MAYANK BAKSHI

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EDUCATION

- **California Institute of Technology**
  Ph.D. in Electrical Engineering *2012*
- **Indian Institute of Technology Kanpur**
  M.Tech. in Electrical Engineering *2005*
  B.Tech. in Electrical Engineering *2003*

EMPLOYMENT

- **Assistant Professor** *2025–date*
  Northern Arizona University
- **Research Scientist** *2022–2025*
  Arizona State University Host: Prof. Oliver Kosut
- **Principal Researcher** *2019–2021*
  Theory Lab, Huawei Hong Kong
- **Research Assistant Professor** *2014–2019*
  The Chinese University of Hong Kong
- **Postdoctoral Fellow** *2012–2014*
  The Chinese University of Hong Kong Host: Institute of Network Coding
- **Research and Teaching Assistant** *2006–2011*
  California Institute of Technology
- **Research Intern** *2004–2004*
  EPFL, Switzerland Host: Prof. Martin Vetterli
- **Research Intern** *2002–2002*
  Indian Institute of Sciences, India Host: Centre for Theoretical Studies

AWARDS AND RECOGNITION

- **Research Incentive Scheme** *2017*
  The Chinese University of Hong Kong
- **Atwood Fellowship** *2005*
  California Institute of Technology
- **Center for Mathematics of Information Graduate Award** *2005*
  California Institute of Technology
- **Microsoft Award for Innovation** *2002*
  IEEE Computer Society International Design Competition

GRANTS (FUNDED AND PENDING)

1. **Secure and Efficient Distributed Learning in Adversarial Environments: the interplay between Byzantine-Robustness and Communication-Efficiency** *2025*
Role: PI
Agency: National Science Foundation, USA *Status:* Pending

2. **Confusability, Covertness, and Collusion: Information Theoretic Deniability against Coercing Eavesdroppers** *2017*

Role: Principal Investigator
Agency: Research Grants Council, Hong Kong *Status: Funded*
Amount: HK$ 634,560

3. **A Sparse Recovery Approach for High-Throughput Energy-Efficient Wireless Networks** *2015*
Role: Co-author and Co-I *Others:* Prof. Sidharth Jaggi (CUHK), Prof. Dina Katabi (MIT), Prof. Pitor Indyk (MIT), Prof. Qian Zhang (HKUST), Prof. Minghua Chen (CUHK)
Agency: Innovation and Technology Commission, Hong Kong *Status:* Funded
Amount: HK$ 5,459,000

RESEARCH INTERESTS

► **Information Theory:** physical layer security, error correction, network coding, multi-user channels.

► **Artificial Intelligence:** trustworthy federated learning and decentralized learning.

► **Big Data and Sparse Recovery:** compressive sensing, group testing, phase retrieval, low-rank matrix recovery, tensor recovery, high-dimensional statistics, and network data compression.

MAJOR RESEARCH PROJECTS

► **Trustworthy distributed machine learning:** My work studies communication-efficient adversarial mitigation strategies and protocols for federated and decentralized learning. I draw connections to information theory to show that the amount of communication needed can be reduced by orders of magnitude while being robust to adversaries. I also study adversary detection as a low-overhead adversary mitigation measure.

► **Adversary detection and identification:** My work studies authentication/validation of outcomes in distributed learning and communication through adversary detection and identification. We show that adversary detection requires negligible communication overhead and can act as the first line of defense against adversaries.

► **Error correction against limited-view adversaries:** My work examines codes for storage and transmission secure against adversaries that have a limited view (*e.g.*, locality and causality). We characterize the capacity and show that error correction can be efficiently performed beyond the Singleton bound.

► **Compressive Sensing and Sparse Recovery:** My work develops a framework for algorithms that leverage the sparsity of the underlying data to reduce the resources needed significantly. For several problems (*e.g.*, compressed sensing, group testing, phase retrieval), this framework leads to the first linear-time algorithms that are provably as fast as possible and require as few samples as possible. On the applications side, I have worked on applying sparse recovery techniques such as matrix completion and tensor recovery to practical problems such as network traffic recovery from limited network measurements.

► **Covert Communication**: My work is the first to show that it is possible for two parties to communicate over a noisy channel without any shared secret such that an eavesdropper cannot even infer whether any communication has taken place. In subsequent work, we design efficient algorithms and extend the results to other classes of channels.

► **Network Coding and Source Coding:** In my Ph.D. thesis, I examined fundamental principles governing the network coding and network source coding capacity of large networks. In particular, I characterized the effect of side information on network source coding capacity regions, showed that

the capacity region may be enlarged in the presence of feedback, and proved a capacity equivalence between noisy and noiseless adversarial networks.

