

Ardhendu Tripathy

Education

- 2012 - • Ph.D. in Electrical and Computer Engineering with a minor in Mathematics, Iowa State University
Advisor: Aditya Ramamoorthy
Expected graduation: May, 2018
- 2008 - 12 • B.Tech. in Electrical Engineering, Indian Institute of Technology Kanpur

Awards

- 2015 & 16 • Received IEEE student travel grant to attend the International Symposium on Information Theory (ISIT) in 2015 and 2016.
- 2010 • 'Best project' in Summer Undergraduate Research Grant for Excellence (SURGE) program, Indian Institute of Technology, Kanpur.
- 2007 • Certificate of Distinction, National Standard Examination in Physics and Astronomy, India.
- 2006 - 08 • Kishore Vaigyanik Protsahan Yojana (KVPY) Fellowship, India
- 2006 • National Talent Search Exam (NTSE) Scholarship, India

Publications

Preprints contributing to Ph.D. research available at https://arxiv.org/a/tripathy_a_1.html

Preprint

- 2017 • A. Tripathy, Y. Wang, and P. Ishwar. Privacy-preserving adversarial networks. Available online at <https://arxiv.org/abs/1712.07008>

Journal articles

- To appear • A. Tripathy and A. Ramamoorthy. Sum-networks from incidence structures: construction and capacity analysis. Accepted for publication in *IEEE Trans. Inform. Theory*.
- 2014 • L. Kumar, A. Tripathy, and R. M. Hegde. Robust multi-source localization over planar arrays using music-group delay spectrum. In *IEEE Trans. Sig. Proc.*, 62(17): 4627-4636, Sep. 2014.

Conference proceedings

- 2016 • A. Tripathy and A. Ramamoorthy. On computation rates for arithmetic sum. In *Proc. IEEE Intl. Symp. Inform. Theory (ISIT)*, Jul. 2016.
- 2015 • A. Tripathy and A. Ramamoorthy. Capacity of sum-networks for different message alphabets. In *Proc. IEEE Intl. Symp. Inform. Theory (ISIT)*, Jun. 2015.
- 2014 • A. Tripathy and A. Ramamoorthy. Sum-networks from undirected graphs: construction and capacity analysis. In *52nd Annual Allerton Conf. on Comm., Control and Comput.*, Oct. 2014.
- 2012 • A. Tripathy, L. Kumar, and R. M. Hegde. Robust two dimensional source localization using the MUSIC-Group delay spectrum. In *Intl. Conf. Sig. Proc. Comm. (SPCOM)*, Jul. 2012.
- 2011 • A. Tripathy, L. Kumar, and R. M. Hegde. Group delay based methods for speech source localization over circular arrays. In *Joint Workshop on Hands-free Speech Comm. and Microphone Arrays (HSCMA)*, May 2011.

Publications (continued)

Poster

- 2015 • A. Tripathy. Sum-networks from graphs and designs. In DIMACS workshop on network coding: the next 15 years, Rutgers University, Dec. 2015.

Graduate courses taken

- ECE • Random processes, Convex optimization, Information theory, Design & analysis of algorithms, Detection & estimation theory, Digital signal processing, Communication systems, Deep machine learning (audit).
- MATH • Linear algebra, Graph theory, Abstract algebra, Design theory & association schemes.

