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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 Assistant, 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

Optimization: distributed optimization, gradient-free optimization, non-convex optimization
Machine learning: online learning, graphical model, factor analysis, neural networks
Computational biology: genome architecture and transcription, system biology, cell reprogramming
Data science: time-series data analytics, graph and network analytics
Network science: communication networks, biological networks, multi-layer networks
Signal processing: estimation/detection, object tracking, filtering, information fusion

RESEARCH EXPERIENCE

Postdoctoral Research Fellow, University of Michigan April 2016 – present

Distributed optimization and online learning

Collaborators: [Alfred Hero](#) (UofM), [Pin-Yu Chen](#) (IBM)

- Decentralized network topology estimation
- Accelerated distributed optimization over well-designed networks
- Online zeroth-order alternating direction method of multipliers
- Selected publications: [[C1](#), [C5](#), [J2](#), [C9](#)]

Multilayer network analysis of genomic form and function

Collaborators: [Indika Rajapakse](#) (UofM), [Alfred Hero](#) (UofM), [Stephen Smale](#) (UCB)

- Devise algorithm for cellular reprogramming
- Understand genome architecture and function during cell fate decision
- Analyze allele-specific human genome during the cell cycle
- Selected publications: [[C4](#), [J3](#), [J4](#), [J5](#)]

Graph signal processingCollaborators: [Alfred Hero](#) (UofM), [Geert Leus](#) (TU Delft)

- Semiblind graph reconstruction using incomplete information
- Learning sparse graphs under smoothness prior
- Selected publications: [[B1](#), [J6](#), [C6](#), [C10](#)]

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
- Publication: patent [[P1](#)] with released R package

Research Assistant, Syracuse University Sept. 2011 – Mar. 2016**Sparsity-aware optimization for resource management**Collaborators: [Pramod K. Varshney](#) (Syr.), [Makan Fardad](#) (Syr.)

- Strike balance between inference accuracy and resource usage
- Adaptive resource management via design of sparsity-promoting learning systems
- Selected publications: [[J10](#), [J14](#), [J15](#), [J16](#)]

Sensor collaboration for message passing over networksCollaborators: [Pramod K. Varshney](#) (Syr.), [Makan Fardad](#) (Syr.)

- Power-efficient communication schemes for sensor collaboration
- Online power allocation with energy harvesting constraints
- Selected publications: [[J7](#), [J9](#), [J13](#)]

Memristor-based optimization and learning frameworkCollaborators: [Pramod K. Varshney](#) (Syr.), [Makan Fardad](#) (Syr.), [Yanzhi Wang](#) (Syr.)

- Algorithm-hardware co-optimization for mathematical programming
- Sparse learning using memristor crossbars
- Selected publications: [[J1](#), [C11](#), [C7](#)]

SCHOLASTIC ACHIEVEMENTS

- **Winner of Best Student Paper Award**, the 42nd IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2017
- **Recipient of All University Doctoral Prize**, Syracuse University, 2016
- **Signal Processing Society Travel Grant Award** at IEEE ICASSP, 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/EQUAL-QUALITY PUBLICATIONS*****Optimization for machine learning***

- [C1] **S. Liu**, J. Chen, P.-Y. Chen and A. O. Hero, “Zeroth-Order Online Alternating Direction Method of Multipliers: Convergence Analysis and Applications,” submitted to *International Conference on Artificial Intelligence and Statistics (AISTATS) 2018*, <https://arxiv.org/abs/1710.07804>

- [J1] **S. Liu**, Y. Wang, M. Fardad and P. K. Varshney, “A Memristor-Based Optimization Framework for Artificial Intelligence Applications,” *IEEE Circuits and Systems Magazine*, in press, <https://arxiv.org/abs/1710.08882>
- [J2] **S. Liu**, P.-Y. Chen and A. O. Hero, “Accelerated Distributed Optimization for Evolving Networks of Growing Connectivity”, *IEEE Trans. Signal Process.*, under review, 2017, <https://arxiv.org/abs/1704.05193>

Computational biology

- [J3] H. Chen*, **S. Liu***, L. Seaman, C. Najaria, W. Wu, A. O. Hero, M. Wicha and I. Rajapakse, “Parental allele-specific genome architecture and transcription during the cell cycle,” to be submitted to *Nature Genetics*, 2017 (* co-first authors) <https://www.biorxiv.org/content/early/2017/10/11/201715>
- [J4] **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 and I. Rajapakse, “Genome Architecture Leads a Bifurcation in Cell Identity,” *Nature Communications*, under review, 2017, <http://biorxiv.org/content/early/2017/06/19/151555>
- [J5] 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

