

SIRISHA RAMBHATLA

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INFORMATION	3710 McClintock Ave, Los Angeles, CA, USA	Homepage: www.sirisharambhatla.com LinkedIn: www.linkedin.com/in/sirisharambhatla/	
RESEARCH FOCUS	Statistical Machine Learning, Design of Provable Learning Algorithms, Sparse Signal Processing, Optimization, Interpretability of Deep Learning Models, Spatiotemporal Data Analysis.		
EDUCATION	Doctor of Philosophy (Ph.D.) in Electrical Engineering Sep. 2014 – Sep. 2019 University of Minnesota – Twin Cities, USA (3.8) Thesis: <i>Provably Learning from Data: New Algorithms for Matrix/Tensor Decompositions & Factorizations</i> Advisor: Prof. Jarvis Haupt Committee Members: Prof. Georgios B. Giannakis, Prof. Nikos Papanikolopoulos, Prof. Mingyi Hong Master of Science (M.S.) in Electrical Engineering Aug. 2010 – Dec. 2012 University of Minnesota – Twin Cities, USA (3.7) Thesis: <i>Semi-Blind Source Separation via Sparse Approximation & Online Dictionary Learning</i> Advisor: Prof. Jarvis Haupt Committee Members: Prof. Zhi-Quan Luo, Prof. Arindam Banerjee Bachelor of Technology (B.Tech) in Electronics & Telecom. Engineering Aug. 2006 – May 2010 College of Engineering Roorkee (COER), India (81.4% (Honors)) (<i>University Bronze Medalist</i>)		
EXPERIENCE	Postdoctoral Scholar – Research Associate Oct. 2019 – Present Mentor: Prof. Yan Liu Melady Lab, Computer Science Department Viterbi School of Engineering University of Southern California, Los Angeles, CA, USA Focus: Machine learning for real-world spatiotemporal data analysis, interpretability of deep learning models, and physics informed machine learning. <ul style="list-style-type: none">• Develop a principled feature attribution and interaction detection technique to analyze the predictions by deep learning models, achieving state-of-the-art performance on attribution on real-world tasks such as <i>sentiment analysis, image classification, and recommender systems</i>.• Develop an explainable deepfake detection technique leveraging temporal logic specifications and unnatural temporal dynamics in a deepfake video, achieving state-of-the-art results.• Develop a mobility-aware Hawkes process-based technique to predict fine-grained spatiotemporal COVID-19 risk scores to drive policy decisions for safe reopening of activities.• Develop a meta-learning based technique to provide data-driven feedback to surgeons regarding their suturing skills in Robot Assisted Surgery. Graduate Research Assistant Feb. 2011 – May 2012 & Aug. 2014 – Sept. 2019 Dept. of Electrical and Computer Eng. University of Minnesota – Twin Cities, Minneapolis, MN <ul style="list-style-type: none">• Analyzed matrix/tensor factorization and demixing models for machine learning applications by posing them as semi-supervised and unsupervised learning tasks.• Develop provable algorithms for convex and non-convex optimization tasks leveraging tools from statistical signal processing and optimization, achieving state-of-the-art theoretical results.• Develop and implement fast, scalable, distributed algorithm with performance guarantees using neural architectures.• Develop a model for target localization in hyperspectral images using their spectral signatures.		

- Develop an algorithm to build topological maps for vehicle navigation using **tensor decompositions from Lidar data for vehicle localization and navigation**, achieving 8300 times compression as compared to a full Lidar scan.

Explore Computer Science Research (ExplorCSR) Mentor
Volunteer Group Leader

Oct. 2018 – Feb. 2019
Google Research

- Identify, formulate, and design a research problem for from hedging strategies using optimization techniques for financial portfolio management.
- Successfully lead the team comprising of undergraduate students to present the findings at the 2019 Minnesota Women in Computing (MinneWIC) Conference.

Science Advisor

Mar. 2013 – Jun. 2014

Intellectual Property (IP) and Technology Litigation

Robins Kaplan LLP, Minneapolis, MN

- Strategize for various technical issues involved in **technology licensing and IP litigation**. Analyze potential IP cases to evaluate their validity and scope, and communicate the results both inside and outside the firm.
- Design experiments to identify infringement. In a particular instance, developed an experiment on-the-fly in a client-facing meeting to prove infringement, **saving upwards of \$100,000 in chip tear-down costs** (and time).

Engineering Intern (R&D)

Jun.– Aug. 2011 & Jun.– Oct. 2012

Technology and Engineering Division

Ativa Medical Inc., St. Paul, MN

- Develop data analysis algorithms to analyze, evaluate and identify potential issues with the flow-cytometry-based blood diagnostics (hematology) product.
- Develop an imaging based product, including a wavelet based focus-stacking algorithm to improve quality of images to enable identification of blood cells.

Graduate Research Assistant

Feb. 2011 – May 2011 & Aug. 2011 – May 2012

Dept. of Electrical and Computer Eng.

University of Minnesota – Twin Cities, Minneapolis, MN

- Develop alternating minimization algorithms for matrix demixing, leveraging sparse representations.
- Leverage the demixing technique for a source separation task encountered while deploying electro-shock law enforcement devices.