Research experience

- 2012 - § **Function computation in graphical networks in the network coding framework**, with Dr. Aditya Ramamoorthy at Iowa State University.
- Demonstrated that, unlike the coding capacity of multiple unicast networks, the computation capacity for computing finite field sum in directed acyclic networks depends on the message field.
 - Used block designs to obtain interesting problem instances, whose computation capacity could be bounded using linear algebraic techniques.
 - Used flow-based existence results in combinatorial matrix theory to find optimal network codes.
 - Existing work in zero-error function computation over directed acyclic networks take a combinatorial approach. Demonstrated, by means of a simple network which computes the sum over natural numbers, that using a probability distribution on the messages allows a higher computation rate in a variable-length network coding framework.
 - Used Schur-concavity of the entropy function with respect to the majorization relation between vectors to obtain a bound on the computation rate.
 - Used typical-set encoding to get examples of variable-length network codes; an article describing these results is currently in preparation.
- 2017 - § **Privacy-preserving data analysis**, with Dr. Ye Wang at Mitsubishi Electric Research Labs, Boston and Dr. Prakash Ishwar at Boston University.
- Used adversarial neural networks to ensure information-theoretic privacy of sensitive attributes associated with a data set. A privacy-utility tradeoff for the dataset can be formulated. When the attribute model is known, this tradeoff can be evaluated.
 - When the attribute model is unknown, we use training data instances for the adversarial networks and obtain a sanitized release of the dataset.
 - For synthetic data, we show that our procedure attains operating points close to the optimal tradeoff. For MNIST data, we visualize a tradeoff between minimizing the pixel-level distortion versus concealing the digit.
- 2011 - 12 § **Resource allocation in wireless Orthogonal Frequency-Division Multiple Access (OFDMA) networks**, with Dr. Ajit Chaturvedi at Indian Institute of Technology Kanpur.
- Developed a heuristic to allocate resources in single-carrier FDMA communication systems, heuristic solved a linear program as opposed to the optimal set-partitioning solution. Studied the Peak to Average Power Ratio (PAPR) of OFDM signals and proposed a gradient-descent based method to reduce the ratio by pulse-shaping.
- 2010 - 12 § **Direction of arrival estimation using microphone arrays**, with Dr. Rajesh Hegde and Dr. Lalan Kumar at Indian Institute of Technology Kanpur.
- The MULTiple SIGNAL Classification (MUSIC) method is used in microphone arrays to identify the direction of arrival (DOA) of incident waves based on the geometry of the array.
 - Studied a method in which the group delay of the received signal Fourier phase is used to get a robust estimate of the DOA in the presence of sensor noise, and applied it to planar arrays.

Industry experience

- 2017 § Summer intern at Mitsubishi Electric Research Labs, Boston, MA from 05/15 to 08/11, 2017.
- Worked to ensure information-theoretic privacy of sensitive variables that may be present or could be inferred from databases while still maintaining the utility of the database. Code written in Python used Chainer deep learning library.
- 2011 § Summer intern in Qualcomm India Pvt. Ltd. at Hyderabad, India from 05/01 to 08/01, 2011.
- Measured throughput and power usage of WLAN chipsets, and wrote Perl scripts to automate testing procedures. Qualcomm proprietary ASIA framework used to control test equipment.

Teaching experience

- Spring
2018 • Teaching assistant for EE 224 (Signals and Systems I): Led recitations for all sections, in total around 100 students, mostly sophomores and juniors. Held office hours for clearing doubts and supplementary instruction.

Programming skills

- MATLAB (proficient), Python (proficient), C (basic), R (basic), SageMath, L^AT_EX, Git.

Professional activities

Reviewer

- IEEE International Conference on Communications
- IEEE Transactions on Communications
- IEEE Transactions on Signal Processing

Affiliations

- 2014 - • Student Member, IEEE and IEEE Information Theory Society

Participant

- Croucher Summer School in Information Theory, Chinese University of Hong Kong, Jun. 2015.
- DIMACS workshop on network coding: the next 15 years, Rutgers University, Dec. 2015.
- Graduation day, Information Theory and Applications workshop, Feb. 2018.

University service

- Representative of Electrical and Computer Engineering (ECE) department to the Graduate and Professional Student Senate (GPSS) at Iowa State University (ISU).
- Member of the executive committee of the GPSS in the academic year 2015 - 16.
- A founding organizer of a weekly Data Science Reading Group, consisting of graduate students in the ECE and related departments at ISU. Website: <http://www.dsrg.stuorg.iastate.edu/>