NSF BIGDATA: Random and Adaptive Projections for Scalable Optimization and Learning. $1,000,000, January 2019-Dec 2021.

Laura Balzano. Army Research Office (ARO) YIP: Mathematics for Learning Nonlinear Generalizations of Subspace Models in High Dimensions. $360,000, November 2018-October 2021.

Laura Balzano. 3M NTFA: Algorithms for Low-Dimensional Modeling of High-Dimensional Data.

$30,000, May 2018-May 2028.

Jason Corso, Laura Balzano. DARPA D3M: SPIDER: Subspace Primitives that are Interpretable and Diverse. $1,600,000, March 2017-July 2020.

Jun Li, Anna Gilbert, Clay Scott, Gagnon Bartsch, Roman Vershynin, Laura Balzano, Max Wicha, Sue Hammoud, Gil Omenn, Justin Colacino, Ebrahim Azizi, Diane Simone, Dana Dolinoy, Yuanfang Guan. University of Michigan MIDAS: Michigan Center for Single-Cell Genomic Data Analytics. $1,249,233, March 2017-April 2020.

Laura Balzano. NVIDIA hardware award, Titan X GPU $4000 MSRP. October 2016.

Laura Balzano, Eric Schwartz, Alfred Hero. University of Michigan MCubed: Consumer preference learning from limited feedback. $60,000, September 2016-December 2017.

Laura Balzano. Intel Early Career Fellowship. $25,000, September 2015-October 2025.

Johanna Mathieu, Laura Balzano. NSF Energy, Power, and Control Networks: Inferring the behavior of distributed energy resources from incomplete measurements, $399,452, July 2015-June 2018.

Laura Balzano. ARO: Subspace Methods for Massive and Messy Data. $344,959, September 2014-August 2017.

Laura Balzano. NSF BRIGE: Simultaneous Modeling and Calibration for Environmental Sensor Data. $174,996, September 2013-August 2016.

Laura Balzano, Branko Kerkez, Don Scavia. University of Michigan MCubed: A mathematical, scientific, and measurement framework for the assessment of water balance and water quality. $60,000, September 2013-December 2014.

AWARDS

Vulcans Education Excellence Award, University of Michigan, January 2020

Fulbright U.S. Scholar Award, February 2019

National Science Foundation CAREER Award, February 2019

Air Force Office of Scientific Research Young Investigator Award, October 2018

Army Research Office Young Investigator Award, May 2018

3M Non-Tenured Faculty Award, May 2018.

Intel Early Career Faculty Honor Program Award, August 2015.

University of Wisconsin, Electrical and Computer Engineering Department,
Best Dissertation Award, 2012.

University of Wisconsin **Peer Mentor Award**, 2012.

3M Fellowship for Graduate Study, 2009-2012.

Innovative Signal Analysis Graduate Scholarship, 2008.

University of California, Los Angeles, Electrical Engineering Department,
Outstanding Master's Degree Award, 2007.

PUBLICATIONS SUBMITTED OR IN PREPARATION

G. Ongie, D. Pimentel-Alarcon, R. Nowak, R. Willett, and L. Balzano, "**Tensor Methods for Nonlinear Matrix Completion**." Submitted to SIAM Journal of the Mathematics of Data Science. Preprint available at https://arxiv.org/abs/1804.10266.

K. Gilman and L. Balzano, "**Grassmannian Optimization for Online Tensor Completion and Tracking in the t-SVD Algebra**." In preparation. Preprint available at https://arxiv.org/abs/2001.11419.

J. Lipor, D. Hong, Y. Tan, and L. Balzano, "**Subspace Clustering Using Ensembles of K-Subspaces**." Submitted to the IMA Journal of Information and Inference. Preprint available at https://arxiv.org/abs/1709.04744.

H. Lyu, D. Needell, and L. Balzano, "**Online Matrix Factorization for Markovian Data and Applications to Network Dictionary Learning**." Submitted to the Journal of Machine Learning Research. Preprint available at https://arxiv.org/abs/1911.01931.

Y. Wang, T. Thong, V. Saligrama, J. Colacino, L. Balzano, and C. Scott. "**A Gene Filter for Comparative Analysis of Single-Cell RNA-Sequencing Trajectory Datasets**." In preparation. Early results available at https://www.biorxiv.org/content/10.1101/637488v1.