Graph signal processing

- [B1] B. Oselio, **S. Liu** and Alfred O. Hero, “Multi-layer Social Networks”, book chapter in *Cooperative and Graph Signal Processing: Principles and Applications*, Elsevier, 2017
- [J6] P.-Y. Chen and **S. Liu**, “Bias-Variance Tradeoff of Graph Laplacian Smoothing Regularizer”, *IEEE Signal Process. Lett.*, 2017

Optimization in signal processing and communications

- [J7] S. Zhang, **S. Liu**, V. Sharma and P. K. Varshney, “Optimal Sensor Collaboration for Parameter Tracking Using Energy Harvesting Sensors,” *IEEE Trans. Signal Process.*, under review, 2017
- [J8] K. Yang, L. Jiang, S. Low, **S. Liu** and S. Zhao, “Energy Procurement and Demand Response with Fast Convergence for Smart Grid with Renewables,” *IEEE Transactions on Network Science and Engineering*, under review, 2017
- [J9] **S. Liu**, S. Kar, M. Fardad and P. K. Varshney, “Optimized Sensor Collaboration for Estimation of Temporally Correlated Parameters”, *IEEE Trans. Signal Process.*, 2016
- [J10] **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
- [J11] **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
- [J12] B. Kailkhura, **S. Liu**, T. Wimalajeewa and P. K. Varshney, “Measurement Matrix Design for Compressive Detection with Secrecy Guarantees”, *IEEE Wireless Commun. Lett.*, 2016
- [J13] **S. Liu**, S. Kar, M. Fardad and P. K. Varshney, “Sparsity-Aware Sensor Collaboration for Linear Coherent Estimation”, *IEEE Trans. Signal Process.*, 2015
- [J14] **S. Liu**, A. Vempaty, M. Fardad, E. Masazade and P. K. Varshney, “Energy-Aware Sensor Selection in Field Reconstruction,” *IEEE Signal Process. Lett.*, 2014
- [J15] X. Shen, **S. Liu** and P. K. Varshney, “Sensor Selection for Nonlinear Systems in Large Sensor Networks,” *IEEE Trans. Aerosp. Electron. Syst.*, 2014

- [J16] **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/WORKSHOPS

- [C2] F. Harirchi, O. A. Khalil, **S. Liu**, P. Elvati A. Violi and A. O. Hero, “A Data-Driven Sparse-Learning Approach to Model Reduction in Chemical Reaction Networks,” submitted to *NIPS workshop on Advances in Modeling and Learning Interactions using Complex Data*, 2017
- [C3] J. Chen, **S. Liu** and P.-Y. Chen, “Zeroth-Order Diffusion Adaptation over Networks,” submitted to *ICASSP’18*.
- [C4] **S. Liu**, P.-Y. Chen, I. Rajapakse and A. O. Hero, “First-Order Bifurcation Detection for Dynamic Complex Networks,” submitted to *ICASSP’18*.
- [C5] **S. Liu**, P.-Y. Chen, J. Chen and A. O. Hero, “Convergence Analysis of Zeroth-Order Online Alternating Direction Method of Multipliers,” to appear in *NIPS Workshop on Optimization for Machine Learning*, 2017.
- [C6] T. P. Xie, **S. Liu** and A. O. Hero, “Semiblind Subgraph Reconstruction in Gaussian Graphical Models,” *GlobalSIP*, 2017
- [C7] **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**)
- [C8] **S. Liu**, P.-Y. Chen and A. O. Hero, “Distributed Optimization for Evolving Networks of Growing Connectivity,” *ICASSP*, 2017
- [C9] **S. Liu**, S. P. Chepuri, G. Leus and A. O. Hero, “Distributed Sensor Selection for Field Estimation,” *ICASSP*, 2017
- [C10] S. P. Chepuri, **S. Liu**, G. Leus and A. O. Hero, “Learning Sparse Graphs Under Smoothness Prior,” *ICASSP*, 2017
- [C11] 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
- [C12] **S. Liu**, N. Cao and P. K. Varshney, “Sensor Placement for Field Estimation via Poisson Disk Sampling,” *GlobalSIP*, 2016
- [C13] **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
- [C14] **S. Liu**, Y. Wang, M. Fardad and P. K. Varshney, “Optimal Energy Allocation and Storage Control for Distributed Estimation with Sensor Collaboration,” *CISS*, 2016
- [C15] **S. Liu**, S. Kar, M. Fardad and P. K. Varshney, “On Optimal Sensor Collaboration for Distributed Estimation with Individual Power Constraints,” *Asilomar*, 2015
- [C16] V. S. S. Nadendla, **S. Liu** and P. K. Varshney, “Design of transmit-diversity schemes in detection networks under secrecy constraints,” *Allerton*, 2015
- [C17] **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
- [C18] **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**)
- [C19] **S. Liu**, M. Fardad, S. Kar and P. K. Varshney, “On Optimal Sensor Collaboration Topologies for Linear Coherent Estimation,” *ISIT*, 2014

