

Anand D. Sarwate

Curriculum Vitæ

CONTACT INFORMATION

Assistant Professor

Department of Electrical and Computer Engineering
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RESEARCH INTERESTS

I am broadly interested in statistical algorithms and methods applied to problems in distributed systems, communications, and privacy and security.

EDUCATION

- 1/06–7/08 **University of California, Berkeley**, (Berkeley, California USA)
Ph.D., Electrical Engineering and Computer Sciences (awarded 12/2008)
Designated Emphasis in Communication, Computation and Statistics
Thesis: *Robust and adaptive communication under uncertain interference*
Advisor: Professor Michael Gastpar
- 8/02–12/05 **University of California, Berkeley**, (Berkeley, California USA)
M.S., Electrical Engineering and Computer Sciences (awarded 12/2005)
Thesis : *Observation uncertainty in Gaussian sensor networks*
Advisor: Professor Michael Gastpar
- 9/97–6/02 **Massachusetts Institute of Technology**, (Cambridge, Massachusetts USA)
B.S., Electrical Science and Engineering (awarded 6/2002)
B.S., Mathematics (awarded 6/2002)
Minors in Music and Theater Arts

EMPLOYMENT

- 1/14–present **Rutgers, The State University of New Jersey**, (Piscataway, New Jersey USA)
Assistant Professor
- 10/11–12/13 **Toyota Technological Institute at Chicago**, (Chicago, Illinois USA)
Research Assistant Professor
- 9/08–9/11 **University of California, San Diego**, (La Jolla, California USA)
Postdoctoral Researcher
Supervisors: Professors Alon Orlitsky, Tara Javidi, and Young-Han Kim

CURRENT RESEARCH SUPPORT

- NSF [SaTC-1617849] **TWC: Small: PERMIT: Privacy-Enabled Resource Management for IoT Networks** This proposal studies how privacy, utility, and bandwidth affect each

other in networked data collection and information processing systems. PI: Anand D. Sarwate, Co-PI: Narayan Mandayam: \$500,000.00

- DARPA/Navy [N66001-15-C-4070] **Jana: Ensuring Secure, Private and Flexible Data Access** This project is about building a secure database system that uses secure multiparty computing and privacy-preserving algorithms to hold and process queries on data held by multiple parties. PI: David Archer (Galois, Inc.), subcontract to Rutgers (PI: Rebecca Wright, co-PIs: Anand D. Sarwate, David Cash): \$1,013.723
- NSF [CCF-1453432] **CIF: Small: Active data screening for efficient feature learning** This proposal develops methods for screening samples to use for dictionary learning algorithms to balance representation accuracy and computational efficiency. PI: Waheed Bajwa, Co-PI: Anand D. Sarwate: \$160,000.00
- NIH [1R01DA040487-01A1] **COINSTAC: Decentralized, Scalable Analysis of Loosely Coupled Data** This proposal is to develop a system for automated and privacy-sensitive statistical analyses of data from neuroimaging researchers studying the same condition at different sites. PI: Vince Calhoun, subcontract to Rutgers (PI: Anand D. Sarwate): \$692,575.00 (estimated)
- NSF [CCF-1453432] **CAREER: Privacy-preserving learning for distributed data** This proposal develops key design principles for making practical privacy-preserving distributed learning algorithms and validate them in collaboration with neuroimaging researchers. The results will identify new challenges for information processing and machine learning in general distributed systems. PI: Anand D. Sarwate: \$540,000.00