D. Hong, L. Balzano, and J. Fessler, "**Optimally Weighted PCA for High-dimensional Heteroscedastic Data**." In preparation. Early results available at https://arxiv.org/abs/1810.12862.

D. Zhang and L. Balzano, "**Convergence of a Grassmannian Gradient Descent Algorithm for Subspace Estimation from Undersampled Data**." In preparation. Early results available at https://arxiv.org/abs/1610.00199.

JOURNAL PUBLICATIONS

1) T. Thong, Y. Wang, M.D. Brooks, C. Lee, C. Scott, L. Balzano, M.S. Wicha, J.A. Colacino, "**Hybrid stem cells in normal human and mouse mammary gland: Single-cell analyses reveal transcriptomic similarities to basal breast cancer**." *Frontiers in Cell and Developmental Biology* 8 (2020): 288.

2) J. Lipor and L. Balzano, "**New Clustering Quality Metrics for Subspace Clustering**," *Pattern Recognition* 104 (2020): 107328.

3) A. Eftekhari, G. Ongie, L. Balzano, and M. Wakin, "**Streaming Principal Component Analysis from Incomplete Data**." *Journal of Machine Learning* Research 20, no. 86 (2019): 1-62.

4) A. Gitlin, B. Tao, L. Balzano, and J. Lipor, "**Improving K-Subspaces via Coherence Pursuit**." *IEEE Journal of Selected Topics in Signal Processing* 12, no. 6 (2018): 1575-1588.

5) L. Balzano, Y. Chi, and Y. Lu, "**A Modern Perspective on Streaming PCA and Subspace Tracking: The Missing Data Case**." *Proceedings of the IEEE*, vol. 106, no. 8, pp. 1293-1310, Aug. 2018.

6) G.S. Ledva, L. Balzano, and J.L. Mathieu, "**Real-Time Energy Disaggregation of a Distribution Feeder's Demand Using Online Learning**." *IEEE Transactions on Power Systems* 33, no. 5 (2018): 4730-4740.

7) D. Hong, L. Balzano, and J. Fessler, "**Asymptotic performance of PCA for high-dimensional heteroscedastic data**." *Journal of Multivariate Analysis*, 167 (2018): 435-452.

8) J. Lipor, B. Wong, D. Scavia, B. Kerkez, L. Balzano, "**Distance-Penalized Active Learning for Spatial Sampling.**" *IEEE Transactions on Signal Processing* 65, no. 20 (2017): 5453-5465.

9) A. Eftekhari, L. Balzano, and M. Wakin, "**What to Expect when you are Expecting on the Grassmannian.**" *IEEE Signal Processing Letters* 24, no. 6 (2017): 872-876.

10) R. Kennedy, L. Balzano, S.J. Wright, and C.J. Taylor, "**Online Algorithms for Factorization-Based Structure from Motion**," *Journal for Computer Vision and Image Understanding* 150 (2016): 139-152.

11) L. Balzano and S. Wright, "**Local Convergence of an Algorithm for Subspace Identification from Partial Data**," *Journal for Foundations on Computational Mathematics (FOCM)* 15, no. 5 (2015): 1279-1314.

12) J. He, D. Zhang, L. Balzano, and T. Tao, "**Iterative Grassmannian Optimization for Robust Image Alignment**," *Journal of Image and Vision Computing* 32, no. 10 (2014): 800-813.

13) V. Tan, L. Balzano, and S. Draper, "**Rank Minimization over Finite Fields: Fundamental Limits and Coding-Theoretic Interpretations**," *IEEE Transactions on Information Theory* 58, no. 4 (2012): 2018-2039.

14) K. Ni, N. Ramanathan, M.N. Hajj Chehade, L. Balzano, S. Nair, S. Zahedi, G. Pottie, M. Hansen, and M. Srivastava, "**Sensor Network Data Fault Types**," *ACM Transactions on Sensor Networks* 5, no. 3 (2009): 25.

15) S. Ganeriwal, L. Balzano, and M. Srivastava, "**Reputation-based Framework for High Integrity Sensor Networks**," *ACM Transactions on Sensor Networks* 4, no. 3 (2008): 15.

16) V. Gambiroza, P. Yuan, L. Balzano, Y. Liu, S. Sheafor, and E. Knightly, "**Design, Analysis, and Implementation of DVSR: A Fair, High Performance Protocol for Packet Rings**," *IEEE/ACM Transactions on Networking* 12, no. 1 (2004): 85-102.

