

Contact Information

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Research Interests

- Low-dimensional models
- Random matrix theory
- Tensor decompositions
- Inverse problems
- Medical imaging reconstruction

Education

- University of Michigan, Ann Arbor, MI, USA
 - Ph.D. Electrical Engineering: Systems
Awarded: May 2019
Thesis title: Learning Low-Dimensional Models for Heterogeneous Data
Co-advised by: Laura Balzano and Jeffrey A. Fessler
 - M.S. Electrical Engineering: Systems
Awarded: December 2015
Cumulative GPA: 4.0
- Duke University, Durham, NC, USA
 - B.S., Electrical and Computer Engineering, Mathematics
Awarded: May 2013
Cumulative GPA: 3.9 (Summa Cum Laude)
- NC School of Science and Mathematics (NCSSM), Durham, NC, USA
 - High School Diploma
Awarded: June 2009
Unweighted GPA: 4.0

Positions

Fall 2019 – Current	Postdoctoral Scholar, Department of Statistics, University of Pennsylvania
Fall 2013 – Summer 2019	Research Assistant in Systems Group, University of Michigan
Summer 2017	Data Science Graduate Summer Intern at Sandia National Labs (mentored by: Clifford Anderson-Bergman and Tamara G. Kolda)
Fall 2012 – Spring 2013	Research Assistant in Sensor Array and Multipath Group, Duke University
Summer 2011	Robotics Instructor at Hyde Park Primary School, Cape Town, South Africa
Summer 2009	Internship in the Base Table Group, SAS World Headquarters

Affiliations

2019 – Current	American Statistical Association (ASA)
2018 – Current	European Association for Signal Processing (EURASIP)
2017 – Current	Institute of Electrical and Electronics Engineers (IEEE)

2017 – Current	Society for Industrial and Applied Mathematics (SIAM)
2016 – Current	Phi Kappa Phi Honor Society
2012 – Current	Tau Beta Pi Engineering Honor Society
2012 – Current	IEEE-Eta Kappa Nu Honor Society

Honors

2018	Electrical and Computer Engineering Graduate Student Instructor Award (University of Michigan)
2017	Richard and Eleanor Towner Prize for Outstanding Ph.D. Research (University of Michigan)
2017	Most Innovative Use of Data at the University of Michigan Data Science Symposium (MIDAS Symposium)
2017	Best in Show Individual Poster at the Sandia National Labs (CA) Student Intern Symposium
2017	Departmental Poster Presentation Winner for EECS at the Michigan Student Symposium for Interdisciplinary Statistical Sciences (MSSISS)
2016	Most Interesting Methodological Advancement at the University of Michigan Data Science Symposium (MIDAS Symposium)
2016	Session award for (SIC) Signal and Image Processing at the University of Michigan Engineering Graduate Symposium
2016	Induction into the Phi Kappa Phi Honor Society
2014	National Science Foundation Graduate Research Fellowship
2013	University of Michigan Rackham Merit Fellowship
2012	Induction into the Tau Beta Pi Engineering Honor Society
2012	Induction into the IEEE-Eta Kappa Nu Honor Society
2011	Volunteer of the Month Award from ProjectsAbroad: South Africa
2009	Benjamin N. Duke Scholarship (Full Scholarship)
2009	National Merit Scholarship
2008	Fred Fletcher Outstanding Volunteer Project from the City of Raleigh
2007	Rank of Eagle Scout from the Boy Scouts of America

Journal papers (* = equal contributors)

Optimally Weighted PCA for High-Dimensional Heteroscedastic Data. David Hong, Jeffrey A. Fessler, Laura Balzano. *In preparation*. <https://arxiv.org/abs/1810.12862>

Stochastic Gradients for Large-Scale Tensor Decomposition. Tamara G. Kolda, David Hong. *Under review*. 2019. <https://arxiv.org/abs/1906.01687>

Subspace Clustering using Ensembles of K-Subspaces. John Lipor*, David Hong*, Yan Shuo Tan, Laura Balzano. *Under review*. 2018. <https://arxiv.org/abs/1709.04744>

Convolutional Analysis Operator Learning: Dependence on Training Data. Il Yong Chun*, David Hong*, Ben Adcock, Jeffrey A. Fessler. *IEEE Signal Processing Letters*, 26(8), 1137-1141. 2019. <https://doi.org/10.1109/lsp.2019.2921446>

Generalized Canonical Polyadic Tensor Decomposition. David Hong, Tamara G. Kolda, Jed A. Duersch. *Accepted, to appear in SIAM Review*. 2018. <https://arxiv.org/abs/1808.07452>

Asymptotic performance of PCA for high-dimensional heteroscedastic data. David Hong, Laura Balzano, Jeffrey A. Fessler. *Journal of Multivariate Analysis*, 167, 435-452. 2018. <https://doi.org/10.1016/j.jmva.2018.06.002>

Closed-Form Expressions for Minimizing Total Harmonic Distortion in Three-Phase Multilevel Converters. David Hong, Sanzhong Bai, Srdjan M. Lukic. *IEEE Transactions on Power Electronics*, 29(10), 5229-5241. 2014. <https://doi.org/10.1109/TPEL.2013.2290377>

Conference papers

Tensor Completion-based Baseline Estimation of Commercial Building HVAC Fan Power. Shunbo Lei, David Hong, Johanna L. Mathieu, Ian A. Hiskens. *Under review*.

