Pritam Mukherjee

Stanford Center for Biomedical Informatics Research
Stanford Medicine, Stanford University
Stanford, CA 94305

Email: pritamm@stanford.edu
http://www.web.stanford.edu/∼pritamm/
Phone: (+1) 301-221-2697

Education

University of Maryland, College Park, MD 2010–2016
Ph.D. in Electrical Engineering
Advisor: Prof. Sennur Ulukus
GPA: 4.0/4.0

Indian Institute of Technology, Kharagpur 2006–2010
B.Tech in Electronics and Electrical Communication Engineering
Major: Electronics and Electrical Communication Engineering
Minor: Computer Science and Engineering
CGPA: 9.19/10

Research Interests

- Machine learning, bioinformatics, biomedical imaging, electronic health records, information theory, statistics

Research Experience

Postdoctoral Scholar Jan 2018 – Present
Stanford Center for Biomedical Informatics Research, Stanford University, CA
Advisor: Prof. Olivier Gevaert
Project: We are interested in using machine learning techniques for detection, treatment and predicting the prognosis of cancer. Specifically, we exploit multi-omics data including diagnostic imaging (CT, MRI, PET), genomic data, and histopathology to determine genetic drivers, detect cancer early, suggest treatment and predict response. We are also interested in mining electronic health records data for disease diagnosis and management.

Postdoctoral Scholar Jan 2017 – Dec 2017
Electrical Engineering, Stanford University, CA
Advisors: Prof. Tsachy Weissman and Prof. Ayfer Ozgur
Project: We explored problems that lie in the intersection of information theory, statistics and learning theory. We were especially interested in problems of inference from distributed data sources under communication constraints.

Graduate Research Assistant Aug 2010 –Dec 2016
University of Maryland, College Park, MD
Advisor: Prof. Sennur Ulukus
Dissertation: Security under imperfect channel knowledge in wireless networks
Abstract: We study physical layer security in wireless networks using an information theoretic framework. The central theme of our work is exploring the effect of delayed or no channel state information on physical layer security in wireless channel models.

Summer Internship Summer 2014
Alcatel-Lucent Bell labs, New Jersey
Advisor: Dr. Howard Huang
Project: Localization using cellular networks

Undergraduate B.Tech Project 2009–2010
Indian Institute of Technology, Kharagpur, India
Advisor: Prof. M. Chakraborty
Project: Design of adaptive filters with low hardware complexity

Undergraduate Summer Internship Summer, 2009
Temasek laboratories, Nanyang Technological University, Singapore
Advisor: Prof. Y. C. Lim
Project: Design of sharp digital filters with low hardware complexity using frequency response masking

Teaching Experience

University of Maryland: As part of the Future Faculty Program, I co-taught ENEE322: Signal and System Theory, with Prof. Steve Marcus in Fall, 2014. Responsibilities included preparing and delivering about half of the lectures, assigning homeworks, as well as giving and grading examinations.

Mentoring Experience

As a postdoctoral scholar with Gevaertlab, I have had the opportunity to mentor and collaborate with multiple students:

- Summer 2020: Mentored a visiting high school student Annelisa Fache.
- Summer 2019: Formally mentored a high school student Bruke Wossenseged, who visited our lab as part of the Stanford Institutes of Medicine Summer Research Program. Bruke is now a freshman at the Massachusetts Institute of Technology.
- Summer 2018: Mentored a graduate student Anna Brezhneva who worked on "Lung Nodule Candidate Generation and Cancer Prediction" as her CS231n (Convolutional Neural Networks for Visual Recognition) project with our lab. A part of that work was presented at RSNA 2019.