Undergraduate Research Intern

May 2009 – Jul. 2009

Networked Control Systems Lab

Indian Institute of Technology Kanpur (IIT-K), Kanpur, India

- Develop a networked embedded test-bed for an all-wheel drive and steer prototype lunar rover.
- Design, 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.

AWARDS AND
HONORS

Travel Award,	<i>International Conference on Learning Representations (ICLR), 2019</i>
Selected Presenter, “Graduation Day” Session,	<i>Information Theory & Applications Workshop, 2019</i>
Finalist, Student Best Paper Award,	<i>Asilomar Conference on Signals, Systems & Computers, 2017</i>
National Science Foundation (NSF) Travel Award,	<i>GlobalSIP, 2016</i>
E. Bruce Lee Memorial Fellowship,	<i>University of Minnesota – Twin Cities, 2014</i>
SciTechsperience Fellowship,	<i>Minnesota High Tech Association, 2012</i>
University Merit List, Third Place – ECE (Bronze Medal),	<i>Uttarakhand Technical University, India, 2010</i>
Proficiency Award for Academic Excellence,	<i>COER, India, Academic Year 2009 – 10</i>
Proficiency Award for Academic Excellence,	<i>COER, India, Academic Year 2006 – 07</i>

- PUBLICATIONS [1] L. Trinh, M. Tsang, **S. Rambhatla**, Y. Liu. Interpretable and Trustworthy Deepfake Detection via Dynamic Prototypes. *IEEE Winter Conference on Applications of Computer Vision (WACV)*, 2021. [\[Link\]](#)
- [2] **S. Rambhatla**, X. Li, and J. Haupt. Provable Online CP/PARAFAC Decomposition of a Structured Tensor via Dictionary Learning. *Neural Information Processing Systems (NeurIPS)*, 2020. [\[Link\]](#)
- [3] M. Tsang, **S. Rambhatla**, Y. Liu. How does this interaction affect me? Interpretable attribution for feature interactions. *Neural Information Processing Systems (NeurIPS)*, 2020. [\[Link\]](#)
- [4] **S. Rambhatla**, X. Li, J. Ren and J. Haupt. A Dictionary-Based Generalization of Robust PCA With Applications to Target Localization in Hyperspectral Imaging. *IEEE Transactions on Signal Processing*, vol. 68, pp. 1760 – 1775, 2020. [\[Link\]](#)
- [5] **S. Rambhatla**, X. Li, and J. Haupt. NOODL: Provable Online Learning for Dictionary Learning and Sparse Coding. *International Conference on Learning Representations (ICLR)*, 2019. **Travel Award**. [\[Link\]](#)
- [6] **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. [\[Link\]](#)
- [7] 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. [\[Link\]](#)
- [8] **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**. [\[Link\]](#)
- [9] **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**. [\[Link\]](#)
- [10] **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. [\[Link\]](#)
- [11] **S. Rambhatla***, S. Zeighami*, K. Shahabi, C. Shahabi, and Y. Liu. Towards Accurate Spatiotemporal COVID-19 Risk Scores using High Resolution Real-World Mobility Data. (*Journal in preparation*), 2020.
- [12] C. Meng, **S. Rambhatla**, Y. Liu. Cross-Node Federated Graph Neural Network for Spatio-Temporal Data Modeling. (*Under review*), 2020.
- [13] S. Seo*, C. Meng*, **S. Rambhatla**, Y. Liu. Physics-aware Spatiotemporal Modules with Auxiliary Tasks for Meta-Learning. (*Under review*), 2020. [\[Link\]](#)
- [14] N. Kamra, Y. Zhang, **S. Rambhatla**, C. Meng, Y. Liu. PolSIRD: Modeling Epidemic Spread under Intervention Policies and an Application to the Spread of COVID-19. (*Under review*), 2020. [\[Link\]](#)
- [15] K. Sharma, S. Seo, C. Meng, **S. Rambhatla**, Y. Liu. COVID-19 on Social Media: Analyzing Misinformation in Twitter Conversations. (*Under review*), 2020. [\[Link\]](#)

Preprints/reprints available on [arxiv](#) and at <https://sirisharambhatla.com/publications.html>. * Equal contribution.

SOFTWARE PACKAGES DEVELOPED	TensorNOODL:	Provable Online CP/PARAFAC Decomposition via Dictionary Learning (MATLAB).
	NOODL:	Provable Online Learning Algorithm for Dictionary Learning and Sparse Coding. • Distributed implementations via MATLAB and TensorFlow.
	D-RPCA:	Dictionary-Based Generalization of Robust PCA. (MATLAB) • Analysis of Theoretical Properties, and Target Localization in Hyperspectral Images.
	TensorMap:	Lidar-based Mapping and Localization via Tensor Decompositions. (MATLAB)