Probabilistic PCA for heteroscedastic data. David Hong, Laura Balzano, Jeffrey A. Fessler. *Accepted to the 8th IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP 2019)*.

Incorporating handcrafted filters in convolutional analysis operator learning for ill-posed inverse problems. Caroline Crockett, David Hong, Il Yong Chun, Jeffrey A. Fessler. *Accepted to the 8th IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP 2019)*.

Exploration of tensor decomposition applied to commercial building baseline estimation. David Hong, Shunbo Lei, Johanna L. Mathieu, Laura Balzano. *Accepted to the 7th IEEE Global Conference on Signal and Information Processing (GlobalSIP 2019)*.

Learning Dictionary-Based Unions of Subspaces for Image Denoising. David Hong, Robert P. Malinas, Jeffrey A. Fessler, Laura Balzano. *Presented at the 26th European Signal Processing Conference (EUSIPCO 2018)*. [invited paper] <https://doi.org/10.23919/EUSIPCO.2018.8553117>

Online Estimation of Coherent Subspaces with Adaptive Sampling. Greg Ongie, David Hong, Dejjiao Zhang, Laura Balzano. *Proceedings of the 2018 IEEE Statistical Signal Processing Workshop (SSP)*. <https://doi.org/10.1109/SSP.2018.8450830>

Enhanced Online Subspace Estimation via Adaptive Sensing. Greg Ongie, David Hong, Dejjiao Zhang, Laura Balzano. *Proceedings of the 2017 51st Asilomar Conference on Signals, Systems and Computers*. <http://doi.org/10.1109/ACSSC.2017.8335497>

Towards a Theoretical Analysis of PCA for Heteroscedastic Data. David Hong, Laura Balzano, Jeffrey A. Fessler. *Proceedings of the 54th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*. 2016. <http://doi.org/10.1109/ALLERTON.2016.7852272>

Exploiting HF Ambient Noise to Synchronize Distributed Receivers. David Hong and Jeffrey L. Krolik. *Proceedings of the 2013 US National Committee of URSI National Radio Science Meeting (USNC-URSI NRSM)*. 2013. <http://doi.org/10.1109/USNC-URSI-NRSM.2013.6525144>

Posters and Talks at Conferences, Workshops and Symposiums

Probabilistic PCA for Heteroscedastic Data *8th IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*. 2019.

Incorporating handcrafted filters in convolutional analysis operator learning for ill-posed inverse problems. *8th IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*. 2019.

Understanding parallel analysis methods for rank selection in PCA. *Random Matrices and Complex Data Analysis Workshop*. 2019.

Exploration of tensor decomposition applied to commercial building baseline estimation. *7th IEEE Global Conference on Signal and Information Processing*. 2019.

Asymptotic eigenstructure of weighted sample covariance matrices for large dimensional low-rank models with heteroscedastic noise. *Workshop on Higher-Order Asymptotics and Post-Selection Inference*. 2019.

Optimally Weighted PCA for High-Dimensional Heteroscedastic Data. *Information Theory and Applications Workshop*. 2019.

Learning Dictionary-Based Unions of Subspaces for Image Denoising. *26th European Signal Processing Conference*. 2018.

Online Estimation of Coherent Subspaces with Adaptive Sampling. *IEEE Statistical Signal Processing Workshop*. 2018.

Optimally Weighted PCA for High-Dimensional Heteroscedastic Data. *University of Michigan Engineering Graduate Symposium*. 2017.

Optimally Weighted PCA for High-Dimensional Heteroscedastic Data. *University of Michigan Data Science Symposium (MIDAS Symposium)*. 2017.

Generalized Tensor Decompositions. *Sandia National Labs (CA) Student Intern Symposium*. 2017.

Theoretical Analysis of PCA for Heteroscedastic Data. *The Signal Processing with Adaptive Sparse Structured Representations (SPARS) Workshop*. 2017.

Asymptotic Performance of PCA for High-Dimensional Heteroscedastic Data. *Michigan Student Symposium for Interdisciplinary Statistical Sciences (MSSISS)*. 2017.

Predicting the asymptotic performance of rank-1 PCA with heteroscedastic data. *University of Michigan Data Science Symposium (MIDAS Symposium)*. 2016.

Predicting the asymptotic performance of rank-1 PCA with heteroscedastic data. *University of Michigan Engineering Graduate Symposium*. 2016.

Towards a Theoretical Analysis of PCA for Heteroscedastic Data. *2016 54th Annual Allerton Conference on Communication, Control, and Computing*. 2016.