- [C20] S. Liu, E. Masazade, M. Fardad and P. K. Varshney, “Sparsity-Aware Field Estimation via Ordinary Kriging,” *ICASSP*, 2014
- [C21] S. Liu, M. Fardad, E. Masazade and P. K. Varshney, “On Optimal Periodic Sensor Scheduling for Field Estimation in Wireless Sensor Networks,” *GlobalSIP*, 2013
- [C22] 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)
- [C23] S. Liu, E. Masazade, and P. K. Varshney, “Temporally Staggered Sensing for Field Estimation with Quantized Data in Wireless Sensor Networks, *SSP*, 2012

PATENT

- [P1] 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 INVITED TALKS AND PRESENTATIONS

- [1] *Zeroth-order online learning and bifurcation detection in cell reprogramming*, IBM T. J. Watson Research Center, NY, Oct. 2017
- [2] *Zeroth-order online ADMM*, University of Michigan, Ann Arbor, June 2017
- [3] *Data-enabled graphical model to build chemical reaction mechanisms*, The Michigan Institute for Computational Discovery and Engineering Symposium, Ann Arbor, April 2017
- [4] *An algorithm for cellular reprogramming*, Carnegie Mellon University, April 2017
- [5] *Sparsity and sparsity-inducing optimization*, Syracuse University, March 2016
- [6] *Sparsity-promoting techniques in sensor management*, Symposium for Cognitive Wireless Systems & Networks, Syracuse University, March 2014
- [7] *Temporally staggered sensing for field estimation*, Nunan Research Day, Syracuse University, March 2012

TEACHING EXPERIENCE

- Guest Lecturer for *Adaptive Learning (ELE 853)*, Syracuse University, Fall 2015
- Guest Lecturer for *Advanced Numerical Methods II (MAT 781)*, Syracuse University, Fall 2014
- Guest Lecturer for *Optimal Control Systems (ELE 712)*, Syracuse University, Fall 2013
- Guest Lecturer for *Detection and Estimation (ELE 851)*, Syracuse University, Fall 2012
- Teaching Assistant for *Multi-Source Information Fusion*, Xi’an Jiaotong University, Fall 2010

STUDENTS MENTORED

- Hafiz Tiomoko Ali, exchange PhD student from CentraleSupélec, FRANCE
- Omar Khalil, UofM EECS MS student, publication [C2]
- Tianpei Xie, UofM EECS PhD student, publication [C6]
- Ao Ren, SyrU EECS PhD student, publication [C11]
- Shan Zhang, SyrU EECS PhD student, publication [J7]

SERVICE & PROFESSIONAL ACTIVITIES

- **Co-chair** of *ICME Workshop on Machine Learning and Artificial Intelligence for Multimedia Creation*, 2018
- **Vice-chair** of *IEEE ComSoc SIG on AI Embedded Cognitive Networks*, 2017-present

- **Guest editor**, Wireless Communications and Mobile Computing, special issue on *Machine Intelligence and Cyber Security for Cognitive Internet of Things*, 2017
- **TPC member** for *GlobalSIP on Distributed Optimization and Resource Management over Networks*, 2017
- **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*

MISCELLANEOUS ACTIVITIES

- Judge for UofM Engineering Graduate Symposium, University of Michigan, Nov. 2017
- CNY Rocket Team Challenge volunteer, Syracuse University, June 2015
- International Student Orientation Volunteer, Syracuse University, Sept. 2014
- Judge for Ying Tri Region Science & Engineering Fair, March 2014

VISA TYPE

- F1 OPT extension

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