

University of Michigan
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WORK EXPERIENCE

- Postdoctoral Research Fellow, University of Michigan, Ann Arbor** April 2016 – present
Supervisors: [Alfred Hero](#) and [Indika Rajapakse](#)
- Data Science PhD Intern, Huawei R&D USA, Bridgewater, NJ** June 2015 – Aug. 2015
Mentor: Kai Yang, Director: Jin Yang
- Research Asistant, Syracuse University, Syracuse, NY** Sept. 2011 – Mar. 2016
Advisors: [Pramod K. Varshney](#) and [Makan Fardad](#)

EDUCATION

- Ph.D. in Electrical and Computer Engineering, Syracuse University** Mar. 2016
Thesis: “Resource management for distributed estimation via sparsity-promoting regularization”
(**All University Doctoral Prize**)
Advisors: [Pramod K. Varshney](#) and [Makan Fardad](#)
- M.S. in Electrical Engineering, Xi’an Jiaotong University** May 2011
- B.S. in Electrical Engineering, Xi’an Jiaotong University** May 2008

RESEARCH INTERESTS

Machine learning: Graphical model, multi-view learning, neural networks, GAN
Optimization: Distributed optimization, online zero-order optimization, optimization for AI
Computational biology: 4D Nucleome, cellular reprogramming, system biology
Data Science: Time-series data analysis, data over graphs, graph mining, community detection
Statistical signal processing: Estimation/detection, object tracking, filtering, information fusion

RESEARCH EXPERIENCE

- Postdoctoral Research Fellow, University of Michigan** April 2016 – present
- Distributed learning & online zero-order (gradient free) optimization
 - Optimization for AI and deep learning
 - Genomic data science and system biology
 - Probabilistic graphical model to build chemical reaction mechanisms
 - Signal processing over graphs/networks
 - 4 journals, 4 conferences
- Data Science PhD Intern, Huawei R&D USA, Bridgewater, NJ** June 2015 – Aug. 2015
- Anomaly root cause analysis in communication networks**
- Data-driven anomaly demarcation and root cause analysis
 - Root cause analysis via denoising autoencoder using neural networks
 - Delivered R package and 1 patent
- Research Assistant, Syracuse University** Sept. 2011 – Mar. 2016
- Sparsity-aware optimization for resource management**
- Collaborators: [Geert Leus](#) (TU Delft), [Engin Masazade](#) (Yeditepe Univ.)

- Strike balance between inference accuracy and resource usage
- Adaptive resource management via design of sparsity-promoting learning systems
- 5 journals, 7 conferences

Sensor collaboration for message passing over networks

Collaborator: [Swarnendu Kar](#) (Intel), [Yanzhi Wang](#) (Syr.), [Vinod Sharma](#) (Indian Institute of Science)

- Power-efficient communication schemes for sensor collaboration
- Online power allocation with energy harvesting constraints
- 5 journals, 5 conferences

Memristor-based optimization and learning framework

Collaborator: [Yanzhi Wang](#) (Syr.)

- Design optimization solver using memristor crossbar arrays
- Algorithm-hardware co-optimization for linear and quadratic programming
- Ultra-efficient hardware architecture for compressive sensing via memristor crossbars
- 2 conferences

SCHOLASTIC ACHIEVEMENTS

- **Winner of Best Student Paper Award** (3rd place), The 42nd IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), New Orleans, 2017
- **Recipient of All University Doctoral Prize**, Syracuse University, 2016
- **Signal Processing Society Travel Grant Award** at IEEE ICASSP'15, Australia, 2015
- **Best Student Paper Nominee** (among the seven finalists) at Asilomar Conference on Signals, Systems, and Computers, CA, Pacific Grove, CA, 2013
- **Winner of Best Poster Award** at Nunan Poster Competition, Syracuse University, 2012
- **Outstanding Graduate Student**, Xi'an Jiaotong University, 2011