Publications

Journals

- **P. Mukherjee**, M. Zhou, E. Lee, A. Schicht, Y. Balagurunathan, S. Napel, R. Gillies, S. Wong, A. Thieme, A. Leung, O. Gevaert, A Shallow Convolutional Neural Network Predicts Prognosis of Lung Cancer Patients in Multi-Institutional CT-Image Data, *Nature Machine Intelligence*, 2:274-282, May 2020.
  - Featured on the cover of Nature Machine Intelligence.
- **P. Mukherjee**, M. Cintra, C. Huang, M. Zhou, S. Zhu, A. D. Colevas, N. Fischbein and O. Gevaert, CT-based Radiomic Signatures for Predicting Histopathologic Features in Head and Neck Squamous Cell Carcinoma, *Radiology: Imaging Cancer*, 2(3), May 2020.
- P. Bulens, A. Couwenberg, M. Intven, A. Debucquoy, V. Vandecaveye, E. Cutsem, A. D'Hoore, A. Wolthuis, **P. Mukherjee**, O. Gevaert, K. Haustermans, Predicting the Tumor Response to Chemoradiotherapy for Rectal Cancer: Model Development and External Validation using MRI Radiomics, *Radiotherapy and Oncology*, 142:246-252, January 2020.
  - I was responsible for the radiomics model development and subsequent statistical analysis in this paper.
- **P. Mukherjee** and S. Ulukus, Secure Degrees of Freedom of the Multiple Access Wiretap Channel with Multiple Antennas, *IEEE Transactions on Information Theory*, 64(3):2093-2103, March 2018.
- **P. Mukherjee** and S. Ulukus, Secrecy in MIMO Networks with No Eavesdropper CSIT, *IEEE Transactions on Communications*, 65(10):4382-4391, October 2017.
- **P. Mukherjee**, R. Tandon and S. Ulukus, Secure Degrees of Freedom Region of the Two-User MISO Broadcast Channel with Alternating CSIT, *IEEE Transactions on Information Theory*, 63(6):3823-3853, June 2017.
- **P. Mukherjee**, J. Xie and S. Ulukus, Secure Degrees of Freedom of One-hop Wireless Networks with No Eavesdropper CSIT, *IEEE Transactions on Information Theory*, 63(3):1898-1922, March 2017.
- T-Y. Liu, **P. Mukherjee**, S. Ulukus, S-C. Lin and Y-W. P. Hong; Secure Degrees of Freedom of MIMO Rayleigh Block Fading Wiretap Channels with No CSI Anywhere, *IEEE Transactions on Wireless Communications*, 14(5):2655-2669, May 2015.
- S. Choudhary, **P. Mukherjee**, M. Chakraborty, S. S. Rath; A SPT Treatment to the Realization of the Sign-LMS Based Adaptive Filters; *IEEE Transactions on Circuits and Systems I: Regular Papers*, 59(9);2025-2033, September 2012.

Peer Reviewed Conference Proceedings

- Y. Han, **P. Mukherjee**, A. Ozgur and T. Weissman, Distributed Statistical Estimation of High-Dimensional and Nonparametric Distributions, *IEEE International Symposium on Information Theory*, Vail, CO, June 2018.

- **P. Mukherjee** and S. Ulukus, Covert Bits Through Queues, *IEEE Conference on Communications and Network Security*, Philadelphia, PA, October 2016.
- **P. Mukherjee** and S. Ulukus, MIMO One Hop Networks with No Eve CSIT, *54th Annual Allerton Conference on Communications, Control and Computing*, Monticello, IL, September 2016.
- **P. Mukherjee** and S. Ulukus, Real Interference Alignment for Vector Channels, *IEEE International Symposium on Information Theory*, Barcelona, Spain, July 2016.
- **P. Mukherjee** and S. Ulukus, Real Interference Alignment for the MIMO Multiple Access Wiretap Channel, *IEEE International Conference on Communications*, Kuala Lumpur, Malaysia, May 2016.
- **P. Mukherjee** and S. Ulukus, Secure Degrees of Freedom of the Gaussian MIMO Multiple Access Wiretap Channel, *49th Asilomar Conference on Signals, Systems and Computers*, Pacific Grove, CA, November 2015.
- **P. Mukherjee** and S. Ulukus, Secure Degrees of Freedom of the Interference Channel with No Eavesdropper CSI, *IEEE Information Theory Workshop*, Jeju, Korea, October 2015.
- **P. Mukherjee** and S. Ulukus, Secure Degrees of Freedom of the Multiple Access Wiretap Channel with No Eavesdropper CSI, *IEEE International Symposium on Information Theory*, Hong Kong, June 2015.
- **P. Mukherjee**, R. Tandon and S. Ulukus, Secrecy for MISO Broadcast Channels with Heterogeneous CSIT, *IEEE International Symposium on Information Theory*, Hong Kong, June 2015.
- **P. Mukherjee**, R. Tandon and S. Ulukus, Secrecy for MISO Broadcast Channels via Alternating CSIT, *IEEE International Conference on Communications*, London, England, June 2015.
- **P. Mukherjee**, R. Tandon and S. Ulukus, MISO Broadcast Channels with Confidential Messages and Alternating CSIT, *IEEE International Symposium on Information Theory*, Honolulu, HI, June 2014.
- T-Y. Liu, **P. Mukherjee**, S. Ulukus, S-C. Lin, Y-W. P. Hong, Secure DoF of MIMO Rayleigh Block Fading Wiretap Channels with No CSI Anywhere, *IEEE International Conference on Communications*, Sydney, Australia, June 2014.
- **P. Mukherjee**, R. Tandon and S. Ulukus, Even Symmetric Parallel Linear Deterministic Interference Channels are Inseparable, *51st Annual Allerton Conference on Communications, Control and Computing*, Monticello, IL, October 2013.
- **P. Mukherjee** and S. Ulukus, Fading Wiretap Channel with No CSI Anywhere, *IEEE International Symposium on Information Theory*, Istanbul, Turkey, July 2013.
- S. Choudhary, **P. Mukherjee**, M. Chakraborty; A SPT treatment to the Bit Serial Realization of the Sign-LMS based Adaptive Filter; *IEEE International Symposium on Circuits and Systems*, Paris, France, May 2010