JOURNAL ARTICLES

1. "Optimal Information Security Against Limited-View Adversaries: The Benefits of Causality and Feedback," Mayank Bakshi, Swanand Kadhe, Qiaosheng Zhang, Sidharth Jaggi, and Alex Sprintson, *IEEE Transactions on Communications*, vol. 73, no. 8, pp. 5908–5919, 2025.
2. "Byzantine Multiple Access Channels—Part II: Communication With Adversary Identification," Neha Sangwan, Mayank Bakshi, Bikash Kumar Dey, and Vinod M. Prabhakaran, *IEEE Transactions on Information Theory*, vol. 71, no. 1, pp. 23–60, 2025.
3. "Byzantine Multiple Access Channels—Part I: Reliable Communication," Neha Sangwan, Mayank Bakshi, Bikash Kumar Dey, and Vinod M. Prabhakaran, *IEEE Transactions on Information Theory*, vol. 70, no. 4, pp. 2309–2366, 2024.
4. "Optimal Information Security Against Limited-View Adversaries: Beyond MDS Codes," Qiaosheng Zhang, Swanand Kadhe, Mayank Bakshi, Sidharth Jaggi, and Alex Sprintson, *IEEE Transactions on Communications*, vol. 71, no. 12, pp. 7206–7217, 2023.
5. "An Accurate and Practical Algorithm for Internet Traffic Recovery Problem," Zhenyu Ming, Liping Zhang, Hao Wu, Yanwei Xu, Mayank Bakshi, Bo Bai, and Gong Zhang, *Neurocomput.*, vol. 467, no. C, pp. 203–213, 2022.
6. "An Algorithm for Matrix Recovery of High-loss-rate Network Traffic Data," Zhenyu Ming, Liping Zhang, Yanwei Xu, and Mayank Bakshi, *Applied Mathematical Modelling*, vol. 96, pp. 645–656, 2021.
7. "Triple Decomposition and Tensor Recovery of Third Order Tensors," Liqun Qi, Yannan Chen, Mayank Bakshi, and Xinzhen Zhang, *SIAM J. Matrix Anal. Appl.*, vol. 42, no. 1, pp. 299–329, 2021.
8. "Covert Communication Over Adversarially Jammed Channels," Qiaosheng Zhang, Mayank Bakshi, and Sidharth Jaggi, *IEEE Transactions on Information Theory*, vol. 67, no. 9, pp. 6096–6121, 2021.
9. "Stealthy Communication Over Adversarially Jammed Multipath Networks," Jianhan Song, Qiaosheng Zhang, Swanand Kadhe, Mayank Bakshi, and Sidharth Jaggi, *IEEE Transactions on Communications*, vol. 68, no. 12, pp. 7473–7484, 2020.
10. "Covert Communication With Polynomial Computational Complexity," Qiaosheng Zhang, Mayank Bakshi, and Sidharth Jaggi, *IEEE Transactions on Information Theory*, vol. 66, no. 3, pp. 1354–1384, 2020.
11. "Plausible Deniability Over Broadcast Channels," Mayank Bakshi and Vinod M. Prabhakaran, *IEEE Transactions on Information Theory*, vol. 64, no. 12, pp. 7883–7902, 2018.
12. "Efficient Algorithms for Noisy Group Testing," Sheng Cai, Mohammad Jahangoshahi, Mayank Bakshi, and Sidharth Jaggi, *IEEE Transactions on Information Theory*, vol. 63, no. 4, pp. 2113–2136, 2017.
13. "SHO-FA: Robust Compressive Sensing With Order-Optimal Complexity, Measurements, and Bits," Mayank Bakshi, Sidharth Jaggi, Sheng Cai, and Minghua Chen, *IEEE Transactions on Information Theory*, vol. 62, no. 12, pp. 7419–7444, 2016.

PREPRINTS

1. Afonso de Sá Delgado Neto, Maximilian Egger, Mayank Bakshi, and Rawad Bitar, *Communication-Efficient Byzantine-Resilient Federated Zero-Order Optimization*, Jun. 2024. arXiv: 2406.14362 [cs].