CONFERENCE PUBLICATIONS

1) A. Bower and L. Balzano, "**Preference Modeling with Context-Dependent Salient Features**." Accepted to the International Conference on Machine Learning (ICML), 2020. Preprint available at https://arxiv.org/abs/2002.09615.

2) K. Gilman and L. Balzano, "**Online Tensor Completion and Free Submodule Tracking with the t-SVD**." Proceedings of the International Conference of Conference for Acoustics, Speech, and Signal Processing (ICASSP), May 2020.

3) Z. Du, N. Ozay, and L. Balzano, "**Mode Clustering for Markov Jump Systems**." Proceedings of the IEEE Conference on Computational Advances in Multi-Sensor Array Processing (CAMSAP), December 2019. **Best student paper, 3rd place.**

4) D. Hong, L. Balzano, and J. Fessler, "**Probabilistic PCA for Heteroscedastic Data**." Proceedings of the IEEE Conference on Computational Advances in Multi-Sensor Array Processing (CAMSAP), December 2019.

5) D. Hong, S. Lei, J.L. Mathieu, and L. Balzano, "**Exploration of tensor decomposition applied to commercial building baseline estimation**." Proceedings of the IEEE Global Conference on Signal and Information Processing (GlobalSIP), November 2019.

6) K. Gilman and L. Balzano, "**Panoramic Video Separation with Online Grassmannian Robust Subspace Estimation."** International Conference on Computer Vision (ICCV), Workshop on Robust Subspace Learning and Applications in Computer Vision, 2019.

7) A. Ritchie, C. Scott, L. Balzano, D. Kessler, C. Sripada, "**Supervised Principal Component Analysis via Manifold Optimization**." IEEE Data Science Workshop (DSW), June 2019.

8) D. Zhang, T. Zhao, and L. Balzano. "**Information Maximization Auto-Encoding**." Workshop on Bayesian Deep Learning, NeurIPS 2018.

9) J. Lipor and L. Balzano, "**Clustering Quality Metrics for Subspace Clustering**," Proceedings of the Asilomar Conference on Signals, Systems, and Computers, 2018.

10) G.S. Ledva, L. Balzano, and J. Mathieu, "**Exploring Connections between a Multiple Model Kalman Filter and Dynamic Fixed Share with Applications to Demand Response**." Proceedings of the IEEE Conference on Control Technology and Applications (CCTA), 2018.

11) D. Hong, R. Malinas, J. Fessler, and L. Balzano, "**Learning Dictionary-Based Unions of Subspaces for Image Denoising**." Proceedings of the European Signal Processing Conference (EUSIPCO) 2018.

12) Z. Du, L. Balzano, and N. Ozay, "**A Robust Algorithm for Online Switched System Identification**." Proceedings of the Symposium on System Identification (SYSID) 2018.

13) G. Ongie, D. Hong, D. Zhang, and L. Balzano, "**Online Estimation of Coherent Subspaces with Adaptive Sampling**." Proceedings of the SSP Workshop 2018.

14) D. Zhang, J. Katz-Samuels, M. Figueiredo, and L. Balzano, "**Simultaneous Sparsity and Parameter Tying for Deep Learning using Ordered Weighted ℓ_1 Regularization**," Proceedings of the SSP Workshop 2018.

15) G. Ongie, N. Murthy, L. Balzano, and J. Fessler, "**Memory-efficient Splitting Algorithms for Large-Scale Sparsity Regularized Optimization**." Proceedings of the International Conference on Image Formation in X-Ray Computed Tomography (CT Meeting) 2018.

16) A. Bower, L. Jain, and L. Balzano, "**The Landscape of Nonconvex Quadratic Feasibility**." Proceedings of the International Conference for Acoustics, Speech, and Signal Processing (ICASSP) 2018.

17) D. Zhang, H. Wang, M. Figueiredo, and L. Balzano, "**Learning to Share: Simultaneous Parameter Tying and Sparsification for Deep Learning**." Proceedings of the International Conference on Learning Representations (ICLR) 2018.

18) G. Ongie, S. Dewangan, J. Fessler, and L. Balzano, "**Online Dynamic MRI Reconstruction via Robust Subspace Tracking**." Proceedings of the IEEE Global Conference on Signal and Information Processing (GlobalSIP), November 2017.

19) G. Ongie, D. Hong, D. Zhang, and L. Balzano, "**Enhanced Online Subspace Estimation Via Adaptive Sensing**." Proceedings of the Asilomar Conference on Signals, Systems, and Computers, November 2017.