PUBLICATIONS

JOURNALS

- [1] **S. Liu**, H. Chen, S. Ronquist, L. Seaman, N. Ceglia, W. Meixner, L. A. Muir, P.-Y. Chen, G. Higgins, P. Baldi, S. Smale, A. O. Hero, I. Rajapakse, "Genome Architecture Leads a Bifurcation in Cell Identity," submitted to *Cell*, 2017, <http://biorxiv.org/content/early/2017/06/19/151555>
- [2] **S. Liu**, P.-Y. Chen and A. O. Hero, "Accelerated Distributed Optimization for Evolving Networks of Growing Connectivity", submitted to *IEEE Trans. Signal Process.*, 2017, <https://arxiv.org/abs/1704.05193>
- [3] S. Zhang, **S. Liu**, V. Sharma and P. K. Varshney, "Optimal Sensor Collaboration for Parameter Tracking Using Energy Harvesting Sensors," submitted to *IEEE Trans. Signal Process.*, 2017
- [4] K. Yang, L. Jiang, S. Low, **S. Liu** and S. Zhao, "Energy Procurement and Demand Response with Fast Convergence for Smart Grid with Renewables," submitted to *IEEE Transactions on Network Science and Engineering*, 2017
- [5] P.-Y. Chen and **S. Liu**, "Bias-Variance Tradeoff of Graph Laplacian Smoothing Regularizer", *IEEE Signal Process. Lett.*, 2017
- [6] H. Chen, L. Seaman, **S. Liu**, T. Ried, and I. Rajapakse, "Chromosome conformation and gene expression patterns differ profoundly in human fibroblasts grown in spheroids versus monolayers," *Nucleus*, 2017
- [7] **S. Liu**, S. Kar, M. Fardad and P. K. Varshney, "Optimized Sensor Collaboration for Estimation of Temporally Correlated Parameters", *IEEE Trans. Signal Process.*, 2016

- [8] B. Kailkhura, **S. Liu**, T. Wimalajeewa and P. K. Varshney, “Measurement Matrix Design for Compressive Detection with Secrecy Guarantees”, *IEEE Wireless Commun. Lett.*, 2016
- [9] **S. Liu**, S. P. Chepuri, M. Fardad, E. Masazade, G. Leus and P. K. Varshney, “Sensor Selection for Estimation with Correlated Measurement Noise”, *IEEE Trans. Signal Process.*, 2016
- [10] **S. Liu**, S. Kar, M. Fardad and P. K. Varshney, “Joint Design of Optimal Sensor Selection and Collaboration Strategies for Distributed Estimation,” *IEEE Communications Society MMTC Communications - Frontiers*, 2016
- [11] **S. Liu**, S. Kar, M. Fardad and P. K. Varshney, “Sparsity-Aware Sensor Collaboration for Linear Coherent Estimation”, *IEEE Trans. Signal Process.*, 2015
- [12] **S. Liu**, A. Vempaty, M. Fardad, E. Masazade and P. K. Varshney, “Energy-Aware Sensor Selection in Field Reconstruction,” *IEEE Signal Process. Lett.*, 2014
- [13] X. Shen, **S. Liu** and P. K. Varshney, “Sensor Selection for Nonlinear Systems in Large Sensor Networks,” *IEEE Trans. Aerosp. Electron. Syst.*, 2014
- [14] **S. Liu**, M. Fardad, E. Masazade and P. K. Varshney, “Optimal Periodic Sensor Scheduling in Large-Scale Dynamical Networks,” *IEEE Trans. Signal Process.*, 2014

CONFERENCES – REFEREED PROCEEDINGS

- [1] T. P. Xie, **S. Liu**, and A. O. Hero, “Semiblind Subgraph Reconstruction in Gaussian Graphical Models,” submitted to *GlobalSIP*, 2017
- [2] **S. Liu**, A. Ren, Y. Wang and P. K. Varshney, ”Ultra-Fast Robust Compressive Sensing Based on Memristor Crossbars,” *ICASSP*, 2017 (Winner of Best Student Paper Award)
- [3] **S. Liu**, P.-Y. Chen and A. O. Hero, ”Distributed Optimization for Evolving Networks of Growing Connectivity,” *ICASSP*, 2017
- [4] **S. Liu**, S. P. Chepuri, G. Leus and A. O. Hero, ”Distributed Sensor Selection for Field Estimation,” *ICASSP*, 2017
- [5] S. P. Chepuri, **S. Liu**, G. Leus and A. O. Hero, ”Learning Sparse Graphs Under Smoothness Prior,” *ICASSP*, 2017
- [6] A. Ren, **S. Liu**, R. Cai, P. K. Varshney and Y. Wang, “Algorithm-Hardware Co-Optimization of Memristor Crossbar-Based Framework for Solving SOCP and Homogeneous QCQP Problems,” *ASP-DAC*, 2016
- [7] **S. Liu**, N. Cao and P. K. Varshney, “Sensor Placement for Field Estimation via Poisson Disk Sampling,” *GlobalSIP*, 2016
- [8] **S. Liu**, V. Sharma and P. K. Varshney, “Towards An Online Energy Allocation Policy for Distributed Estimation with Sensor Collaboration Using Energy Harvesting Sensors,” *GlobalSIP*, 2016
- [9] **S. Liu**, Y. Wang, M. Fardad and P. K. Varshney, “Optimal Energy Allocation and Storage Control for Distributed Estimation with Sensor Collaboration,” *CISS*, 2016
- [10] **S. Liu**, S. Kar, M. Fardad and P. K. Varshney, “On Optimal Sensor Collaboration for Distributed Estimation with Individual Power Constraints,” *Asilomar*, 2015
- [11] V. S. S. Nadendla, **S. Liu** and P. K. Varshney, “On Enhancing Secrecy in Centralized Detection using Transmit-Beamforming with Artificial Noise,” *Allerton*, 2015
- [12] **S. Liu**, F. Chen, A. Vempaty, M. Fardad and P. K. Varshney, “Sparsity-Promoting Sensor Management for Estimation: An Energy Balance Point of View,” *FUSION*, 2015