A weighted PCA method for subspace estimation from heterogeneous data. *University of Michigan Statistical Machine Learning Student Workshop*. 2016.

Adaptive Dictionary Learning with Training Images for Image Formation. *University of Michigan Statistical Machine Learning Student Workshop*. 2015.

Exploiting HF Ambient Noise to Synchronize Distributed Receivers. *2013 US National Committee of URSI National Radio Science Meeting (USNC-URSI NRSM)*. 2013.

Minimizing 3-Phase THD in Inverters under Step Modulation. *US-Korea Conference on Science, Technology and Entrepreneurship of the Korean-American Scientists and Engineers Association*. 2010.

Talks at Institutions

Performance of PCA for High Dimensional Heteroscedastic Data. *University of Chicago, Department of Statistics, HELIOS Reading Group*. 2017.

Performance of PCA for High Dimensional Heteroscedastic Data. *Duke University, ECE Seminar*. 2017.

Towards a Theoretical Analysis of PCA for Heteroscedastic Data. *University of Chicago, Department of Statistics, Student Seminar*. 2016.

Towards a Theoretical Analysis of PCA for Heteroscedastic Data. *Shanghai Jiao Tong University, UM-SJTU Joint Institute*. 2016.

Exploiting HF Ambient Noise to Synchronize Distributed Receivers. *North Carolina State University, Applied Math Club*. 2013.

Local Talks

Optimally Weighted PCA for High-Dimensional Heteroscedastic Data. *University of Michigan, Fessler Group Meeting*. 2018.

Learning Dictionary-Based Unions of Subspaces for Image Denoising. *University of Michigan, Fessler Group Meeting*. 2018.

Optimally Weighted PCA for High-Dimensional Heteroscedastic Data. *University of Michigan, Statistics Student Seminar Series*. 2018.

Generalized CP Tensor Decompositions. *University of Michigan, Michigan Data Science Team Invited Talk*. 2018.

Optimally Weighted PCA for High-Dimensional Heteroscedastic Data. *University of Michigan, Fessler Group Meeting*. 2018.

Generalized CP Tensor Decompositions. *University of Michigan, Fessler Group Meeting*. 2017.

Generalized CP Tensor Decompositions. *University of Michigan, Student Applied Math Seminar*. 2017.

Generalized CP Tensor Decompositions. *SPADA Lab Meeting*. 2017.

Generalized CP Tensor Decompositions. *Sandia National Labs (CA)*. 2017.

Performance of PCA for High Dimensional Heteroscedastic Data. *Sandia National Labs (CA)*. 2017.

Theoretical Analysis of PCA for Heteroscedastic Data. *Fessler Group Meeting*. 2017.

Towards a Theoretical Analysis of PCA for Heteroscedastic Data. *University of Michigan SPEecs Signal Processing Student Seminar*. 2016.

Towards a Theoretical Analysis of PCA for Heteroscedastic Data. *University of Michigan, Student Applied Math Seminar*. 2016.

Towards a Theoretical Analysis of PCA for Heteroscedastic Data. *Fessler Group Meeting*. 2016.

Adaptive Dictionary Learning with Training Images for Image Formation. *University of Michigan SPEecs Signal Processing Student Seminar*. 2015.

Review of DLMRI and Potential Extensions. *Fessler Group Meeting*. 2015.

Distributed Receiver Synchronization using Ambient Noise. *Research Experience for Undergraduates (REU) Final Presentations, Duke University*. 2012.

Finite Expressions for 3-Phase Total Harmonic Distortion in Staircase Waveforms. *Korean-American Scientists and Engineers Association South-Atlantic Regional Conference (SARC)*. 2011.

Teaching Assistantships

Spring 2018 EECS551/598: Computational Data Science,
Department of Electrical Engineering and Computer Science, University of Michigan

Fall 2017 EECS551: Matrix Methods for Signal Processing, Data Analysis & Machine Learning,
Department of Electrical Engineering and Computer Science, University of Michigan

Fall 2016 EECS551: Matrix Methods for Signal Processing, Data Analysis & Machine Learning,
Department of Electrical Engineering and Computer Science, University of Michigan

Spring 2013 ECE280: Introduction to Signals and Systems,
Department of Electrical and Computer Engineering, Duke University

Technical Skills

Programming: Assembly, Shell Script, Visual Basic, PBASIC, Python, C/C++, Java, MATLAB, Octave, Julia, Maple, SAS DATA Step/TSPL, LabView, MultiSim, VHDL, HTML, CSS, JavaScript, PHP, SQL

Software: GIMP, Photoshop, Inkscape, Scribus, \LaTeX , LyX, Scientific Workplace, Office Suite, Audacity, LoggerPro 3.5.0, Graphical Analysis

Hardware: Analog Circuitry, Digital Circuitry, Spectrum Analyzer, Logic Analyzer, Oscilloscope, Multi-meter, Function Generator, Power Supply