20) D. Pimentel-Alarcon, G. Ongie, L. Balzano, R. Nowak, and R. Willett, "**Low Algebraic Dimension Matrix Completion**." Proceedings of the Allerton Conference on Communications, Control, and Computing, September 2017.

21) J. Lipor and L. Balzano, "**Leveraging Union of Subspace Structure to Improve Constrained Clustering**." Proceedings of the International Conference on Machine Learning (oral presentation 25% acceptance), August 2017.

22) G. Ongie, L. Balzano, R. Nowak, and R. Willett, "**Algebraic Variety Models for High-Rank Matrix Completion**." Proceedings of the International Conference on Machine Learning (oral presentation 25% acceptance), August 2017.

23) D. Pimentel Alarcon, L. Balzano, R. Marcia, R. Nowak, and R. Willett, "**Mixture Regression as Subspace Clustering**." Proceedings of the Sampling Theory and Applications Conference (SampTA), July 2017.

24) D. Zhang and L. Balzano, "**Matched Subspace Detection using Compressively Sampled Data**." Proceedings of the International Conference for Acoustics, Speech, and Signal Processing (ICASSP), March 2017.

25) N. Rao, R. Ganti, L. Balzano, R. Willett, and R. Nowak, "**On Learning High-Dimensional Structured Single Index Models**." Proceedings of the conference of the Association for the Advancement of Artificial Intelligence (AAAI) (oral presentation), February 2017.

26) D. Hong, L. Balzano, and J. Fessler, "**Towards a Theoretical Analysis of PCA for Heteroscedastic Data**." Proceedings of the Allerton Conference on Communications, Control, and Computing, September 2016.

27) P. Xiao and L. Balzano, "**Online Sparse and Orthogonal Subspace Estimation from Partial Information**." Proceedings of the Allerton Conference on Communications, Control, and Computing, September 2016.

28) D. Pimentel Alarcon, L. Balzano, and R. Nowak, "**Necessary and Sufficient Conditions for Sketched Subspace Clustering**." Proceedings of the Allerton Conference on Communications, Control, and Computing, September 2016.

29) D. Pimentel Alarcon, L. Balzano, R. Marcia, R. Nowak, and R. Willett, "**Group-Sparse Subspace Clustering with Missing Data**." Proceedings of the IEEE Statistical Signal Processing (SSP) Workshop, July 2016.

30) N. Rao, R. Ganti, L. Balzano, R. Willett, and R. Nowak, "**On Learning High-Dimensional Structured Single Index Models**." Workshop on Advances in non-convex analysis and optimization at the International Conference on Machine Learning (ICML), June 2016.

31) D. Zhang and L. Balzano, "**Global Convergence of a Grassmannian Gradient Descent Algorithm for Subspace Estimation.**" Proceedings of Artificial Intelligence and Statistics (AI Stats) (Poster presentation 30% acceptance), May 2016.

32) R. Ganti, L. Balzano, and R. Willett, "**Matrix Completion under Monotonic Single Index Models**," Proceedings of the conference for Neural Information Processing Systems (NIPS) (Poster presentation 25% acceptance), December 2015.

33) J. Lipor and L. Balzano, "**Margin-Based Active Subspace Clustering**," Proceedings of the IEEE Conference on Computational Advances in Multi-Sensor Array Processing (CAMSAP), December 2015.

34) J. Lipor, L. Balzano, B. Kerkez, and D. Scavia, "**Quantile-search: A Distance-Penalized Active Learning Algorithm for Spatial Sampling**," Proceedings of the Allerton Conference on Communications, Control, and Computing, September 2015.

35) G.S. Ledva, L. Balzano, and J.L. Mathieu, "**Inferring the Behavior of Distributed Energy Resources with Online Learning**," Proceedings of the Allerton Conference on Communications, Control, and Computing, September 2015.

36) R. Kennedy, C.J. Taylor, and L. Balzano, "**Online Completion of Ill-Conditioned Low-Rank Matrices**," IEEE Global Conference on Signal and Information Processing (GlobalSIP), December 2014.

37) J. Lipor and L. Balzano, "**Robust Blind Calibration via Least Squares**," IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), May 2014.

38) R. Kennedy, L. Balzano, S.J. Wright, and C.J. Taylor, "**Online Algorithms for Factorization-Based Structure from Motion**," IEEE Winter Conference on Applications of Computer Vision (WACV), March 2014.