PAST RESEARCH SUPPORT

- NSF [CCF-1218331] **Inference by social sampling.** This work investigates communication and networking paradigms that can enable a network of individual agents to collaboratively estimate distributions over high dimensional spaces, even when individual observations are severely limited in accuracy, space, or time. Co-PIs Anand D. Sarwate, Tara Javidi (UCSD): \$208,426
- Verisign Gift through DIMACS Center to work on applied and theoretical privacy. PIs: Rebecca Wright, Anand D. Sarwate: \$25,000
- DHS **DPAD: Differentially Private Anomaly Detection** [Subcontract to CICCADA] This work seeks to understand how and when we can safely detect anomalies in private data. PIs: Rebecca Wright, Anand D. Sarwate: \$125,000
- ARL [CTA on Robotics] **Active Feature Learning and Classifier Training for Object Recognition** : developing active learning approaches for feature learning for object recognition in rich data such as video. Subaward from General Dynamics. Joint proposal with Waheed Bajwa and Athina Petropulu (Rutgers): \$125,526
- AcademyHealth [EDM Forum] **Review of Technologies to Protect Patient Privacy When Sharing Data for Comparative Effectiveness Research** : commissioned paper for a review of privacy-preserving methods for sharing data for medical research. Joint proposal with Lucila Ohno-Machado and Xiaoqian Jiang (UCSD): \$5,000

PREPRINTS

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- [2] H. Imtiaz and A. D. Sarwate, “Distributed differentially-private algorithms for matrix and tensor factorization,” ArXiv, Tech. Rep. arXiv:1804.10299 [stat.ML], apr 2018. [Online]. Available: <https://arxiv.org/abs/1804.10299>
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- [5] M. Ghassemi, Z. Shakeri, A. D. Sarwate, and W. U. Bajwa, “STARK: Structured dictionary learning through rank-one tensor recovery,” ArXiv, Tech. Rep. arXiv:1711.04887 [stat.ML], November 2017. [Online]. Available: <https://arxiv.org/abs/1711.04887>
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JOURNAL

- [1] H. Imtiaz and A. D. Sarwate, “Distributed differentially-private algorithms for matrix and tensor factorization,” *IEEE Journal of Selected Topics in Signal Processing*, to appear 2019.

- [2] K. Kalantari, L. Sankar, and A. D. Sarwate, "Robust privacy-utility tradeoffs under differential privacy and hamming distortion," *IEEE Transactions on Information Forensics and Security*, vol. 13, no. 11, pp. 2816–2830, November 2018. [Online]. Available: <http://dx.doi.org/10.1109/TIFS.2018.2831619>
- [3] A. Lalitha, T. Javidi, and A. D. Sarwate, "Social learning and distributed hypothesis testing," *IEEE Transactions on Information Theory*, to appear 2018. [Online]. Available: <http://dx.doi.org/10.1109/TIT.2018.2837050>
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CONFERENCE PAPERS

[1] Z. Shakeri, A. D. Sarwate, and W. U. Bajwa, "Identifiability of kronecker-structured dictionaries for tensor data," in *Proceedings of the 52nd Asilomar Conference on Asilomar Conference on Signals, Systems, and Computers*, oct 2018.

[2] D. Bittner, A. D. Sarwate, and R. Wright, "Using noisy binary search for differentially private anomaly detection," in *Proceedings of the 2nd International Symposium on Cyber Security Cryptography and Machine Learning (CSCML 2018)*, ser. Lecture Notes in Computer Science. Springer, jun 2018.

[3] H. Imtiaz and A. D. Sarwate, "Improved algorithms for differentially private orthogonal tensor decomposition," in *Proceedings of the 43rd IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2018)*, April 2018.

[4] M. Ghassemi, N. Goela, and A. D. Sarwate, "Global optimality in inductive matrix completion," in *Proceedings of the 43rd IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2018)*, April 2018.

[5] S. Xiong, A. D. Sarwate, and N. B. Mandayam, "Defending against packet-size side-channel attacks in iot networks," in *Proceedings of the 43rd IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2018)*, April 2018.

[6] H. Imtiaz and A. D. Sarwate, "Differentially private distributed principal component analysis," in *Proceedings of the 43rd IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2018)*, April 2018.

