

Anand D. Sarwate

Curriculum Vitæ

CONTACT INFORMATION

Associate Professor

Department of Electrical and Computer Engineering

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RESEARCH INTERESTS

I am broadly interested in probability, statistics, and algorithms 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)
Minor in Music
Minor in Theater Arts

EMPLOYMENT

- 7/20– **Rutgers, The State University of New Jersey**, (Piscataway, New Jersey USA)
Associate Professor
- 1/14–6/20 **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

AWARDS AND HONORS

Board of Trustees Research Fellowship for Scholarly Excellence, 2020

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

NSF CAREER Award, 2015

IEEE Senior Member

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)

PREPRINTS

- [1] N. Sathyavageeswaran, R. D. Yates, A. D. Sarwate, and N. Mandayam. *Privacy Leakage in Discrete Time Updating Systems*. Tech. rep. arXiv:2205.15630 [eess.SY]. ArXiv, May 2022. URL: <https://arxiv.org/abs/2205.15630>.
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- [2] S. Basodi, R. Raja, B. Ray, H. Gazula, A. D. Sarwate, S. Plis, J. Liu, E. Verner, and V. D. Calhoun. “Decentralized Brain Age Estimation Using MRI Data”. In: *Neuroinformatics* (Apr. 2022). DOI: [10.1007/s12021-022-09570-x](https://doi.org/10.1007/s12021-022-09570-x).
- [3] D. K. Saha, V. D. Calhoun, Y. Du, Z. Fu, S. M. Kwon, A. D. Sarwate, S. R. Panta, and S. M. Plis. “Privacy-preserving quality control of neuroimaging datasets in federated environments”. In: *Human Brain Mapping* 43 (Mar. 2022), pp. 2289–2310. DOI: [10.1002/hbm.25788](https://doi.org/10.1002/hbm.25788).
- [4] Y. Zhang, S. Vatedka, S. Jaggi, and A. D. Sarwate. “Quadratically Constrained Myopic Adversarial Channels”. In: *IEEE Transactions on Information Theory* to appear (2022). DOI: [10.1109/TIT.2022.3167554](https://doi.org/10.1109/TIT.2022.3167554).
- [5] H. Imtiaz, J. Mohammadi, R. Silva, B. Baker, S. M. Plis, A. D. Sarwate, and V. D. Calhoun. “A Correlated Noise-Assisted Decentralized Differentially Private Estimation Protocol, and its Application to fMRI Source Separation”. In: *IEEE Transactions on Signal Processing* 69 (Nov. 2021), pp. 6355–6370. DOI: [10.1109/TSP.2021.3126546](https://doi.org/10.1109/TSP.2021.3126546).
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- [11] H. Gazula, R. Kelly, J. Romero, E. Verner, B. T. Baker, R. F. Silva, H. Imtiaz, D. K. Saha, R. Raja, J. A. Turner, A. D. Sarwate, S. M. Plis, and V. D. Calhoun. “COINSTAC: Collaborative Informatics and Neuroimaging Suite Toolkit for Anonymous Computation”. In: *Journal of Open Source Software* 5.54 (Oct. 2020), p. 2166. DOI: [10.21105/joss.02166](https://doi.org/10.21105/joss.02166).
- [12] D. M. Bittner, A. E. Brito, M. Ghassemi, S. Rane, A. D. Sarwate, and R. N. Wright. “Understanding Privacy-Utility Tradeoffs Using Differentially Private Online Active Learning”. In: *Journal of Privacy and Confidentiality* 10.2 (June 2020). DOI: [10.29012/jpc.720](https://doi.org/10.29012/jpc.720).

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- [32] B. K. Dey, S. Jaggi, M. Langberg, and A. D. Sarwate. “Upper Bounds on the Capacity of Binary Channels with Causal Adversaries”. In: *IEEE Transactions on Information Theory* 59.6 (June 2013), pp. 3753–3763. DOI: [10.1109/TIT.2013.2245721](https://doi.org/10.1109/TIT.2013.2245721).
- [33] A. D. Sarwate, S. Checkoway, and H. Shacham. “Risk-Limiting Audits and the Margin of Victory in Nonplurality Elections”. In: *Statistics, Politics and Policy* 3.3 (Dec. 2012), pp. 29–64. DOI: [10.1515/spp-2012-0003](https://doi.org/10.1515/spp-2012-0003).
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- [42] A. G. Dimakis, A. D. Sarwate, and M. J. Wainwright. “Geographic Gossip: Efficient Averaging for Sensor Networks”. In: *IEEE Transactions on Signal Processing* 56.3 (Mar. 2008), pp. 1205–1215. DOI: [10.1109/TSP.2007.908946](https://doi.org/10.1109/TSP.2007.908946).
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BOOK CHAPTER

- [1] Z. Shakeri, A. D. Sarwate, and W. U. Bajwa. “Sample Complexity Bounds for Dictionary Learning from Vector- and Tensor-valued Data”. In: *Information-Theoretic Methods in Data Science*. Ed. by M. Rodrigues and Y. C. Eldar. Cambridge, UK: Cambridge University Press, 2021, pp. 134–162. DOI: [10.1017/9781108616799.006](https://doi.org/10.1017/9781108616799.006).