39) D. Pimentel, R. Nowak, and L. Balzano, "**On the Sample Complexity of Subspace Clustering with Missing Data,**" Proceedings of the Statistical Signal Processing Workshop (SSP), June 2014.

40) L. Balzano and S. Wright, "**On GROUSE and the ISVD**," Proceedings of the IEEE Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP), special session on New Sensing and Inference Methods for Large-Scale Data, December 2013.

41) J. He, D. Zhang, L. Balzano, and T. Tao, "**Iterative Online Subspace Learning for Robust Image Alignment**," IEEE Automatic Face and Gesture Recognition conference, April 2013.

42) L. Balzano, A. Szlam, B. Recht, and R. Nowak, "**k-Subspaces with Missing Data**," Proceedings of the Statistical Signal Processing Workshop (SSP), August 2012.

43) J. He, L. Balzano, and A. Szlam, "**Incremental Gradient on the Grassmannian for Online Foreground and Background Separation in Subsampled Video,**" Proceedings of the conference on Computer Vision and Pattern Recognition (CVPR) (Oral presentation 5% acceptance), June 2012.

44) L. Balzano, B. Eriksson, and R. Nowak, "**High-Rank Matrix Completion**," Proceedings of the conference on Artificial Intelligence and Statistics (AISTATS) (Poster presentation 35% acceptance), April 2012.

45) V. Tan, L. Balzano, and S. Draper, "**Rank Minimization in Finite Fields**," Proceedings of the International Symposium on Information Theory (ISIT), August 2011.

46) L. Balzano, R. Nowak, and M. Roughan, "**On the Success of Network Inference using a Markov Random Walk Model**," Proceedings of the International Conference on Acoustics, Speech, and Signal Processing (ICASSP), May 2011.

47) L. Balzano, W. Bajwa, and R. Nowak, "**Column Subset Selection with Missing Data**," In the NIPS workshop on Low-Rank Methods for Large-Scale Machine Learning, December 2010.

48) L. Balzano, B. Recht, and R. Nowak, "**Online and Adaptive Tracking of Subspaces from Highly Incomplete Information**," In the NIPS workshop on Low-Rank Methods for Large-Scale Machine Learning, December 2010.

49) L. Balzano, R. Nowak, and B. Recht, "**Online and Adaptive Tracking of Subspaces from Highly Incomplete Information**," Proceedings of the Allerton Conference on Communications, Control, and Computing, September 2010.

50) L. Balzano, B. Recht, and R. Nowak, "**High-Dimensional Matched Subspace Detection when Data are Missing**," Proceedings of the International Symposium on Information Theory (ISIT), June 2010.

51) L. Balzano and R. Nowak, "**Blind Calibration in Sensor Networks**," Proceedings of the Conference on Information Processing in Sensor Networks (IPSN) (Oral presentation 15%

acceptance), April 2007.

52) N. Ramanathan, L. Balzano, D. Estrin, T. Harmon, M. Hansen, J. Jay, B. Kaiser, and G. Sukhatme. "**Designing Wireless Sensor Networks as a Shared Resource for Sustainable Development**," Proceedings of the 1st International Conference on Information and Communication Technologies and Development, April 2006.

ABSTRACTS, BOOK CHAPTERS, AND OTHER PUBLICATIONS

1) G.S. Ledva, Z. Du, L. Balzano, and J. Mathieu, "**Disaggregating Load by Type from Distribution System Measurements in Real-Time**." Energy Markets and Responsive Grids: Modeling, Control, and Optimization, Sean Meyn, Tariq Samad, Sonja Glavaski, Ian Hiskens, and Jakob Stoustrup, editors. pp. 413-437. Springer, New York, NY, 2018.

2) D. Zhang, Y. Sun, B. Eriksson, and L. Balzano, "**Deep Unsupervised Clustering Using a Mixture of Autoencoders**." University of Michigan Tech Report at http://hdl.handle.net/2027.42/145190.

3) D. Zhang and L. Balzano, "**Convergence results of GROUSE**," Presented at Signal Processing with Adaptive Sparse Structured Representations (SPARS), June 2017.

4) J. Lipor and L. Balzano, "**Leveraging Union of Subspace Structure to Improve Constrained Clustering**," Presented at Signal Processing with Adaptive Sparse Structured Representations (SPARS), June 2017.