CONFERENCE PUBLICATIONS

1. "VALID : A Validated Algorithm for Learning in Decentralized Networks with Possible Adversarial Presence," Mayank Bakshi, Sara Ghasvarianjahromi, Yauhen Yakimenka, Allison Beemer, Oliver Kosut, and Joerg Kliewer, *2024 IEEE International Symposium on Information Theory (ISIT)*, 2024.
2. "Sequential Adversarial Hypothesis Testing," Eeshan Modak, Mayank Bakshi, Bikash Kumar Dey, and Vinod M Prabhakaran, *2024 IEEE International Symposium on Information Theory (ISIT)*, 2024.
3. "On Authentication against a Myopic Adversary Using Stochastic Codes," Mayank Bakshi and Oliver Kosut, *2023 IEEE International Symposium on Information Theory (ISIT)*, pp. 2422–2427, 2023.
4. "Hypothesis Testing for Adversarial Channels: Chernoff-Stein Exponents," Eeshan Modak, Neha Sangwan, Mayank Bakshi, Bikash Kumar Dey, and Vinod M. Prabhakaran, *2023 IEEE International Symposium on Information Theory (ISIT)*, pp. 1225–1230, 2023.
5. "Universal Compression of High Dimensional Gaussian Vectors with James-Stein Shrinkage," Narayana Prasad Santhanam and Mayank Bakshi, *2023 IEEE International Symposium on Information Theory (ISIT)*, pp. 382–387, 2023.
6. "Compound Arbitrarily Varying Channels," Syomantak Chaudhuri, Neha Sangwan, Mayank Bakshi, Bikash Kumar Dey, and Vinod M. Prabhakaran, *2021 IEEE International Symposium on Information Theory (ISIT)*, pp. 503–508, 2021.
7. "Communication With Adversary Identification in Byzantine Multiple Access Channels," Neha Sangwan, Mayank Bakshi, Bikash Kumar Dey, and Vinod M. Prabhakaran, *2021 IEEE International Symposium on Information Theory (ISIT)*, pp. 688–693, 2021.
8. "Multiple Access Channels with Adversarial Users," Neha Sangwan, Mayank Bakshi, Bikash Kumar Dey, and Vinod M. Prabhakaran, *2019 IEEE International Symposium on Information Theory (ISIT)*, pp. 435–439, 2019.
9. "Multiple Access Channels with Byzantine Users," Neha Sangwan, Mayank Bakshi, Bikash Kumar Dey, and Vinod M. Prabhakaran, *2019 IEEE Information Theory Workshop (ITW)*, pp. 1–5, 2019.
10. "Undetectable Radios: Covert Communication under Spectral Mask Constraints," Qiaosheng Eric Zhang, Matthieu R. Bloch, Mayank Bakshi, and Sidharth Jaggi, *2019 IEEE International Symposium on Information Theory (ISIT)*, pp. 992–996, 2019.
11. "Multipath Stealth Communication with Jammers," Jianhan Song, Qiaosheng Zhang, Mayank Bakshi, Sidharth Jaggi, and Swanand Kadhe, *2018 IEEE International Symposium on Information Theory (ISIT)*, pp. 761–765, 2018.
12. "Covert Communication over Adversarially Jammed Channels," Qiaosheng Eric Zhang, Mayank Bakshi, and Sidharth Jaggi, *2018 IEEE Information Theory Workshop (ITW)*, pp. 1–5, 2018.

