

# A. Salman Avestimehr

Professor of Electrical & Computer Engineering  
University of Southern California  
EEB 504B

Tel: 213-740-7326  
Email: [avestimehr@ee.usc.edu](mailto:avestimehr@ee.usc.edu)  
<https://www.avestimehr.com>

## Research Interests

Information theory, distributed computing, machine learning, and secure/private computing and learning.

## Education

- **UC Berkeley** Berkeley, CA  
*Ph.D. in EECS (Best Dissertation Award)* 1/1/2006 - 8/1/2008
- **UC Berkeley** Berkeley, CA  
*M.Sc in EECS* 8/1/2003 - 12/31/2005
- **Sharif University of Technology** Tehran, Iran  
*B.Sc in EE (Ranked 1 in the Department)* 7/1999-7/2003

## Positions Held

- **Electrical & Computer Engineering Dept. (ECE)** University of Southern California  
*Inaugural Director of USC-Amazon Center on Trusted AI* 2/1/2021 - now
- **Electrical & Computer Engineering Dept. (ECE)** University of Southern California  
*Full Professor* 12/1/2018 - now
- **Alexa AI** Amazon  
*Amazon Scholar* 1/1/2021 - now
- **Electrical & Computer Engineering Dept. (ECE)** University of Southern California  
*Associate Professor* 1/1/2014 - 12/1/2018
- **Electrical Engineering Department (EE)** California Institute of Technology  
*Visiting Professor* 8/1/2016 - 12/31/2016
- **School of Electrical and Computer Engineering (ECE)** Cornell University  
*Assistant Professor* 6/1/2009 - 12/31/2013
- **Center for the Mathematics of Information (CMI)** California Institute of Technology  
*Postdoctoral Scholar* 8/1/2008 - 6/1/2009
- **Wichorus Inc.** San Jose, CA  
*Scientist* 5/2007 - 8/2007 (*part time*)
- **Qualcomm Inc.** Campbell, CA  
*Intern* 6/2005 - 8/2005

## Selected Honors and Awards

- IEEE Fellow, 2020
- IEEE Information Theory Society James L. Massey Research & Teaching Award (the highest award in the information theory society to researchers under the age of 40), 2019
- Communications Society and Information Theory Society Joint Paper Award (2013)
- Presidential Early Career Award for Scientists and Engineers (PECASE) from President Obama (2012)
- Jack K. Wolf Best Paper Award at 2017 IEEE International Symposium on Information Theory (ISIT)
- Best Paper Award at 2017 IEEE Globecom Conference
- Okawa Foundation Award in Information and Telecommunications (2015)
- Michael Tien Excellence in Teaching Award (2012)
- US Air Force Young Investigator Program (YIP) Award (2011)
- National Science Foundation CAREER award (2010)
- Best Paper Award Finalists at the 2020 NeurIPS Spicy-FL workshop
- Best Paper Award Finalists at the 2019 ACM/IEEE High Performance Computing Conference (SC '19)
- Best Paper Award Finalist at the 2019 ACM Mobihoc Conference (Mobihoc '19, top 7 papers)
- Best PhD Thesis Award at Cornell ECE (as advisor, 2013)
- David J. Sakrison Memorial Prize (Best PhD Thesis Award) from UC Berkeley (2008)
- Vodafone-U.S. Foundation Fellows Initiative Research Merit Award (2005)
- Best Student Paper Award Finalist (as advisor), 2011 IEEE International Symposium on Information Theory (ISIT)
- Qualcomm Innovation Award (as advisor, 2013)
- Ranked 1st in the EE Department of Sharif University of Technology (2002)
- Ranked 1st and recipient of the best innovative award at AAI (2002)
- Presidential Award for Ranking 2nd in Iranian National Qualifying Exam from President Khatami (1999)
- Recipient of silver medal in National Mathematical Olympiad (1998)

## Major Professional Activities

- **Director:**  
USC-Amazon Center on Secure and Trusted Machine Learning (Trusted AI)  
Information Theory and Machine Learning (vITAL) Research Lab
- **Co-Director:**  
Communication Sciences Institute at USC, 2017 – 2019  
Wireless Health MS program at USC, 2014 – now
- **General Co-Chair:**

IEEE International Symposium on Information Theory, 2020  
IEEE North American School of Information Theory, 2012  
Workshop on Interference Networks, 2012

- **Associate Editor:**

IEEE Transactions on Information Theory, 2014-2017

IEEE Transactions on Information Theory: Special Issue on Interference Networks, 2010-2011

## PhD Students and Postdocs

- **7 in academic faculty positions** at University of Illinois Urbana Champaign - UIUC (ECE), University of Michigan (ECE), Purdue University (EE), University of California at Riverside (UCR), University of Colorado-Denver (EE), Hong Kong University of Science and Technology (HKUST - CS), and IIT Hyderabad (EE).
- **6 in Industry** at Google, Intel, Youtube, Goldman Sachs, Dolby, and Micron Technologies.