5) A. Eftekhari, L. Balzano, D. Yang, M. Wakin, "**SNIPE for Memory-Limited PCA From Incomplete Data: From Failure to Success**," Presented at Signal Processing with Adaptive Sparse Structured Representations (SPARS), June 2017.

6) D. Hong, L. Balzano, and J. Fessler, "**Theoretical Analysis of PCA with Heteroscedastic Data**," Presented at Signal Processing with Adaptive Sparse Structured Representations (SPARS), June 2017.

7) N. Farouk, M. Zhang, and L. Balzano, "**Ordinal Embedding with a Latent Factor Model**," University of Michigan Tech Report CSPL-420, March 2017.

8) B. Wong, B. Kerkez, J. Lipor, L. Balzano, and D. Scavia, "**Measuring the water quality of lakes using an internet-enabled robot**," Presented at the International Conference on Hydroinformatics, August 2016.

9) R. Kennedy, C.J. Taylor, and L. Balzano, "**Online Completion of Ill-Conditioned Low-Rank Matrices**," Signal Processing with Adaptive Sparse Structured Representations (SPARS), June 2015.

10) J. Lipor and L. Balzano, "**Quantile Search**," Signal Processing with Adaptive Sparse Structured Representations (SPARS), June 2015.

11) A. Russell-Graham, P. Xiao, S. Brown, and L. Balzano, "**Determination of Trends in Ozone in the Mid-Atlantic Using Non-Negative Matrix Factorization**," American Geophysical Union (AGU) Fall meeting, December 2014.

12) J. He, L. Balzano, and A. Szlam, "**Online Robust Background Modeling via Alternating Grassmannian Optimization**." Background Modeling and Foreground Detection for Video Surveillance, Thierry Bouwmans, editor. Chapman and Hall. July 2014.

13) L. Balzano, "**Handling Missing Data in High-Dimensional Subspace Modeling**," Ph.D. Thesis under the supervision of Professors Rob Nowak, Ben Recht, Barry Van Veen, Stark Draper, and Jordan Ellenberg. University of Wisconsin, Madison, May 2012.

14) L. Balzano, R. Nowak, A. Szlam and B. Recht, "**K-Subspaces with Missing Data**," University of Wisconsin Tech Report ECE-11-02, February 2011.

15) He, L. Balzano, A. Szlam, and J. C.S. Lui, "**Online Robust Subspace Tracking from Partial Information,**" Tech report; Arxiv version available at http://arxiv.org/abs/1109.3827

16) L. Balzano and J. Ellenberg, "**Understanding Persistent Homology and Plex using a Networking Dataset**," University of Wisconsin Tech Report, October 2010.

17) L. Balzano and R. Nowak, "**Blind Calibration of Networks of Sensors: Theory and Applications**," Networked sensing information and control, Venkatesh Saligrama, editor. Springer 2008.

18) L. Balzano, "**Addressing Fault and Calibration in Sensor Networks**," Masters Thesis

under the guidance of Professors Mani Srivastava, Mark Hansen, Greg Pottie and Steven Margulis. University of California, Los Angeles, March 2007.

19) N. Ramanathan, L. Balzano, M. Burt, D. Estrin, E. Kohler, T. Harmon, C. Harvey, J. Jay, S. Rothenberg, and M. Srivastava, "**Rapid Deployment with Confidence: Calibration and Fault Detection in Environmental Sensor Networks**," Center for Embedded Networked Sensing (CENS) Technical Report #62, April 2006.

TEACHING EXPERIENCE

Courses Taught

Term	Course number		Enrollment	Q1	Q2	Q4
WN 2013	EECS/IOE 600	Functional Analysis for Optimization	16	4.33	4.75	
FA 2013	EECS 451	Digital Signal Processing and Analysis	74	4.37	4.73	4.33
WN 2014	EECS 564	Estimation, Filtering, and Detection	40	4.25	4.50	4.50
FA 2014	EECS 451	Digital Signal Processing and Analysis	91	4.11	4.24	4.17
FA 2014	EECS/IOE 600	Functional Analysis for Optimization	17	4.50	4.50	4.50
FA 2015	EECS 351	Digital Signal Processing and Analysis	40	4.44	4.72	4.46
WN 2016	EECS 564	Estimation, Filtering, and Detection	37	4.64	4.83	4.59
FA 2016	EECS 351	Digital Signal Processing and Analysis	49	4.74	4.92	4.39
FA 2016	EECS/IOE 600	Functional Analysis for Optimization	24	4.17	4.40	4.58
FA 2018	EECS/IOE 600	Functional Analysis for Optimization	21	4.80	4.70	4.60
WN 2019	EECS 351	Digital Signal Processing and Analysis	59	4.50	4.70	4.10

Scores out of 5:
Q1: Overall, this is an excellent course.
Q2: Overall, Laura Balzano is an excellent teacher.
Q4: I have a strong desire to take this course.

