ARDHENDU S. TRIPATHY

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310 Computer Science, Missouri S&T, Rolla

RESEARCH FOCUS

My goal is to develop sample-efficient algorithms for sequential and representation learning, with an emphasis on obtaining provable guarantees. I am quantifying the limitations of modern machine learning methods and working to enable their faster training and safer deployment. The techniques I use combine perspectives from signal processing, optimization, and information theory.

EDUCATION

PhD Iowa State University, Electrical and Computer Engineering — May 2018
Dissertation: "Network Coding for Function Computation"
Advisor: Aditya Ramamoorthy

BTech Indian Institute of Technology, Kanpur, Electrical Engineering — May 2012

EMPLOYMENT

Nov 2020 - Present	Assistant Professor, Computer Science, Missouri University of Science & Technology, Rolla, MO.
2018 - 2020	Postdoctoral Research Associate, University of Wisconsin-Madison, WI. Supervisor: Robert Nowak
2012 - 2018	Graduate Research Assistant, Iowa State University, Ames, IA. Supervisor: Aditya Ramamoorthy
2017	Summer Intern, Mitsubishi Electric Research Laboratories, Cambridge, MA. Supervisor: Ye Wang
2011	Interim Engineering Intern, Qualcomm India Private Limited, Hyderabad, India. Supervisor: Chandra Chetty

PUBLICATIONS

Journal Publications

2018 **A. Tripathy** and A. Ramamoorthy, "Sum-Networks from Incidence Structures: Construction and Capacity Analysis," in *IEEE Transactions on Information Theory*, vol. 64, no. 5, pp. 3461-3480, May 2018, doi: 10.1109/TIT.2017.2765661.

2014 L. Kumar, **A. Tripathy**, and R. M. Hegde, "Robust Multi-Source Localization Over Planar Arrays Using MUSIC-Group Delay Spectrum," in *IEEE Transactions on Signal*

Processing, vol. 62, no. 17, pp. 4627-4636, Sept.1, 2014, doi: 10.1109/TSP.2014.2337271.

Peer-Reviewed Conference Papers

2022 S. Mukherjee*, **A. Tripathy***, and R. Nowak, "Chernoff Sampling for Active Testing and Extension to Active Regression," *Proceedings of the 25th International Conference on Artificial Intelligence and Statistics (AISTATS)*, in *Proceedings of Machine Learning Research*, 151:7384-7432 Available from https://proceedings.mlr.press/v151/mukherjee22a.html.
(* denotes equal contribution and listed alphabetically)

2021 B. Mason, **A. Tripathy**, and R. Nowak, "Nearest neighbor search under uncertainty," *Proceedings of the 37th Conference on Uncertainty in Artificial Intelligence (UAI)*, in *Proceedings of Machine Learning Research* 161:1777-1786. Available from https://proceedings.mlr.press/v161/mason21a.html.

2021 M. Malloy, **A. Tripathy**, and R. Nowak, "Optimal Confidence Sets for the Multinomial Parameter," *2021 IEEE International Symposium on Information Theory (ISIT)*, 2021, pp. 2173-2178, doi: 10.1109/ISIT45174.2021.9517964.

2020 B. Mason, L. Jain, **A. Tripathy**, and R. Nowak, "Finding all ε-good arms in stochastic bandits," *Advances in Neural Information Processing Systems (NeurIPS)*, 33, 20707-20718. Available from https://proceedings.neurips.cc/paper/2020/hash/edf0320adc8658b25ca26be5351b6c4a-Abstract.html.

2019 **A. Tripathy**, Y. Wang, and P. Ishwar, "Privacy-Preserving Adversarial Networks," *2019 57th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, 2019, pp. 495-505, doi: 10.1109/ALLERTON.2019.8919758.

2019 S. Katariya*, **A. Tripathy***, and R. Nowak, "MaxGap Bandit: Adaptive Algorithms for Approximate Ranking," *Advances in Neural Information Processing Systems (NeurIPS)*, 32. Available from https://proceedings.neurips.cc/paper/2019/hash/9b16759a62899465ab21e2e79d2ef75c-Abstract.html.
(* denotes equal contribution and listed alphabetically)

2019 B. Mason*, **A. Tripathy***, and R. Nowak, "Learning Nearest Neighbor Graphs from Noisy Distance Samples," *Advances in Neural Information Processing Systems (NeurIPS)*, 32. Available from https://proceedings.neurips.cc/paper/2019/hash/98c56bce74669e2e4e7a9fc1caa8c326-Abstract.html.
(* denotes equal contribution and listed alphabetically)

2018 **A. Tripathy** and A. Ramamoorthy, "Zero-error Function Computation on a Directed Acyclic Network," *2018 IEEE Information Theory Workshop (ITW)*, 2018, pp. 1-5, doi: 10.1109/ITW.2018.8613467.

2016 **A. Tripathy** and A. Ramamoorthy, "On computation rates for arithmetic sum," *2016 IEEE International Symposium on Information Theory (ISIT)*, 2016, pp. 2354-2358, doi: 10.1109/ISIT.2016.7541720.