[7] M. Ghassemi, Z. Shakeri, A. D. Sarwate, and W. U. Bajwa, "STARK: Structured dictionary learning through rank-one tensor recovery," in *Proceedings of the 7th IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP 2017)*, December 2017. [Online]. Available: <http://dx.doi.org/10.1109/CAMSAP.2017.8313164>

[8] H. Imtiaz and A. D. Sarwate, "Differentially private canonical correlation analysis," in *Proceedings of the 2017 IEEE Global Conference on Signal and Information Processing*, November 2017. [Online]. Available: <http://dx.doi.org/10.1109/GlobalSIP.2017.8308649>

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[10] Z. Shakeri, W. U. Bajwa, and A. D. Sarwate, "Sample complexity bounds for dictionary learning of tensor data," in *Proceedings of the 42nd IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2017)*, March 2017, pp. 4501–4505. [Online]. Available: <http://dx.doi.org/10.1109/ICASSP.2017.7953008>

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TUTORIALS

- 12/17 *Differentially Private Machine Learning: Theory, Algorithms, and Applications* (with K. Chaudhuri), tutorial at the 2017 Neural Information Processing Systems (NIPS).
- 12/14 *Differential privacy and machine learning* (with K. Chaudhuri), tutorial at the 2014 IEEE Workshop on Information Forensics and Security (WIFS)

INVITED WORKSHOPS

- 5/18 BIRS Workshop: Mathematical Foundations of Data Privacy
- 2/10–2/18 ITA Workshop, UC San Diego
- 1/18 “Hacking Deep Learning”: Workshop at Bar-Ilan University’s Center for Research in Applied Cryptography and Cyber Security
- 8/17 DIMACS Workshop on Distributed Optimization, Information Processing, and Learning
- 5/17 Simons Institute for Theoretical Computer Science Workshop on Data Privacy, Berkeley, CA

- 4/17 DIMACS/Northeast Big Data Hub Workshop on Privacy and Security for Big Data
- 9/16 Google Learning, Privacy, and Mobile Data Workshop, Seattle, WA
- 5/15 Big Data Analytics for Health Care: Differential Privacy, University of Delaware
- 3/15 BIRS Workshop: Between Shannon and Hamming: Network Information Theory and Combinatorics
- 12/13 Simons Institute for Theoretical Computer Science Workshop on Big Data and Differential Privacy
- 10/12 DIMACS Workshop on Recent Work on Differential Privacy across Computer Science
- 10/11–10/12 iDASH Privacy Workshop, UC San Diego
- 10/11 BIRS Workshop on Information theory and statistics for large alphabets
- 5/10 2010 IEEE Communication Theory Workshop
- 8/09 American Institute of Mathematics Workshop on Permanents and modeling probability distributions

RECENT TALKS

- 1/18 *Differential Privacy and Collaborative Learning*, Bar-Ilan University Cyber Center Workshop on “Hacking Deep Learning”
- 7/17 *Between Shannon and Hamming: The Impact of Delay*, École Polytechnique Fédérale de Lausanne (EPFL), and Technical University of Vienna (TU-Wien)
- 5/17 *Challenges in Privacy-Preserving Learning for Collaborative Research Consortia*, Simons Institute for Theoretical Computer Science Planning Workshop on Data Privacy
- 4/17 *Privacy Protections as an Incentive for Collaborative Research on Human Health*, DIMACS/Northeast Big Data Hub Workshop on Privacy and Security for Big Data
- 4/16,5/16 *Differential Privacy in Distributed Systems*, Harvard University EE Seminar, CUNY Graduate Center
- 11/15 *Privacy-Protecting Technologies for Collaborative Research*, Christiana Care CME Series
- 4/15,6/15 *Learning From Distributed Private Data: Algorithms and Applications*, NYU-Poly (April), National Chiao Tung University (June)
- 5/15 *The role of differential privacy in collaborative healthcare research*, University of Delaware ACCEL Retreat

EDITORSHIPS

- 12/2014–Present Associate Editor, *IEEE Transactions on Signal and Information Processing over Networks*

PROFESSIONAL SERVICE

2017–2019	Machine Learning and Signal Processing Technical Committee, IEEE Signal Processing Society
2015–Present	Online Editor, IEEE Information Theory Society
2009–2014	Online Associate Editor, IEEE Information Theory Society
2007–2009	IEEE Information Theory Society Ad Hoc Committee on Online Content and Services
10/08–12/10	IEEE Information Theory Society Student Committee
9/08–8/09	UCSD Information Theory and Applications Seminar organizer
8/05–8/07	UC Berkeley Networking, Communications, and DSP Seminar organizer

