

SIRISHA RAMBHATLA

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SKILLS AND INTERESTS	Statistical Machine Learning, Optimization, Time Series Analysis, Design of Provable Learning Algorithms, and their applications in Deep Learning and Knowledge Representations.		
EDUCATION	<p>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: Algorithms for Matrix/Tensor Decompositions & Factorizations</i> Advisor: Professor Jarvis Haupt</p> <p>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: Professor Jarvis Haupt</p> <p>Bachelor of Technology (B.Tech) in Electronics & Telecom. Engineering Aug. 2006 - May 2010 College of Engineering Roorkee (COER), India (81.4% (Honors)) (<i>Bronze Medalist</i>)</p>		
SKILLS	Scientific Computing: MATLAB/Simulink and Mathematica. Programming Languages: Python, C, and C++. Deep Learning Tools: TensorFlow, PyTorch. Embedded Programming: dsPIC, ATMEGA16/32, and MPLAB. Other skills: Linux/Unix Shell, Supercomputing, and Version control.		
EXPERIENCE	<p>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: Time series analysis, probabilistic modeling, and interpretability for real-world data.</p> <ul style="list-style-type: none">• Explainable Artificial Intelligence (AI)<ul style="list-style-type: none">– Develop a technique for feature attribution to analyze the predictions by deep learning models.– Develop a complementary feature interaction detection algorithm to identify feature interactions.– Applications: Explaining sentiment analysis, image classification, and recommender systems.• COVID-19 Misinformation Analysis<ul style="list-style-type: none">– Analyze the information sharing patterns on Twitter to identify COVID-19 misinformation spread.– Strategize and devise research direction to analyze misinformation spread patterns to identify flow of misinformation across countries, malicious group of users, and specific spread patterns.• COVID-19 Disease Spread Prediction<ul style="list-style-type: none">– Develop probabilistic models to analyze the COVID-19 disease spread.– Analyze and interpret the results to strategize for incorporating additional sources of information, such as flight data, government issues lock-down timelines, and other mobility data.• Interpretable Deep Fake Detection<ul style="list-style-type: none">– Develop a deep fake detection technique based on identifying unnatural dynamics to learn prototypes of dynamics corresponding to real and deep fake videos.• Physics Informed Meta-Learning		

- Develop a meta-learning-based model to transfer the knowledge of physics-based model to improve performance of real-world prediction.
- **Applications:** Climate Modeling and COVID-19 policy evaluation and prediction.

Graduate Research Assistant

Feb. 2011 – May 2012 & Aug. 2014 – Present

Dept. of Electrical and Computer Eng.

University of Minnesota – Twin Cities, Minneapolis, MN

Theoretical Focus:

- Analyzed matrix/tensor factorization and demixing models for machine learning applications by posing them as semi-supervised and unsupervised learning tasks.
- Developed provable algorithms for these learning tasks using convex and non-convex formulations.
- 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.
- 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.
- Developed an algorithm for tensor factorization based on the dictionary learning technique.

Applications Focus:

- 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.
- Developed a technique to build maps from Lidar data using tensor decompositions to localization and navigation of vehicles.
- Leveraged the tensor factorization model for simultaneous clustering and pattern recovery to analyze Enron's organizational behavior and sports analytics.

ExplorCSR Mentor

Oct. 2018 – Feb. 2019

Volunteer Group Leader

University of Minnesota – Twin Cities, Minneapolis, MN

- Identify, formulate, and design a research problem for hedging strategies using optimization techniques for financial portfolio management.
- Successfully lead and prepare the team to present the research findings at the 2019 MinneWIC Conference organized in Duluth, Minnesota.

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

- Develop a signal and data analysis algorithms for instrumentation of flow-cytometry-based blood diagnostic product.
- 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.

PUBLICATIONS	<p>[1] S. Rambhatla, X. Li, and J. Haupt. Provable Online CP/PARAFAC Decomposition of a Structured Tensor via Dictionary Learning. (<i>Manuscript under review</i>)</p> <p>[2] S. Rambhatla, X. Li, and J. Haupt. NOODL: Provable Online Learning for Dictionary Learning and Sparse Coding. <i>International Conference on Learning Representations (ICLR)</i>, 2019. Student Travel Award</p> <p>[3] S. Rambhatla, X. Li, J. Ren and J. Haupt, "A Dictionary-Based Generalization of Robust PCA With Applications to Target Localization in Hyperspectral Imaging," in <i>IEEE Transactions on Signal Processing</i>, vol. 68, pp. 1760 – 1775, 2020.</p> <p>[4] S. Rambhatla, N. Sidiropoulos, and J. Haupt. TensorMap: Lidar-based Topological Mapping and Localization via Tensor Decompositions. <i>IEEE Global Conference on Signal and Information Processing (GlobalSIP)</i>, 2018.</p> <p>[5] X. Li, J. Ren, S. Rambhatla, Y. Xu, and J. Haupt. Robust PCA via Dictionary Based Outlier Pursuit. <i>IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)</i>, 2018.</p> <p>[6] S. Rambhatla, X. Li, and J. Haupt. Target Based Hyperspectral Demixing via Generalized Robust PCA. <i>Asilomar Conference on Signals, Systems, and Computers (Asilomar)</i>, 2017. Student Best Paper Award Finalist.</p> <p>[7] S. Rambhatla, X. Li, and J. Haupt. A Dictionary Based Generalization of Robust PCA. <i>IEEE Global Conference on Signal and Information Processing (GlobalSIP)</i>, 2016. National Science Foundation (NSF) Travel Award.</p> <p>[8] S. Rambhatla and J. Haupt. Semi-Blind Source Separation via Sparse Representations and Online Dictionary Learning. <i>Asilomar Conference on Signals, Systems, and Computers (Asilomar)</i>, 2013.</p> <p>All preprints/reprints available on arxiv and at www.sirisharambhatla.com/about.</p>	
PACKAGES DEVELOPED	<p>NOODL: A Provable Online Learning Algorithm for Dictionary Learning and Sparse Coding.</p> <ul style="list-style-type: none"> • Distributed implementation across CPU cores via MATLAB, • Distributed neural network implementation across GPUs via TensorFlow <p>D-RPCA: Dictionary-Based Generalization of Robust PCA. (MATLAB)</p> <ul style="list-style-type: none"> • Analysis of Theoretical Properties, and Target Localization in Hyperspectral Images. <p>TensorMap: Lidar-based Mapping and Localization via Tensor Decompositions. (MATLAB)</p>	
AWARDS AND HONORS	<p>Student Travel Award, <i>International Conference on Learning Representations (ICLR)</i>, 2019</p> <p>Selected Presenter, “Graduation Day” Session, <i>Information Theory & Applications Workshop</i>, 2019</p> <p>Finalist, Student Best Paper Award, <i>Asilomar Conference on Signals, Systems & Computers</i>, 2017</p> <p>National Science Foundation (NSF) Travel Award, <i>GlobalSIP</i>, 2016</p> <p>E. Bruce Lee Memorial Fellowship, <i>University of Minnesota – Twin Cities</i>, 2014</p> <p>SciTechsperience Fellowship, <i>Minnesota High Tech Association</i>, 2012</p> <p>Placed Third in Class of 2010 (Bronze Medal), <i>Uttarakhand Technical University, India</i>, 2010</p> <p>Proficiency Award for Academic Excellence, <i>COER, India</i>, Session 2009 – 10 & 2006 – 07</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</i> and <i>IEEE Signal Processing Society (SPS)</i>, since 2018.</p>	