CONFERENCE PAPERS

- [1] N. Sathyavageswaran, R. D. Yates, A. D. Sarwate, and N. Mandayam. “Privacy Leakage in Discrete Time Updating Systems”. In: *Proceedings of the 2022 IEEE International Symposium on Information Theory (ISIT)*. June 2022.
- [2] Y. Zhang, S. Jaggi, M. Langberg, and A. D. Sarwate. “The Capacity of Causal Adversarial Channels”. In: *Proceedings of the 2022 IEEE International Symposium on Information Theory (ISIT)*. June 2022.
- [3] S. M. Kwon, X. Li, and A. D. Sarwate. “Low-Rank Phase Retrieval with Structured Tensor Models”. In: *Proceedings of the 47th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2022)*. May 2022, pp. 3643–3647. DOI: [10.1109/ICASSP43922.2022.9746452](https://doi.org/10.1109/ICASSP43922.2022.9746452).
- [4] F. Cangialosi, N. Agarwal, V. Arun, J. Jiang, S. Narayana, A. Sarwate, and R. Netravali. “Privid: Practical, Privacy-Preserving Video Analytics Queries”. In: *Proceedings of the 19th USENIX Symposium on Networked Systems Design and Implementation (NSDI '22)*. Apr. 2022. URL: <https://www.usenix.org/conference/nsdi22/presentation/cangialosi>.
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- [10] H. Imtiaz and A. D. Sarwate. “Distributed Differentially Private Canonical Correlation Analysis”. In: *Proceedings of the 44th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. Brighton, UK, May 2019, pp. 3112–3116. DOI: [10.1109/ICASSP.2019.8683252](https://doi.org/10.1109/ICASSP.2019.8683252).
- [11] K. Nikolakakis, D. Kalogieras, and A. D. Sarwate. “Learning Tree Structures from Noisy Data”. In: *Proceedings of the Twenty-Second International Conference on Artificial Intelligence and Statistics (AISTATS)*. Ed. by K. Chaudhuri and R. Salakhutdinov. Vol. 89. Proceedings of Machine Learning Research. Naha, Okinawa, Japan: PMLR, Apr. 2019, pp. 1771–1782. URL: <http://proceedings.mlr.press/v89/nikolakakis19a.html>.
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RESEARCH SUPPORT

NSF	<p>CNS-2148104 : \$1,000,000, 5/1/2022–4/30/2025</p> <p>RINGS: REALTIME: Resilient Edge-cloud Autonomous Learning with Timely Inferences</p> <p>PI: Roy Yates, Co-PIs: Dipankar Raychaudhuri, Waheed Bajwa, Anand D. Sarwate</p> <p>This project studies how to design real-time operation, online decision-making, and offline training of real-time ML-based applications that are resilient to data, application, user, and system changes.</p>
NIH	<p>2R01DA040487 : \$623,113, 9/30/2020–6/30/2025</p> <p>COINSTAC 2.0: Decentralized, Scalable Analysis of Loosely Coupled Data</p> <p>PI: Vince Calhoun (Georgia State), subcontract to Rutgers (PI: Anand D. Sarwate)</p> <p>This is a continuation of the COINSTAC project (see below) to develop a system for automated and privacy-sensitive statistical analyses of data from neuroimaging researchers studying the same condition at different sites.</p>
NSF	<p>CCF-1910110 : \$499,976, 10/1/2019–9/30/2022</p> <p>CIF: Small: ESTRELLA: Exploiting Structure in Tensors for Representation, Estimation, and Limits of Learning Algorithms</p> <p>PI: Anand D. Sarwate, Co-PI: Waheed Bajwa</p> <p>This project pursues a comprehensive theory to simplify the measurement, storage, and statistical modeling of tensor-structured data.</p>
NSF	<p>CCF-1909468: \$250,000, 10/1/2019–9/30/2022</p> <p>CIF: Small: Collaborative Research: Between Shannon and Hamming</p> <p>PI: Anand D. Sarwate, Co-PI: Michael Langberg (U. Buffalo)</p> <p>This proposal studies fundamental coding strategies communication over channels in which the interference lies between the average and worst-case models.</p>
NSF	<p>SaTC-1617849: \$500,000.00, 9/1/2016–8/31/2020</p> <p>TWC: Small: PERMIT: Privacy-Enabled Resource Management for IoT Networks</p> <p>PI: Anand D. Sarwate, Co-PI: Narayan Mandayam</p> <p>This proposal studies how privacy, utility, and bandwidth affect each other in networked data collection and information processing systems.</p>
Verisign	<p>Gift: \$25,000, 11/2015</p> <p>Differential Privacy, Multi-target Search, and Anomaly Detection</p> <p>PIs: Rebecca Wright, Anand D. Sarwate</p> <p>Gift through DIMACS Center to work on applied and theoretical privacy.</p>
DHS	<p>Subcontract from CICCADA: \$125,000, 10/1/2015–6/30/2016</p> <p>PIs: Rebecca Wright, Anand D. Sarwate</p> <p>DPAD: Differentially Private Anomaly Detection</p>