2015 **A. Tripathy** and A. Ramamoorthy, "Capacity of sum-networks for different message alphabets," *2015 IEEE International Symposium on Information Theory (ISIT)*, 2015, pp. 606-610, doi: 10.1109/ISIT.2015.7282526.

2014 **A. Tripathy** and A. Ramamoorthy, "Sum-networks from undirected graphs: Construction and capacity analysis," *2014 52nd Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, 2014, pp. 651-658, doi: 10.1109/ALLERTON.2014.7028517.

2012 **A. Tripathy**, L. Kumar, and R. M. Hegde, "Robust two-dimensional source localization using the MUSIC-Group delay spectrum," *2012 International Conference on Signal Processing and Communications (SPCOM)*, 2012, pp. 1-5, doi: 10.1109/SPCOM.2012.6290035.

2011 **A. Tripathy**, L. Kumar, and R. M. Hegde, "Group delay-based methods for speech source localization over circular arrays," *2011 Joint Workshop on Hands-free Speech Communication and Microphone Arrays (HSCMA)*, 2011, pp. 64-69, doi: 10.1109/HSCMA.2011.5942411.

PATENT

2021 Y. Wang, P. Ishwar, and **A. Tripathy**, "Data-driven privacy-preserving communication," United States Patent, No. 11,132,453.

INVITED TALKS

2022 Learning, Information, Optimization, Networks, and Statistics (LIONS) seminar series, Arizona State University.

2022 "MaxGap Bandit: Adaptive Algorithms for Approximate Ranking," Session on Recovering Permuted Data, *Conference on Information Sciences and Systems (CISS)*, Princeton NJ, Mar. 2022.

2020 "Generalized Chernoff Sampling," ARO MURI on Adaptive Exploitation of Non-commutative Multimodal Information Structure, Online, Oct. 2020.

2020 "Adaptive Algorithms in Machine Learning," Theoretical and Applied Data Science Lunch-n-Learn at Iowa State University, Online, May 2020.

2019 "Privacy-Preserving Adversarial Networks," Systems, Information, Learning and Optimization (SILO) seminar, UW-Madison, Nov. 2019.

2018 "Network Coding for Function Computation," Graduation Day, Information Theory and Applications workshop, San Diego, CA, Feb. 2018.

POSTERS

2020 "MaxGap Bandit: Adaptive Algorithms for Approximate Ranking," Bombay Information Theory Seminar, Indian Institute of Technology Bombay, Jan. 2020.

2019 "Learning Nearest-Neighbor Graphs from Noisy Distance Samples," Midwest Machine Learning Symposium, UW-Madison, Jun. 2019.

2018 "Zero-Error Function Computation on a Directed Acyclic Network," North American Summer school in Information Theory, Texas A&M, College Station TX, May 2018.

2015 "Sum-Networks from Incidence Structures," DIMACS workshop on network coding: the next 15 years, Rutgers University, Dec. 2015.

2015 "Capacity of sum-networks for different message alphabets," Croucher Summer school in Information Theory, Chinese University of Hong Kong, Jun. 2015.

HONORS AND AWARDS

Highlighted Reviewer, International Conference on Learning Representations (ICLR) 2022

From the ICLR 2022 website: "… Highlighted Reviewers, who have gone extra steps during the review process and provided excellent, timely, and productive feedback."

Travel Grant to attend NeurIPS in Vancouver 2019

Research Excellence Award, Iowa State University 2018

From the Iowa State University Graduate College website: "The purpose of these awards is to recognize graduate students for outstanding research accomplishments as documented in their theses and dissertations."

IEEE Student Travel Grant to attend ISIT in Barcelona 2016

IEEE Student Travel Grant to attend ISIT in Hong Kong 2015

Best Project, Indian Institute of Technology Kanpur 2015

Summer Undergraduate Research Grant for Excellence (SURGE) program

Certificate of Distinction, National Standard Examination in Physics and Astronomy, India. 2007

Kishore Vaigyanik Protsahan Yojana (KVPY) Fellowship, India. 2006

National Talent Search Exam (NTSE) Scholarship, India. 2006

GRANT EXPERIENCE

Funded

2021 "Trustworthy Machine Learning and Artificial Intelligence-based Framework Development for Hybrid and Sustainable Energy Systems." Ignition Grant Initiative, Office of the Vice Chancellor for Research and Innovation, Missouri S&T. Co-PI. Total amount $40,000.

Pending

2022 *(Invited to submit full proposal)* "Decision-making with Trusted AI under Uncertainty." DARPA In-The-Moment. Lead PI at Missouri S&T, Missouri S&T share $747,312.

2022 "Collaborative Research: CNS Core: Medium: PARADISE: Privacy-Aware Recognition of Activities of Daily-living via non-Intrusive Sensing and Elastic Learning for Senior Care." NSF. Co-PI, Missouri S&T share $499,959.

Not Funded

2021 "CRII: CIF: A Novel Active Learning Method to Optimize Gaussian Process and Neural Network Models." NSF. PI. Total amount $174,464.