13. "Coding for Networks of Compound Channels," Fariba Abbasi and Mayank Bakshi, *2017 IEEE International Symposium on Information Theory (ISIT)*, pp. 2388–2392, 2017.
14. "Plausible Deniability over Broadcast Channels," Mayank Bakshi and Vinod Prabhakaran, *2016 IEEE International Symposium on Information Theory (ISIT)*, pp. 2219–2223, 2016.
15. "Fundamental Limits and Achievable Strategies for Low Energy Compressed Sensing with Applications in Wireless Communication," Tongxin Li, Mayank Bakshi, and Pulkit Grover, *2016 IEEE 17th International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)*, pp. 1–6, 2016.
16. "Arbitrarily Varying Networks: Capacity-achieving Computationally Efficient Codes," Peida Tian, Sidharth Jaggi, Mayank Bakshi, and Oliver Kosut, *2016 IEEE International Symposium on Information Theory (ISIT)*, pp. 2139–2143, 2016.
17. "Computationally Efficient Deniable Communication," Qiaosheng Zhang, Mayank Bakshi, and Sidharth Jaggi, *2016 IEEE International Symposium on Information Theory (ISIT)*, pp. 2234–2238, 2016.
18. "Reliable and Secure Communication over Adversarial Multipath Networks: A Survey," Swanand Kadhe, Alex Sprintson, Qiaosheng Eric Zhang, Mayank Bakshi, and Sidharth Jaggi, *2015 10th International Conference on Information, Communications and Signal Processing (ICICS)*, pp. 1–5, 2015.
19. "Coding against a Limited-View Adversary: The Effect of Causality and Feedback," Qiaosheng Zhang, Swanand Kadhe, Mayank Bakshi, Sidharth Jaggi, and Alex Sprintson, *2015 IEEE International Symposium on Information Theory (ISIT)*, pp. 2530–2534, 2015.
20. "Talking Reliably, Secretly, and Efficiently: A "Complete" Characterization," Qiaosheng Zhang, Swanand Kadhe, Mayank Bakshi, Sidharth Jaggi, and Alex Sprintson, *2015 IEEE Information Theory Workshop (ITW)*, pp. 1–5, 2015.
21. "FRANTIC: A Fast Reference-based Algorithm for Network Tomography via Compressive Sensing," Sheng Cai, Mayank Bakshi, Sidharth Jaggi, and Minghua Chen, *2014 Sixth International Conference on Communication Systems and Networks (COMSNETS)*, pp. 1–7, 2014.
22. "SUPER: Sparse Signals with Unknown Phases Efficiently Recovered," Sheng Cai, Mayank Bakshi, Sidharth Jaggi, and Minghua Chen, *2014 IEEE International Symposium on Information Theory*, pp. 2007–2011, 2014.
23. "Reliable Deniable Communication with Channel Uncertainty," Pak Hou Che, Mayank Bakshi, Chung Chan, and Sidharth Jaggi, *2014 IEEE Information Theory Workshop (ITW 2014)*, pp. 30–34, 2014.
24. "Reliable, Deniable and Hidable Communication," Pak Hou Che, Mayank Bakshi, Chung Chan, and Sidharth Jaggi, *2014 Information Theory and Applications Workshop (ITA)*, pp. 1–10, 2014.
25. "Reliable, Deniable and Hidable Communication: A Quick Survey," Pak Hou Che, Swanand Kadhe, Mayank Bakshi, Chung Chan, Sidharth Jaggi, and Alex Sprintson, *2014 IEEE Information Theory Workshop (ITW 2014)*, pp. 227–231, 2014.
26. "Reliable, Deniable, and Hidable Communication over Multipath Networks," Swanand Kadhe, Sidharth Jaggi, Mayank Bakshi, and Alex Sprintson, *2014 IEEE International Symposium on Information Theory*, pp. 611–615, 2014.

27. "GROTESQUE: Noisy Group Testing (Quick and Efficient)," Sheng Cai, Mohammad Jahangoshahi, Mayank Bakshi, and Sidharth Jaggi, *2013 51st Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, pp. 1234–1241, 2013.
28. "Stochastic Threshold Group Testing," C. L. Chan, S. Cai, M. Bakshi, S. Jaggi, and V. Saligrama, *2013 IEEE Information Theory Workshop (ITW)*, pp. 1–5, 2013.
29. "Reliable Deniable Communication: Hiding Messages in Noise," Pak Hou Che, Mayank Bakshi, and Sidharth Jaggi, *2013 IEEE International Symposium on Information Theory*, pp. 2945–2949, 2013.
30. "On AVCs with Quadratic Constraints," Farzin Haddadpour, Mahdi Jafari Siavoshani, Mayank Bakshi, and Sidharth Jaggi, *2013 IEEE International Symposium on Information Theory*, pp. 271–275, 2013.
31. "On Network Coding Capacity under On-off Scheduling," Mayank Bakshi and Michelle Effros, *2012 IEEE International Symposium on Information Theory Proceedings*, pp. 1667–1671, 2012.
32. "SHO-FA: Robust Compressive Sensing with Order-Optimal Complexity, Measurements, and Bits," Mayank Bakshi, Sidharth Jaggi, Sheng Cai, and Minghua Chen, *2012 50th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, pp. 786–793, 2012.
33. "On Equivalence for Networks of Noisy Channels under Byzantine Attacks," Mayank Bakshi, Michelle Effros, and Tracey Ho, *2011 IEEE International Symposium on Information Theory Proceedings*, pp. 973–977, 2011.
34. "On Zero-Error Source Coding with Feedback," Mayank Bakshi and Michelle Effros, *2010 IEEE International Symposium on Information Theory*, pp. 11–15, 2010.
35. "Concatenated Polar Codes," Mayank Bakshi, Sidharth Jaggi, and Michelle Effros, *2010 IEEE International Symposium on Information Theory*, pp. 918–922, 2010.
36. "On Feedback in Network Source Coding," Mayank Bakshi and Michelle Effros, *2009 IEEE International Symposium on Information Theory*, pp. 1348–1352, 2009.
37. "On Achievable Rates for Multicast in the Presence of Side Information," Mayank Bakshi and Michelle Effros, *2008 IEEE International Symposium on Information Theory*, pp. 1661–1665, 2008.
38. "A Continuity Theory for Lossless Source Coding over Networks," WeiHsin Gu, Michelle Effros, and Mayank Bakshi, *2008 46th Annual Allerton Conference on Communication, Control, and Computing*, pp. 1527–1534, 2008.
39. "On Network Coding of Independent and Dependent Sources in Line Networks," Mayank Bakshi, Michelle Effros, WeiHsin Gu, and Ralf Koetter, *2007 IEEE International Symposium on Information Theory*, pp. 1096–1100, 2007.
40. "On Error Exponent in Lossy Source Coding," Mayank Bakshi and RK Bansal, *Proceedings of the 43rd Annual Allerton Conference on Communication, Control and Computing 2005*, 2005.