- S. Choudhary, **P. Mukherjee**, M. Chakraborty; An Algorithm For Bit-Serial Addition of SPT numbers for multiplierless realization of adaptive equalizers; *Asia-Pacific Signal and Information Processing Association Annual Summit and Conference*, Sapporo, Japan, October,2009

Book Chapters

- **P. Mukherjee**, R. Tandon and S. Ulukus, Physical Layer Security with Delayed, Hybrid and Alternating Channel State Knowledge, *Information Theoretic Security and Privacy of Information Sources*, H. Boche, A. Khisti, H. V. Poor and R. Schaefer, Eds., Cambridge Univ. Press, pp. 200-230, doi:10.1017/9781316450840.009, 2016.

Conference Presentations and Abstracts

- **P. Mukherjee**, A. Brezhneva, S. Napel and O. Gevaert, Early Detection of Lung Cancer in the NLST, *RSNA*, Chicago, December 2019.

- **P. Mukherjee**, M. Zhou, E. Lee, Y. Balagurunathan, S. Napel, R. Gillies, S. Wong, A. Thieme, A. Leung and O. Gevaert, LungNet: Shallow CNN models for NSCLC, *Radiomics*, Clearwater FL, October 2019.

- P. Bulens, A. Couwenberg, M. Intven, A. Debucquoy, V. Vandecaveye, E. Cutsem, A. D'Hoore, A. Wolthuis, **P. Mukherjee**, O. Gevaert, K. Haustermans, Radiomic Analysis of Colorectal Cancer Predicts Chemoradiotherapy Response, *Radiomics*, Clearwater FL, October 2018.

- Y. Han, **P. Mukherjee**, A. Ozgur and T. Weissman, Distributed Statistical Estimation of High-Dimensional and Nonparametric Distributions, *IEEE International Symposium on Information Theory*, Vail, CO, June 2018.

- **P. Mukherjee** and S. Ulukus, Covert Bits Through Queues, *IEEE Conference on Communications and Network Security*, Philadelphia, PA, October 2016.

- **P. Mukherjee** and S. Ulukus, MIMO One Hop Networks with No Eve CSIT, *54th Annual Allerton Conference on Communications, Control and Computing*, Monticello, IL, September 2016.

- **P. Mukherjee** and S. Ulukus, Real Interference Alignment for Vector Channels, *IEEE International Symposium on Information Theory*, Barcelona, Spain, July 2016.

- **P. Mukherjee** and S. Ulukus, Real Interference Alignment for the MIMO Multiple Access Wiretap Channel, *IEEE International Conference on Communications*, Kuala Lumpur, Malaysia, May 2016.

- **P. Mukherjee** and S. Ulukus, Secure Degrees of Freedom of the Gaussian MIMO Multiple Access Wiretap Channel, *49th Asilomar Conference on Signals, Systems and Computers*, Pacific Grove, CA, November 2015.

- **P. Mukherjee** and S. Ulukus, Secure Degrees of Freedom of the Interference Channel with No Eavesdropper CSI, *IEEE Information Theory Workshop*, Jeju, Korea, October 2015.