Advisees

Zhe Du, co-advised by Necmiye Ozay joined July 2016.
Yutong Wang, co-advised by Clay Scott joined January 2017.
Amanda Bower, AIM student co-advised by Martin Strauss joined January 2017.
Kyle Gilman, joined September 2018.
Alex Ritchie, joined September 2018.

Dejiao Zhang, joined September 2013, proposal January 2018, Ph.D. defense May 2019.
"Extracting Compact Knowledge from Massive Data"
Next position: Applied research scientist at Amazon Web Services, New York

David Hong, co-advised by Jeffrey Fessler joined January 2015, proposal March 2017, Ph.D. defense March 2019.
"Learning Low-Dimensional Models for Heterogeneous Data"
Next position: Postdoctoral scholar at Penn – Wharton Statistics Department

John Lipor, joined September 2013, proposal November 2016, Ph.D. defense September 2017.
"*Sensing Structured Signals with Active and Ensemble Methods"*
Next position: Assistant Professor, Portland State University Electrical and Computer Engineering.

Postdoctoral Researchers

Haroon Raja joined August 2019.
Gregory Ongie, co-advised by Jeffrey Fessler September 2016 – July 2018.
Following position: Assistant Professor, Marquette University Math, starting fall 2020.

Undergraduate and Masters student Researchers

Pengyu Xiao, joined January 2014, M.S. completion May 2016.
Next position: Algorithm engineer at Jing Dong.

Short-term researchers: Richard Ortman, Pragya Agrawal, Steven Roudebush, Nora Farouk, Mingyuan (William) Zhang, Mostafa Shuva, Hana Baker, Richard Kim, Dengwang Tang, Junjie Dong, Chenlang Wang, Saket Dewangan, Andrew Gitlin, Akash Rastogi, Robert Malinas, Justin Malin, Shanthakumar Venkatraman, Zeyu Sun, Austin Xu

Outreach and extra-curricular

Faculty Advisor for Michigan IEEE student branch (2015-present) and MIDAS MSAIL artificial intelligence reading group (2017-present).
Supporting students in finding useful resources and helping maintain continuity across student officers.

NSF Research Experience for Undergrads (REU) advisor, 2019-present

AI4All University of Michigan presenter, 2019

Michigan Institute for Data Science (MIDAS) certificate student program, September 2016 – December 2018
Monthly meetings with the data science certificate students, working to build a community and culture of data science leadership at Michigan.

University of Michigan Pipeline Initiative and Wolverine Pathways, 2015
Working with local school districts, this program offers research-based study to underrepresented students and supports them through college admission. The program in 2015 included my lectures in machine learning, and ongoing programs include my material in a "computational thinking" module.

Michigan MSTEM Academies, June 2013
Visit with students in the MSTEM program as the transition from high school to STEM fields at the University of Michigan.

Undergraduate Research Opportunity Program, June 2014 – May 2016
Mentor undergraduate students on research activities.

Girls in EECS (GEECS) Student Group advisor, September 2013-September 2015

Delta Certificate Program for Research, Teaching and Learning in STEM fields, University of Wisconsin, June 2010 – June 2012
Studied research for teaching in the college classroom, for teaching international and diverse communities, and for motivating high school students' interest in STEM careers. Taught units of the college classroom course and taught to high school students at Madison La Follette HS

TALKS AND SEMINARS

Keynote and Plenary Talks

Environmental Protection Agency (EPA) Air Sensors Meeting, March 2013.