UNIVERSITY SERVICE

2016–Present	Health and Safety Committee, School of Engineering
2015–Present	Strategic Planning Committee for Douglass Residential College, Rutgers

CONFERENCE AND WORKSHOP ORGANIZATION

2019	Simons Institute Workshop on Privacy and the Science of Data Analysis
2019	North American School on Information Theory
2018	IPAM Workshop on Algorithmic Challenges in Protecting Privacy for Biomedical Data
2016	Institut Henri Poincaré Program on the Nexus of Information and Computation Theories
2009–2013	Information Theory and Applications Workshop

PROGRAM COMMITTEES

Workshop on the Theory and Practice of Differential Privacy (TPDP 2018)
NIPS Workshop on Privacy Preserving Machine Learning, 2018
26th European Signal Processing Conference (EUSIPCO 2018)
19th IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC 2018)
IEEE International Symposium on Information Theory (ISIT 2017–2018)
IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2017–2018)
IEEE International Workshop on Machine Learning for Signal Processing (MLSP 2017)
IEEE Global Conference on Signal and Information Processing (GlobalSIP 2017) Symposium on Control and Information Theoretic Approaches to Privacy and Security

IEEE Information Theory Workshop (ITW 2015, 2017)

IEEE International Conference on Distributed Computing in Sensor Networks (DCOSS 2012, 2013, 2015)

Sixth International Conference on Information-Theoretic Security (ICITS 2012) - TPC

IEEE Vehicular Technology Conference (VTC) 2011

IEEE ICC Wireless Communications Symposium 2010

PEER REVIEWING

IEEE Transactions : Information Theory, Signal Processing, Automatic Control, Communications, Wireless Communications, Vehicular Technology, Computational Biology and Bioinformatics, Parallel and Distributed Systems, Smart Grid, Network Science and Engineering, Signal and Information Processing over Networks

IEEE Journal of Selected Areas in Communication, IEEE Journal of Selected Topics in Signal Processing, IEEE Signal Processing Magazine, IEEE Signal Processing Letters, IEEE Communications Letters

Problems of Information Transmission

IEEE/ACM Transactions on Networks

ACM Transactions on Sensor Networks

Problems of Information Transmission

Journal of Machine Learning Research (JMLR)

Journal of the American Statistical Association (JASA)

Random Structures and Algorithms

Statistical Science

Machine Learning

Entropy

EURASIP Journal on Wireless Communications and Networking

Queueing Systems : Theory and Applications

AMS Mathematical Reviews

Conferences : ISIT (2007–2018), Globecom (2007, 2009), GlobalSIP (2016, 2017), PIMRC (2007), ITW (2008,2010,2013-2018), CDC (2009,2012), STOC (2010), COLT (2011, 2012), Infocom (2012), ICC (2012), AISTATS (2012, 2013), ICML (2012–2016), NIPS (2012–2016), ACC (2013), SODA (2015), GlobalSIP (2016–2017), AISTATS (2016–2019), ICASSP (2017–2018), CAMSAP (2017)

HONORS AND AWARDS

A. Walter Tyson Assistant Professor Award, Rutgers School of Engineering, 2018

NSF CAREER Award, 2015

NIPS Reviewer Award, 2013

Demetri Angelakos Memorial Achievement Award, UC Berkeley Department of EECS, 2008

Samuel Silver Memorial Scholarship Award, UC Berkeley Department of EECS, 2007

National Defence Science and Engineering Graduate Fellowship, 2002–2005

MIT : Laya and Jerome B. Wiesner Student Art Award, Joseph Everingham Award (Theater), Philip Lowe Memorial Award (Music)

MEMBERSHIPS IEEE, Phi Beta Kappa, Eta Kappa Nu

October 15, 2018