- **P. Mukherjee** and S. Ulukus, Secure Degrees of Freedom of the Multiple Access Wiretap Channel with No Eavesdropper CSI, *IEEE International Symposium on Information Theory*, Hong Kong, June 2015.
- **P. Mukherjee**, R. Tandon and S. Ulukus, Secrecy for MISO Broadcast Channels with Heterogeneous CSIT, *IEEE International Symposium on Information Theory*, Hong Kong, June 2015.
- **P. Mukherjee**, R. Tandon and S. Ulukus, Secrecy for MISO Broadcast Channels via Alternating CSIT, *IEEE International Conference on Communications*, London, England, June 2015.
- **P. Mukherjee**, R. Tandon and S. Ulukus, MISO Broadcast Channels with Confidential Messages and Alternating CSIT, *IEEE International Symposium on Information Theory*, Honolulu, HI, June 2014.
- T-Y. Liu, **P. Mukherjee**, S. Ulukus, S-C. Lin, Y-W. P. Hong, Secure DoF of MIMO Rayleigh Block Fading Wiretap Channels with No CSI Anywhere, *IEEE International Conference on Communications*, Sydney, Australia, June 2014.
- **P. Mukherjee**, R. Tandon and S. Ulukus, Even Symmetric Parallel Linear Deterministic Interference Channels are Inseparable, *51st Annual Allerton Conference on Communications, Control and Computing*, Monticello, IL, October 2013.
- **P. Mukherjee** and S. Ulukus, Fading Wiretap Channel with No CSI Anywhere, *IEEE International Symposium on Information Theory*, Istanbul, Turkey, July 2013.
- S. Choudhary, **P. Mukherjee**, M. Chakraborty, A SPT treatment to the Bit Serial Realization of the Sign-LMS based Adaptive Filter, *IEEE International Symposium on Circuits and Systems*, Paris, France, May 2010.
- S. Choudhary, **P. Mukherjee**, M. Chakraborty, An Algorithm For Bit-Serial Addition of SPT numbers for multiplierless realization of adaptive equalizers, *Asia-Pacific Signal and Information Processing Association Annual Summit and Conference*, Sapporo, Japan, October,2009.

Achievements

- I received $18K in Google Cloud Platform credits as seed funds from the Stanford Center for Artificial Intelligence in Medicine and Imaging towards a year long project (Nov 2020 – Nov 2021) on developing a deep learning model to detect, segment and classify skin lesions based on pictures that have been acquired using a smartphone camera.
- My talk on using AI for the early detection of lung cancer was featured in the *Daily Bulletin* at the 105$^{\text{th}}$ Scientific Assembly and Annual Meeting of the Radiological Society of North America (RSNA), 2019.
- I was also interviewed in the RSNA On-the-Air program 2019, and it was broadcast locally in California and Connecticut.

- I received the *Kulkarni Summer Research Fellowship* at University of Maryland in 2016.
- I received student travel awards to attend the IEEE International Symposium on Information Theory (ISIT) in 2015 and 2016.
- I was selected for and completed the *Future Faculty Program* (FFP) offered by the A. James Clark School of Engineering at University of Maryland, College Park. As a part of the FFP, I attended three training seminars focused on various aspects of a faculty career including teaching and research. I also had the opportunity to co-teach an undergraduate class ENEE322: Signal and System Theory, with Prof. Steve Marcus in Fall 2014. In addition, FFP awarded me $3000 in conference travel grants.
- I received the Bharti-Airtel merit-cum-means scholarship (full tuition waiver) during my undergraduate studies at IIT Kharagpur from 2007 to 2010.
- I was a recipient of the Jagadish Bose National Talent Search Scholarship 2006.
- I was a recipient of the National Talent Search Exam scholarship 2006.

Professional Membership and Service

- Member of IEEE and the IEEE Information Theory Society.
- **Journal reviewer** for Frontiers Oncology, Frontiers in Genetics, Lung Cancer, IEEE Journal of Biomedical and Health Informatics, PLOS One, Symmetry, Entropy, IEEE Signal Processing Letters, IEEE Transactions on Information Theory, IEEE Transactions on Communications, IEEE Transactions on Wireless Communications, IEEE Transactions on Vehicular Technology, and IEEE Journal on Selected Areas in Communications.
- **Session Chair** for the 3rd Workshop on Physical-Layer Methods for Wireless Security at the IEEE Conference on Communications and Network Security, Philadelphia, PA, October 2016.
- **Program Committee member** for the 7th International Conference on Information Management and Big Data, 2020.