Selected Invited Seminars

- Princeton Colloquium Series for the Program in Applied and Computational Mathematics, February 2020
- Princeton Colloquium of the Operations Research and Financial Engineering, December 2019
- MiCHAMP Michigan Integrated Center for Health Analytics and Medical Prediction Seminar, February 2019.
- Berkeley Laboratory for Information Systems and Sciences (BLISS) Seminar, November 2018
- Simons Workshop on Robust High-Dimensional Statistics, November 2018.
- Simons Workshop on Randomized Numerical Linear Algebra and Applications, September 2018.
- ARO Workshop on Geometry of Information and Computation for Machine Learning, May 2018.
- Michigan Institute for Computational Discovery & Engineering (MICDE) Symposium speaker, April 2017.
- Toyota Technical Institute of Chicago Seminar, March 2017.
- Simons Interactive Learning Workshop, February 2017.
- Institute for Mathematics and its Applications (IMA) summer school on Mathematical Optimization, August 2016.
- Air Force Research Lab seminar, June 2016.
- Workshop for Geometry in Machine Learning at the International Conference on Machine Learning (ICML), June 2016.
- The Institute for Mathematics and its Applications (IMA) Workshop on Resource Tradeoffs: Computation, Communication, and Information, May 2016.
- IMA Workshop on Optimization and Parsimonious Modeling, January 2016

- Johns Hopkins Center for Imaging Science, May 2015.
- Annual Workshop on Data Science, Tennessee State University, April 2015.
- University of Chicago Computation Seminar, April 2015.
- Claremont McKenna Math department, February 2015.
- Workshop for Sparse Representations, Numerical Linear Algebra, and Optimization at the Banff International Research Station (BIRS), October 2014.
- Colorado School of Mines Center for Automation, Robotics, and Distributed Intelligence (CARDI) and the EECS department, August 2014.
- University of Michigan Applied Interdisciplinary Mathematics Seminar, March 2014.
- University of Michigan Statistics Colloquium, November 2013.
- Toyota Artificial Intelligence Seminar at Michigan, October 2013.
- University of Michigan Communications and Signal Processing seminar, February 2013.
- Adaptive Data Analysis and Sparsity workshop at the Institute for Pure and Applied Mathematics (IPAM), January 2013.

PROFESSIONAL ACTIVITIES AND SERVICE

Organizer / Program Committee

- Institute for Advanced Study Virtual Workshop on Missing Data Challenges in Statistics, Computation, and Applications, September 2020.
- IEEE Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP) - Special session on The Intersection of Optimization Theory and Information Processing, December 2019.
- Sampling Theory and Applications (SampTA) – conference session on Missing Data Imputation, July 2019.
- Neural Information Processing Systems (NeurIPS) – Senior program committee 2019.
- International Conference on Machine Learning (ICML) – Senior program committee 2019, Technical program committee 2017
- AI Stats - Senior program committee 2019, Technical program committee 2017-2018
- Midwest Machine Learning Workshop – Organizing committee 2017, 2019; Advisory Board 2018, 2020 (postponed)
- SPARS - Technical Program Committee 2015, 2017, 2019
- IEEE Workshop on Statistical Signal Processing (SSP) – Technical program committee 2018
- Michigan Statistical Machine Learning Reading Group (SMLRG) Workshop - Organizer 2014-2018
- Asilomar - Special Session Chair for the session on Structured Matrix and Covariance Recovery within the track on Signal Processing and Adaptive Systems 2017
- Pulsar Information Processing Workshop – Lead organizer (concurrent with SPARS) 2017
- SIAM Optimization - Minisymposium on Non-convex Methods Organizer 2017
- Neural Information Processing Systems (NIPS) – Technical program committee 2016
- IEEE Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP) - Special session on Optimization and Adaptivity in Big Data Organizer 2015
- IEEE Conference on Global Signal and Information Processing (Global SIP) - Symposium on Information Processing and Big Data Organizer 2014; TPC 2013
- Institute for Pure and Applied Mathematics – Workshop on Adaptive Data Sparsity and Analysis Organizer 2013

Department Service

- Computer Engineering Undergraduate Advisor, 2015-present.
- Graduate Admissions Committee, 2013-present.

Contributor / Panelist

- Midwest Machine Learning workshop panel, 2017-2018.
- Information Theory Summer School panel at the University of Toronto, June 2014.
- Girls in EECS (GEECS) panel for high school workshop for Girls Who Code, Nov 2013.
- Matrix Computations (Golub and Van Loan) version 4. Contributed problem 6.4.8. 2012.
- Volunteer for the UW Oral History project series on Women in Science and Engineering. 2008-2012.
- Institute for Pure and Applied Mathematics (IPAM) 2011 Newsletter.
- NPR All Tech Considered, *The path from syphilis to faster MRIs* by Art Silverman. Contributed audio demo, details at http://www.ece.umich.edu/~girasole/csaudio. 2010

Senior Member, IEEE, Signal Processing Society
Member, SIAM, Optimization Society