

# SIRISHA RAMBHATLA

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RESEARCH INTERESTS	Statistical Machine Learning, Optimization, Design of Provable Learning Algorithms, and their applications in Deep Learning and Knowledge Representations.		
EDUCATION	<b>Doctor of Philosophy (Ph.D.)</b> in Electrical Engineering Aug. 2014 - May 2019 ( <i>expected</i> ) University of Minnesota – Twin Cities (3.8) Thesis Topic: <i>Provable Algorithms for Matrix Decompositions &amp; Factorization</i> Advisor: Professor Jarvis Haupt  <b>Master of Science (M.S.)</b> in Electrical Engineering Aug. 2010 - Dec. 2012 University of Minnesota – Twin Cities (3.7) Thesis: <i>Semi-Blind Source Separation via Sparse Approximation &amp; Online Dictionary Learning</i> Advisor: Professor Jarvis Haupt  <b>Bachelor of Technology (B.Tech)</b> in Electronics & Telecom. Engineering Aug. 2006 - May 2010 College of Engineering Roorkee (COER), India (81.4% (Honors)) ( <i>Bronze Medalist</i> )		
AWARDS AND HONORS	Selected Presenter, “Graduation Day” Session, <i>Information Theory &amp; Applications Workshop</i> , 2019 Finalist, Student Best Paper Award, <i>Asilomar Conference on Signals, Systems &amp; Computers</i> , 2017 National Science Foundation (NSF) Travel Award, <i>GlobalSIP</i> , 2016 E. Bruce Lee Memorial Fellowship, <i>University of Minnesota – Twin Cities</i> , 2014 SciTechsperience Fellowship, <i>Minnesota High Tech Association</i> , 2012 Placed Third in Class of 2010 (Bronze Medal), <i>Uttarakhand Technical University, India</i> , 2010 Proficiency Award for Academic Excellence, <i>COER, India</i> , Session 2009 – 10 & 2006 – 07		
EXPERIENCE	<b>Graduate Research Assistant</b> Feb. 2011 – May 2012 & Aug. 2014 – Present Dept. of Electrical and Computer Eng. University of Minnesota – Twin Cities, Minneapolis, MN <b>Theoretical Focus:</b> <ul style="list-style-type: none"><li>• Analyzed matrix/tensor factorization and demixing models for machine learning applications by posing them as semi-supervised and unsupervised learning tasks.</li><li>• Developed provable algorithms for these learning tasks using convex and non-convex formulations.</li><li>• Analyzed the algorithms theoretically leveraging tools from statistical signal processing and optimization. Designed and implemented experiments to analyze the performance of these algorithms leveraging high performance computing resources.</li><li>• Developed a fast, scalable, distributed algorithm with performance guarantees for recovering the factors of the dictionary learning (a matrix factor) model. Designed and implemented the algorithm as a neural network on graphical processing unit (GPU)s via TensorFlow.</li><li>• Developed an algorithm for tensor factorization based on the dictionary learning technique.</li></ul> <b>Applications Focus:</b> <ul style="list-style-type: none"><li>• Identified applications (and analyzed performance) of the developed techniques on real-world datasets. For instance, developed a technique for localizing targets based on their spectral signatures in hyperspectral images.</li><li>• Developed a technique to build maps from Lidar data using tensor decompositions for vehicle navigation.</li></ul>		

## Science Advisor

Mar. 2013 – Jun. 2014

Intellectual Property (IP) and Technology Litigation

Robins Kaplan LLP, Minneapolis, MN

- Strategized for various technical issues involved in technology licensing and IP litigation. Analyzed potential IP cases to evaluate their validity and scope, and communicated the results both inside and outside the firm. Performed infringement analysis, including source code inspection.
- Designed experiments to identify infringement. In a particular instance, developed an experiment on-the-fly in a client-facing meeting to save upwards of \$100,000 in chip tear-down costs (and time) to prove infringement.