TALKS/ POSTERS	• “Provable Online Dictionary Learning and Sparse Coding” — <i>CyberOptics Corporation, Minneapolis, MN.</i>	Jun. 2019
	• “NOODL: Provable Online Dictionary Learning and Sparse Coding” — <i>International Conference on Learning Representations, New Orleans, LA.</i>	May 2019
	• “Provable Online Dictionary Learning and Sparse Coding” — <i>Department of Electrical and Computer Engineering, Georgia Tech., Atlanta, GA.</i>	May 2019
	• “Provable Online Dictionary Learning and Sparse Coding” — <i>Information Theory and Applications (ITA) Workshop, San Diego, CA.</i>	Feb. 2019
	• “Lidar-based Topological Mapping & Localization via Tensor Decompositions.” — <i>GlobalSIP 2018, Anaheim, CA.</i>	Nov. 2018
	• “Provable Online Dictionary Learning and Matrix Factorization” — <i>Digital Technology Center, Minneapolis, MN.</i>	Sept. 2018
	• “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>	Mar. 2018
	• “Provably Recovering Patterns from Data: Matrix to Tensors.” — <i>Yahoo! Research, San Jose, CA.</i>	Nov. 2017
	• “Dictionary-based Generalization of Robust PCA.” — <i>GlobalSIP 2016, Washington D.C.</i>	Dec. 2016
	• “Semi-Blind Source Separation via Sparse Approximation & Online Dictionary Learning.” — <i>Asilomar Conference on Signals, Systems & Computers, Pacific Grove, CA.</i>	Nov. 2013
TEACHING EXPERIENCE	• Instructor, CSCI 567 - Machine Learning — <i>University of Southern California, Los Angeles, CA</i>	Spring 2021
	• Guest Lecturer, CSCI 699 - Advanced Topics in Deep Learning — <i>University of Southern California, Los Angeles, CA</i>	Fall 2020
	• Guest Lecturer, EE 3025 - Statistical Methods in Electrical and Computer Engineering — <i>University of Minnesota – Twin Cities, Minneapolis, MN</i>	Fall 2017
TECHNICAL SERVICE	• Organizer, AI for COVID-19 in LA Virtual Symposium (attended by over 350 participants) — <i>University of Southern California, Los Angeles, CA</i>	2020
	• Ambassador, Women in Data Science (WiDS) — <i>University of Southern California, Los Angeles, CA</i>	2020
	• Organizer, “Patent basics for Engineers and Researchers” — <i>Digital Technology Center, University of Minnesota–Twin Cities, Minneapolis, MN</i>	2019
	• Session Co-Chair, Reinforcement Learning, and High-dimensional Statistics — <i>Information Theory and Applications (ITA) Workshop 2019, San Diego, CA</i>	2019
	• Session Chair, Deep Learning-based Signal Processing for Wireless Communication — <i>GlobalSIP 2018, Anaheim, CA</i>	2018
	• Program Committee, Association for the Advancement of Artificial Intelligence (AAAI)	2020
	• Reviewer, Neural Information Processing Systems (NeurIPS)	2020
	• Reviewer, International Conference on Machine Learning (ICML)	2020
	• Reviewer, Journal of Selected Topics in Signal Processing (JSTSP)	2020
	• Reviewer, ACM Transactions on Computing for Healthcare	2020
	• Reviewer, International Conference on Artificial Intelligence & Statistics (AISTATS)	2018, 2016
	• Reviewer, International Conference on Acoustics, Speech & Signal Processing (ICASSP)	2016, 2015
	• Reviewer, Transactions on Signal Processing (T-SP)	2020, 2019, 2018, 2016, 2015, 2014
	• Reviewer, Signal Processing Letters (SPL)	2017

	<ul style="list-style-type: none"> • Reviewer, SIAM Journal of Imaging Sciences • Reviewer, Transactions on Industrial Informatics (T-II) 	2017 2017
WORKSHOPS	<ul style="list-style-type: none"> • “Frontiers in Machine Learning” — <i>Microsoft Research</i> • “IEEE Data Science Workshop (DSW)” — <i>University of Minnesota Twin-Cities, Minneapolis, MN</i> • “Information Theory & Applications Workshop (ITA)” — <i>San Diego, CA</i> • “Resource Trade-offs: Computation, Communication, and Information” — <i>Institute of Mathematics and its Applications (IMA), Minneapolis, MN</i> • “Sparsity and Computation” — <i>Institute for Advanced Study, Princeton, NJ</i> 	2020 2019 2019 2016 2011
SKILLS	<p>Scientific Computing: MATLAB/Simulink and Mathematica.</p> <p>Programming Languages: Python (scikit-learn, statsmodels, pandas, etc.), C, and C++.</p> <p>Deep Learning: TensorFlow, PyTorch.</p> <p>Embedded Programming: dsPIC, ATMEGA16/32, and MPLAB.</p> <p>Other skills: Linux/Unix Shell, Supercomputing, and Version control.</p>	
RELEVANT COURSEWORK	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, and Linear Systems and Optimal Control.	
PROFESSIONAL MEMBERSHIPS	Collegiate Member, <i>Society of Women Engineers (SWE)</i> , Student Member, <i>IEEE Signal Processing Society (SPS)</i> , Student Member, <i>IEEE</i> , Member, <i>Eta Kappa Nu (HKN)</i> ,	since 2018 since 2018 since 2013 since 2011