- [13] **S. Liu**, E. Masazade, M. Fardad and P. K. Varshney, “Sensor Selection with Correlated Measurements for Target Tracking in Wireless Sensor Networks”, *ICASSP*, 2015 (**IEEE SPS Travel Grant Award**)
- [14] **S. Liu**, M. Fardad, S. Kar and P. K. Varshney, “On Optimal Sensor Collaboration Topologies for Linear Coherent Estimation,” *ISIT*, 2014
- [15] **S. Liu**, E. Masazade, M. Fardad and P. K. Varshney, “Sparsity-Aware Field Estimation via Ordinary Kriging,” *ICASSP*, 2014
- [16] **S. Liu**, M. Fardad, E. Masazade and P. K. Varshney, “On Optimal Periodic Sensor Scheduling for Field Estimation in Wireless Sensor Networks,” *GlobalSIP*, 2013
- [17] **S. Liu**, E. Masazade, X. Shen and P. K. Varshney, “Adaptive Non-Myopic Quantizer Design for Target Tracking in Wireless Sensor Networks,” *Asilomar*, 2013 (**Best Student Paper Nominee**)
- [18] **S. Liu**, E. Masazade, and P. K. Varshney, “Temporally Staggered Sensing for Field Estimation with Quantized Data in Wireless Sensor Networks, *SSP*, 2012

PATENT

- [1] K. Yang and **S. Liu**, “System and Method for Analyzing A Root Cause of Anomalous Behavior Using Hypothesis Testing,” U.S. Patent Application #14/991685, filed Dec. 2015.

SELECTED PRESENTATIONS

- [1] *Zero-order online ADMM*, University of Michigan, Ann Arbor, June 2017
- [2] *Data-enabled graphical model to build chemical reaction mechanisms*, The Michigan Institute for Computational Discovery and Engineering Symposium, Ann Arbor, April 2017
- [3] *An algorithm for cellular reprogramming*, DARPA meeting, Carnegie Mellon University, April 2017
- [4] *Sparsity and sparsity-inducing optimization*, Lecture for Sparse Learning, Syracuse University, March 2016
- [5] *Sparsity-promoting techniques in sensor management*, Symposium for Cognitive Wireless Systems & Networks, Syracuse University, March 2014
- [6] *Temporally staggered sensing for field estimation*, Nunan Poster Competition, Syracuse University, March 2012

PROGRAMMING SKILLS

- R, MATLAB, C/C++, VHDL, Windows, Linux, MacOS

SERVICE & PROFESSIONAL ACTIVITIES

- **Vice-chair** for *IEEE ComSoc Technical Committee of Cognitive Networks Special Interest Group (SIG) on AI Embedded Cognitive Networks*
- **TPC member** for *2017 IEEE Global Conference on Signal and Information Processing (GlobalSIP 2017) on Distributed Optimization and Resource Management over Networks*
- **Member**: IEEE, IEEE Signal Processing Society, IEEE Communications Society, IEEE Information Theory Society, IEEE Control Systems Society
- **Referee for journals**: *IEEE Transactions on Information Theory, IEEE Transactions on Signal Processing, IEEE Transactions on Wireless Communications, IEEE Transactions on Automatic Control, Information Fusion, IFAC Journal of Automatica, IEEE Sensors Journal, Springer Journals on Wireless Networks, Elsevier Journals on Digital Communications and Networks*
- **Referee for conferences**: *INFOCOM, ISIT, ICASSP, CDC, ACC, Fusion, GlobalSIP, VTC*

VISA TYPE

- F1-OPT

REFERENCES

- [Alfred Hero](#), Professor, IEEE Fellow, University of Michigan, Ann Arbor, USA
- [Indika Rajapakse](#), Assistant Professor, University of Michigan, Ann Arbor, USA
- [Pramod K. Varshney](#), Professor, IEEE Fellow, Syracuse University, USA
- [Makan Fardad](#), Assistant Professor, Syracuse University, USA
- [Geert Leus](#), Professor, IEEE Fellow, Delft University of Technology, The Netherlands