## Engineering Intern (R&D)

Jun.– Aug. 2011 & Jun.– Oct. 2012

Technology and Engineering Division

Ativa Medical Inc., St. Paul, MN

- Developed signal and data analysis algorithms for instrumentation of flow-cytometry-based blood diagnostic product.
- Collaborated with the team to develop an imaging based blood diagnostics product. Designed a wavelet based focus-stacking algorithm to improve quality of images to enable identification of blood cells.

## Undergraduate Research Intern

May 2009 – Jul. 2009

Networked Control Systems Lab

Indian Institute of Technology Kanpur (IITK), Kanpur, India

- Developed a networked embedded test-bed for an all-wheel drive and steer prototype lunar rover.
- Designed, test and document the distributed control algorithms on the test-bed for control of D.C. motors to facilitate its use for an undergraduate course at the institute.

## CONFERENCE PUBLICATIONS

- [1] **S. Rambhatla**, X. Li, and J. Haupt. NOODL: Provable Online Learning for Dictionary Learning and Sparse Coding. *International Conference on Learning Representations (ICLR)*, 2019.
- [2] **S. Rambhatla**, N. Sidiropoulos, and J. Haupt. TensorMap: Lidar-based Topological Mapping and Localization via Tensor Decompositions. *IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, 2018.
- [3] X. Li, J. Ren, **S. Rambhatla**, Y. Xu, and J. Haupt. Robust PCA via Dictionary Based Outlier Pursuit. *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2018.
- [4] **S. Rambhatla**, X. Li, and J. Haupt. Target Based Hyperspectral Demixing via Generalized Robust PCA. *Asilomar Conference on Signals, Systems, and Computers (Asilomar)*, 2017. **Student Best Paper Award Finalist.**
- [5] **S. Rambhatla**, X. Li, and J. Haupt. A Dictionary Based Generalization of Robust PCA. *IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, 2016. **National Science Foundation (NSF) Travel Award.**
- [6] **S. Rambhatla** and J. Haupt. Semi-Blind Source Separation via Sparse Representations and Online Dictionary Learning. *Asilomar Conference on Signals, Systems, and Computers (Asilomar)*, 2013.

## JOURNAL PUBLICATIONS

- [1] **S. Rambhatla**, X. Li, J. Ren, and J. Haupt. A Dictionary-Based Generalization of Robust PCA Part I: Study of Theoretical Properties. *(Journal In Review)*, 2018.
- [2] **S. Rambhatla**, X. Li, J. Ren, and J. Haupt. A Dictionary-Based Generalization of Robust PCA Part II: Applications to Target Localization in Hyperspectral Imaging. *(Journal In Review)*, 2018.
- [3] **S. Rambhatla**, X. Li, and J. Haupt. Provable Online Learning for Dictionary Learning and Tensor Factorization. *(Journal in preparation)*
- [4] **S. Rambhatla**, N. Sidiropoulos, and J. Haupt. TensorMap: Lidar-based Topological Mapping and Localization via Tensor Decompositions. *(Journal In Preparation)*.

All preprints/reprints available at [www.sirisharambhatla.com/about](http://www.sirisharambhatla.com/about).