BOOK CHAPTERS

1. "Chapter 8 - Network Coding and Data Compression," Mayank Bakshi, Michelle Effros, Tracey Ho, and Muriel Médard, *Network Coding*, pp. 217–234, Academic Press, 2012.

THESES

1. "Network Coding and Distributed Compression over Large Networks: Some Basic Principles," Mayank Bakshi, California Institute of Technology, 2012.
2. "Error Exponent in Lossy Source Coding," Mayank Bakshi, Indian Instituite of Technology Kanpur, 2005.

INVITED TALKS AND TUTORIALS

1. *Authentication against limited-view adversaries*, Invited Talk, 2023 Information Theory and Applications workshop, San Diego, Feb. 2023.
2. *Byzantine Multiple Access Channels*, Invited Talk, 2022 Information Theory and Applications workshop, San Diego, Feb. 2023.
3. *Sparse recovery: Theory, algorithms, and applications*, Tutorial, Joint Telematics Group/IEEE Information Theory Society Summer School on Signal Processing, Communications, and Networks, Institute of Technology Mandi, Jun. 2022.
4. *Compressive Sensing*, Tutorial, Indian Institute of Technology Delhi, Feb. 2016.
5. *Adaptive Network Coding under Variable Network State*, Invited Talk, The Science of Network Coding, Banff International Research Station, Sep. 2013.
6. *On feedback and side information: A network source coding perspective*, Invited Talk, 2010 Information Theory and Applications workshop, San Diego, Jan. 2010.

PATENTS

1. Rawad Bitar, Maximilian Egger, Afonso de Sá Delgado Neto, and Mayank Bakshi, "Method and system for training a distributed model," pending.

TEACHING EXPERIENCE

Courses taught:

1. **Complex analysis and Differential Equations for Engineers** (ENGG 2420, CUHK) *2018, 2016, 2014*
2. **Probability for Engineers** (ENGG 2470, CUHK) *2018*
3. **Probability for Engineers (advanced)** (ESTR 2012, CUHK) *2018*
4. **Complex analysis and Differential Equations for Engineers (advanced)** (ESTR 2000, CUHK) *2016*
5. **Compressed Sensing and Sparse Recovery** (IERG 6120, CUHK), *designed and taught* *2015*

Teaching Assistant:

1. **Information Theory** (EE/Math 126a, Caltech) *2010, 2009, 2008*
2. **Advanced Information Theory** (EE/Math 126b, Caltech) *2010*
3. **Introduction to Information** (IST 1, Caltech) *2009*

MENTORING EXPERIENCE

Ph.D. supervision

1. **Dr. Zhang Qiaosheng** , Information Engineering, CUHK *2019*
   Thesis: Covert Communications

2. **Dr. Che Pak Hou**, Information Engineering, CUHK *2016*
   Thesis: Network Security
3. **Dr. Cai Sheng**, Information Engineering, CUHK *2015*
   Thesis: A Framework For Fast and Efficient Algorithms for Sparse Recovery Problems
   – Won the **first prize** at the *10th ACM-HK Student Research and Career Day*

Master's supervision

1. **Fang Dongying**, MSc. Information Engineering, CUHK *2017*
2. **Zhou Yutong**, MSc. Information Engineering, CUHK *2017*

PROFESSIONAL SERVICE

- Industry panel, IEEE International Symposium on Information Theory *2021*
- Secretary, Institute of Network Coding Management Board, CUHK *2018–2019*
- Mathematics subject panel, Dept. of Information Engg., CUHK *2014–2018*
- Organization, IEEE International Symposium on Information Theory *2016*
- Organization, Workshop on Entropy and Information Inequalities *2013*
- Technical Program Committee for IEEE WCNC *2013*
- Technical Program Committee for IEEE WCNC *2012*
- Frequent reviewer for several journals, including
  - IEEE Transactions on Information Theory
  - IEEE Transactions on Communications
  - IEEE Transactions on Information Forensics and Security
  - IEEE Transactions in Wireless Communications
  - Entropy