	<p>This work seeks to understand how and when we can safely detect anomalies in private data.</p>
NSF	<p>CCF-1525276: \$160,000.00, 9/1/2015–8/31/2017</p> <p>CIF: Small: Active data screening for efficient feature learning</p> <p>PI: Waheed Bajwa, Co-PI: Anand D. Sarwate</p> <p>This proposal develops methods for screening samples to use for dictionary learning algorithms to balance representation accuracy and computational efficiency.</p>
NIH	<p>1R01DA040487-01A1: \$692,575, 07/01/2015–04/30/2020</p> <p>COINSTAC: Decentralized, Scalable Analysis of Loosely Coupled Data</p> <p>PI: Vince Calhoun (Georgia State), subcontract to Rutgers (PI: Anand D. Sarwate)</p> <p>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.</p>
NSF	<p>CCF-1453432: \$540,000.00, 7/1/2015–6/30/2020</p> <p>CAREER: Privacy-preserving learning for distributed data</p> <p>PI: Anand D. Sarwate</p> <p>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.</p>
DARPA/Navy	<p>N66001-15-C-4070: \$1,013.723, 3/15/2015–3/14/2020</p> <p>Jana: Ensuring Secure, Private and Flexible Data Access</p> <p>PI: David Archer (Galois, Inc.), subcontract to Rutgers (PI: Rebecca Wright, co-PIs: Anand D. Sarwate, David Cash)</p> <p>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.</p>
ARL	<p>CTA on Robotics: \$125,526, 4/16/2014–4/15/2015</p> <p>Subaward from General Dynamics to Rutgers (PI: Waheed Bajwa, Co-PIs: Athina Petropulu, Anand Sarwate)</p> <p>Active Feature Learning and Classifier Training for Object Recognition</p> <p>This work was to develop active learning approaches for feature learning for object recognition in rich data such as video. Subaward from General Dynamics.</p>
NSF	<p>CCF-1218331: \$208,426, 9/1/2012–4/30/2014</p> <p>CIF: Small: Collaborative Research: Inference by social sampling</p> <p>PI: Tara Javidi (UCSD), Co-PI: Anand D. Sarwate</p> <p>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.</p>
AcademyHealth	<p>EDM Forum: \$5,000, 11/2011</p> <p>PI: Xiaoqian Jiang (UCSD), co-PIs: Anand D. Sarwate (TTI-Chicago), Lucila Ohno-</p>

Machado (UCSD)

Review of Technologies to Protect Patient Privacy When Sharing Data for Comparative Effectiveness Research

Commissioned paper for a systematic review of privacy-preserving methods for sharing data for medical research.

EDITORSHIPS

10/20–ongoing	Associate Editor, IEEE Transactions on Information Theory
1/20–ongoing	Consulting Associate Editor, IEEE Open Journal of Signal Processing (OJSP)
1/15–12/18	Associate Editor, IEEE Transactions on Signal and Information Processing over Networks

PROFESSIONAL SERVICE

2021–2023	Member, Board of Governors, IEEE Information Theory Society
2017–2022	Member, Machine Learning for Signal Processing Technical Committee, IEEE Signal Processing Society
1/15–1/19	Online Editor, IEEE Information Theory Society
01/14–12/14	Online Associate Editor, IEEE Information Theory Society
10/08–12/10	Member, Student Committee, IEEE Information Theory Society
2007–2009	Member, Ad Hoc Committee on Online Content and Services, IEEE Information Theory Society