PACKAGES	NOODL:	A Provable Online Learning Algorithm for Dictionary Learning and Sparse Coding.	
DEVELOPED		<b>S. Rambhatla</b>	
		<ul style="list-style-type: none"><li>• Distributed implementation across CPU cores via MATLAB,</li><li>• Distributed neural network implementation across GPUs via TensorFlow</li></ul>	
	D-RPCA:	Dictionary-Based Generalization of Robust PCA. <b>S. Rambhatla</b> (MATLAB)	
		<ul style="list-style-type: none"><li>• Analysis of Theoretical Properties,</li><li>• Applications to Target Localization in Hyperspectral Images.</li></ul>	
	TensorMap:	Lidar-based Topological Mapping and Localization via Tensor Decompositions.	
		<b>S. Rambhatla</b> (MATLAB)	
TALKS/POSTERS	<ul style="list-style-type: none"><li>• “Provable Online Dictionary Learning and Sparse Coding” <i>Information Theory and Applications (ITA) Workshop, San Diego, CA.</i></li><li>• “Lidar-based Topological Mapping &amp; Localization via Tensor Decompositions.” <i>GlobalSIP 2018, Anaheim, CA.</i></li><li>• “Provable Online Dictionary Learning and Matrix Factorization” <i>Digital Technology Center, Minneapolis, MN.</i></li><li>• “Target-Based Hyper Spectral Demixing via Generalized Robust PCA.” — ECE Seminar on Signal Processing, Information Theory, and Communication, <i>University of Minnesota – Twin Cities, Minneapolis, MN.</i></li><li>• “Provably Recovering Patterns from Data: Matrix to Tensors.” — <i>Yahoo! Research, San Jose, CA.</i></li><li>• “Dictionary based Generalization of Robust PCA.” — <i>GlobalSIP 2016, Washington D.C.</i></li><li>• “Semi-Blind Source Separation via Sparse Approximation &amp; Online Dictionary Learning.” — <i>Asilomar Conference on Signals, Systems &amp; Computers, Pacific Grove, CA.</i></li></ul>		Feb. 2019  Nov. 2018  Sept. 2018  Mar. 2018  Nov. 2017  Dec. 2016  Nov. 2013
TECHNICAL SERVICE	<ul style="list-style-type: none"><li>• Session Co-Chair, Reinforcement Learning — <i>Information Theory and Applications Workshop 2019, San Diego, CA</i></li><li>• Session Co-Chair, High-dimensional Statistics — <i>Information Theory and Applications Workshop 2019, San Diego, CA</i></li><li>• Session Chair, Deep Learning-based Signal Processing for Wireless Communication — <i>GlobalSIP 2018, Anaheim, CA</i></li><li>• International Conference on Artificial Intelligence &amp; Statistics (AISTATS)</li><li>• International Conference on Acoustics, Speech &amp; Signal Processing (ICASSP)</li><li>• Transactions on Signal Processing (T-SP)</li><li>• Signal Processing Letters (SPL)</li><li>• SIAM Journal of Imaging Sciences</li><li>• Transactions on Industrial Informatics (T-II)</li></ul>		2019  2019  2018  2018, 2016 2016, 2015 2019, 2018, 2016, 2015, 2014 2017 2017 2017
MENTORING ACTIVITIES	<b>ExplorCSR Mentor</b> <ul style="list-style-type: none"><li>• Mentor undergraduate women in STEM to research in data science and machine learning.</li><li>• Identify, formulate, and design a research problem for hedging strategies using optimization techniques for financial portfolio management.</li><li>• Successfully lead and prepare the team to present the research findings at the 2019 MinneWIC Conference organized in Duluth, Minnesota.</li></ul>		Sept. 2018 – Present

- Utilizing the supercomputing resources at the university in order to significantly speed-up various computational tasks;
- Identifying patentable technologies and filing for appropriate legal protections.
- Organizing a workshop on Intellectual Property protection for the researchers at Digital Technology Center, University of Minnesota – Twin Cities. (*Scheduled for Apr. 2019*)

SKILLS	<p>Scientific Computing: MATLAB/Simulink and Mathematica.</p> <p>Programming Languages: Python, C, and C++.</p> <p>Deep Learning Tools: TensorFlow, PyTorch.</p> <p>Embedded Programming: dsPIC, ATMEGA16/32, and MPLAB.</p> <p>Other skills: Proficient with Linux/Unix Shell; Leveraging Supercomputing resources; Version control.</p>
RELEVANT COURSEWORK	<p>Tensor Decompositions, Machine Learning, Probability and Stochastic Processes, Adaptive Digital Signal Processing, Optimization Theory, Detection and Estimation, Collaborative and Social Computing, Introduction to Nonlinear Optimization, Multirate and Multiscale Signal Processing, Image Processing and Applications, Robust Control System Design, Robotics, and Linear Systems and Optimal Control.</p>
PROFESSIONAL MEMBERSHIPS	<p>Collegiate Member, <i>Society of Women Engineers (SWE)</i>, since 2018.</p> <p>Student Member, <i>IEEE Signal Processing Society (SPS)</i>, since 2018.</p> <p>Student Member, <i>IEEE</i>, since 2013.</p> <p>Member, <i>Eta Kappa Nu (HKN)</i>, since 2011.</p>