2021 *(Selected at university level)* "Generalized Chernoff Sampling for Active Machine Learning." Oak Ridge Associated Universities. PI. Total amount $5,000.

2021 "Cyber-Swat: Cybersecurity and Data Science Program for ROTC and DoD-bound Cyber Workforce Development." Griffiss Institute. Co-PI. Total amount $921,950.

TEACHING EXPERIENCE

Missouri S&T Jan 2021 to May 2022
Assistant Professor

- Developed and taught "Theory of Reinforcement Learning," a graduate course covering the following topics: Markov Decision Processes, Value Iteration and Policy Iteration, UCB algorithms, Sample Complexity bounds.
- Developed and taught "Advanced Topics in Artificial Intelligence," a graduate course covering the following topics: constructing Neural Networks, Gradient Descent convergence, Interpolation and Memorization, Neural Tangent Kernel, Curriculum Learning.
- Taught "Introduction to Operating Systems," an undergraduate course covering the following topics: Processes and Threads, Scheduling, Concurrency, Deadlock, Virtual Memory, File System, Input/Output.

Iowa State University Jan 2014 to Mar 2019
Guest Lecturer

- Special Topics in Communications and Signal Processing taught by Prof. Namrata Vaswani: Gave two tutorial-style lectures on "Introduction to Stochastic Bandits" to around 30 graduate students and faculty from ECE and CS departments.

Teaching Assistant

- Signals and Systems I: Led recitations for all sections, in total around 100 students, mostly sophomores and juniors. Held office hours for answering questions and supplementary instruction.

Substitute Instructor

- For Prof. Aditya Ramamoorthy in the following courses: Information Theory, Random Processes for Communications and Signal Processing, Communication Systems II.

MENTORING EXPERIENCE

Ph.D. students

Major advisor at Missouri S&T:

- Shreen Gul, currently in her second semester.

Committee member at Missouri S&T:

- Fred Love, "Intelligent Cyber-Physical System Security of Lab-On-Chip Medical Systems," graduated Spring 2022.
- Md Yasin Kabir, "Social Media Analytics with Applications in Disaster Management and Covid-19 Events," graduated Spring 2022.
- Mukund Telukunta
- Arindam Khanda
- Luke Smith
- Navid Seidi

Supervision as postdoctoral research associate at UW-Madison:

- Subhojyoti Mukherjee, resulted in 1 paper together.
- Blake Mason, resulted in 3 papers together.
- Sumeet Katariya, resulted in 1 paper together.

M.S.(Thesis) students

Committee member at Missouri S&T:

- Nikola Andric
- Raja Sunkara
- Sree Pooja Akula

Undergraduate students

Research advisor at Missouri S&T:

- Lane Floyd, graduated Spring 2022.
- Joshua Caruso

ONGOING PROFESSIONAL AFFILIATIONS

- IEEE
- IEEE Information Theory Society
- IEEE Signal Processing Society

PROFESSIONAL SERVICE

Reviewer

- Neural Information Processing Systems (NeurIPS)
- International Conference on Machine Learning (ICML)
- AAAI Conference on Artificial Intelligence
- International Conference on Learned Representations (ICLR)
- IEEE International Symposium on Information Theory (ISIT)
- IEEE Transactions on Information Theory
- IEEE Transactions on Dependable and Secure Computing
- IEEE Transactions on Signal and Image Processing over Networks
- IEEE Journal on Selected Areas in Information Theory
- IEEE Transactions on Information Forensics and Security
- IEEE Transactions on Communication
- IEEE Transactions on Signal Processing
- IEEE International Conference on Communications
- IEEE Communications Letters

UNIVERSITY SERVICE AND OUTREACH

Missouri S&T Jan 2021 to May 2022

Organizer of Rolla NeurIPS Meetup 2021

Organized an in-person and virtual four-day meetup for students, faculty and public interested in current machine learning research. The meetup happened on the campus of Missouri S&T concurrently with the virtual Neural Information Processing Systems (NeurIPS) conference. It featured livestreams of keynote talks and oral presentations, followed by discussions among attendees.

Instructor at the Jackling Introduction to Engineering Summer Camp 2021 and 2022

A three-day summer camp for high school students interested in learning about science and engineering, organized by the Kummer Center for STEM Education at Missouri S&T. Developed and supervised a suitable activity for students to complete in a three-hour lab session that introduced them to programming concepts and mathematical reasoning.

Member of the Undergraduate Curriculum Committee in Computer Science

Duties included approving new courses, updating course prerequisites and objectives, revising experiential learning requirements.

Faculty Ambassador for Computer Science

Among a cohort of few faculty selected to represent Computer Science to prospective students in campus discovery and open house days.

Iowa State University Jan 2014 to May 2018

University Relations and Legislative Affairs Chair in the Graduate and Professional Student Senate

Represented graduate students in matters of university-wide policy.

Senator for Electrical and Computer Engineering in the Graduate and Professional Student Senate

Represented the department in the student senate discussions.

Founding Member of the Data Science Reading Group

Reading group consisted of graduate students from ECE, CS, and Statistics departments.