CONFERENCE AND WORKSHOP ORGANIZATION

2023	Finance Chair, 2023 North American School of Information Theory (NASIT 2023), Philadelphia, PA
2022	Online Platform Co-Chair, 2022 IEEE International Symposium on Information Theory (ISIT 2022)
2019	Technical Program Chair, 2019 North American School of Information Theory (NASIT 2019), Boston, MA
2019	Chair, Simons Center Workshop on Privacy and the Science of Data Analysis, Simons Institute for Theoretical Computer Science, Berkeley, CA
2018	Co-Organizer, Algorithmic Challenges for Protecting Privacy for Biomedical Data, Institute for Pure and Applied Mathematics (IPAM), Los Angeles, CA
2016	Co-Organizer, Program on the Nexus of Information and Computation Theories: Secrecy and Privacy, Institute Henri Poincaré, Paris, France

PROGRAM COMMITTEES (LAST 5 YEARS)

2022	Technical Program Committee, Workshop on the Theory and Practice of Differential Privacy (TPDP 2022)
2022	Technical Program Committee, 2022 IEEE International Symposium on Information Theory (ISIT 2022)
2022	Technical Program Committee, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2022)
2021	Technical Program Committee, 2021 IEEE International Symposium on Information Theory (ISIT 2021)
2021	Technical Program Committee, 2021 IEEE International Symposium on Information Theory (ISIT 2021)
2021	Technical Program Committee, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2021)
2020	Technical Program Committee, Workshop on the Theory and Practice of Differential Privacy (TPDP 2020)
2020	Technical Program Committee, IEEE International Workshop on Machine Learning for Signal Processing (MLSP 2020)
2020	Technical Program Committee, NeurIPS 2020 Workshop on Privacy Preserving Machine Learning - PriML and PPML Joint Edition
2020	Technical Program Committee, ICLR 2020 Workshop on Trustworthy ML
2020	Senior Area Chair, Conference on Learning Theory (COLT 2020)
2020	Technical Program Committee, 2020 IEEE International Symposium on Information Theory (ISIT 2020)
2020	Technical Program Committee, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2020)
2019	Technical Program Committee, NeurIPS 2019 Workshop on Privacy in Machine Learning (PriML 2019)
2019	Technical Program Committee, IEEE International Workshop on Machine Learning for Signal Processing (MLSP 2019)
2019	Area Chair, Neural Information Processing Systems (NeurIPS 2019)
2019	Technical Program Committee, 2019 IEEE International Symposium on Information Theory (ISIT 2019)
2019	Technical Program Committee, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2019)
2019	Area Chair, International Conference on Machine Learning (ICML 2019)
2019	Technical Program Committee, Workshop on the Theory and Practice of Differential Privacy (TPDP 2018)

2018	Technical Program Committee NIPS Workshop on Privacy Preserving Machine Learning, 2018
2018	Technical Program Committee, IEEE International Workshop on Machine Learning for Signal Processing (MLSP 2018)
2018	Technical Program Committee, 26th European Signal Processing Conference (EUSIPCO 2018)
2018	Technical Program Committee, 19th IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC 2018)
2018	Technical Program Committee, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2018)
2018	Technical Program Committee, 2018 IEEE International Symposium on Information Theory (ISIT 2018)

PEER REVIEWING

IEEE Transactions : Information Theory, Signal Processing, Automatic Control, Information Forensics and Security, 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, Dependable and Secure Computing

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

Journal of Machine Learning Research (JMLR), Machine Learning

Journal of the American Statistical Association (JASA), Statistical Science, Mathematical Statistics and Learning

Journal of Privacy and Confidentiality

Bernoulli, Random Structures and Algorithms, Queueing Systems : Theory and Applications

Problems of Information Transmission, Entropy

IEEE/ACM Transactions on Networks, ACM Transactions on Sensor Networks, EURASIP Journal on Wireless Communications and Networking, IEEE Open Journal of Signal Processing

SIAM Journal on Matrix Analysis and Applications (SIMAX)

AMS Mathematical Reviews

Conferences : Asilomar (2021–2022), ISIT (2007–2022), ITW (2008,2010,2013–2022), DSLW 2022, COLT (2011, 2012, 2020), ACM Richard Tapia Celebration of Diversity in Computing

Poster Track (2019), AISTATS (2012, 2013, 2017–2019), SPAWC (2018), EUSIPCO (2018), GlobalSIP (2015–2017), CAMSAP (2017), NIPS (2012–2016), ICML (2012–2016), WiOpt (2015), DCOSS (2015), SODA (2015), ACC (2013), ICC (2012), Infocom (2012), CDC (2009,2012), STOC (2010), Globecom (2007, 2009), PIMRC (2007)

July 29, 2022