### PhD Students

- Ilan Shomorony (PhD, 2009-2013)
  - Thesis: Fundamentals Of Multi-Hop Multi-Flow Wireless Networks
  - Current Position: TT-assistant prof. at ECE Department of University of Illinois Urbana Champaign (UIUC).
  - Awards: Jack K. Wolf Student Paper Award Finalist, Simons Fellowship for Postdoctoral Studies, Qualcomm Innovation Award.
- Alireza Vahid (PhD, 2009-2013)
  - Thesis: The Impact Of Imperfect Feedback On The Capacity Of Wireless Networks
  - Current Position: TT-assistant prof. at EE Department of University of Colorado Denver
  - Awards: Best PhD Thesis Award, Best Teaching Assistant Award, Qualcomm Innovation Award.
- Sina Lashgari (PhD, 2010-2014)
  - Thesis: Fundamental Impacts Of Delay And Deadline On Communications Over Wireless Networks
  - Current Position: Program Trading Strategist at Goldman Sachs
  - Awards: ECE Department Fellowship
- Amandy Nwana (PhD, 2010-2014)
  - Thesis: Exploiting Latent User Behavior In Social Media Prediction
  - Current Position: Researcher at YouTube
  - Awards: ECE Department Fellowship
- Navid Naderializadeh (PhD, 2011-2016)

- Thesis: Fundamentals of Two User-Centric Architectures for 5G: Device-to-Device Communication and Cache-Aided Interference Management
- Current Position: Research Scientist at Intel Labs
- Awards: MHI PhD Scholar at USC EE (top five PhD students of the EE Dept.), Shannon Centennial Competition Finalist at Bell Labs, Bronze Prize at 23rd Samsung Electronics HumanTech Paper Contest, Best Pitch Award at MHI Research Festival.
- Songze Li (PhD, 2012-2018)
  - Thesis: Coded Computing: Mitigating Fundamental Bottlenecks in Large-Scale Machine Learning
  - Current Position: TT-assistant prof. at Hong Kong University of Science and Technology (HKUST)
  - Awards: EE Department Fellowship, Qualcomm Innovation Award Finalist.
- Mehrdad Kiamari (PhD, 2014-2019 (expected))
  - Thesis Topic: Wireless Edge Computing
  - Current Position: Research Assistant
  - Awards: Best Paper Award at Globecom Conference
- Qian Yu (PhD, 2015-2020)
  - Thesis Topic: Coded Computing
  - Current Position: Research Assistant
  - Awards: Jack K. Wolf Student Paper Award, Google Fellowship in Machine Learning, Qualcomm Innovation Award Finalist.
- Saurav Prakash (PhD started in 2016)
  - Thesis Topic: Coding for Large Scale Graph Analytics
  - Current Position: Research Assistant
  - Awards: EE Department Fellowship
- Chien-Shen Yang (PhD started in 2016)
  - Thesis Topic: Coded Computing in Dynamic Networks
  - Current Position: Research Assistant
  - Awards: EE Department Fellowship
- Mohammadreza Mousavi Kalan (PhD started in 2016, co-advised)
  - Thesis Topic: Gradient Methods in Machine Learning
  - Current Position: Research Assistant
  - Awards: Travel Award from 2018 IPDPS Conference.
- Jinhyun So (PhD started in 2017)
  - Thesis Topic: Non-Linear Coded Computing
  - Current Position: Research Assistant
  - Awards: EE Department Fellowship

- Chaoyang He (PhD started in 2018)
  - Thesis Topic: Distributed Learning
  - Current Position: Research Assistant
- Roushdy El Kordy (PhD started in 2019)
  - Thesis Topic: Federated Learning
  - Current Position: Research Assistant
- Erum Mushtaq (PhD started in 2019)
  - Thesis Topic: Federated NLP
  - Current Position: Research Assistant
  - Awards: Fulbright Scholar
- Emir Ceyani (PhD started in 2021)
  - Thesis Topic: Federated Data Analytics
  - Current Position: Research Assistant

## Postdocs

- David Kao (2013-2015, current position: Research Scientist at Google)
- Aly El Gamal (2014-2015, current position: TT-assistant prof. in EE Department of Purdue University)
- Silas Fong (2014-2015, current position: Postdoc at University of Toronto)
- Eyal En Gad (2015-2016, current position: Research Scientist at Micron Technology)
- Aditya Siripuram (2016-2017, current position: TT-assistant prof. in EE Department of IIT Hyderabad)
- Mingchao (Fisher) Yu (2017-TBD, current position: Staff Engineer, Dolby Laboratory)
- Saied Sahraei (2018-2020, current position: Senior System Engineer at Qualcomm)
- Fatemeh Arbabjolfaei (2019-2019, current position: Lecturer at University of Michigan)
- Basak Guler (2017-2020, current position: TT-assistant prof. at University of California at Riverside)
- Ramy Ali (2020-now, current position: postdoctoral scholar)
- Sunwoo Lee (2020-now, current position: postdoctoral scholar)

## Research Funding

1. DARPA/PL: Open, Programmable, and Secure 5G: Foundations of Deception in Proactive Networks (12/15/2020-12/14/2024), DARPA, \$1,600,000. (PI)
2. Intel/Avast/Borsetta/Elisa: Privacy Preserving Distributed Machine Learning - Private AI Institute (11/1/2020-10/31/2023), Intel/Avast/Borsetta/Elisa, \$300,000. (PI)
3. Intel/NSF: A Coding-Centric Approach to Robust, Secure, and Private Distributed Learning over Wireless (4/1/2020-12/31/2021), Intel and NSF, \$300,000. (PI)
4. DARPA: DIAMOND: Distributed Training of Massive Models at Bandwidth Frontiers (4/1/2020-3/31/2024), DARPA, \$2,062,540. (PI)
5. Facebook: Research Gift on Privacy Preserving Machine Learning (1/1/2020-1/1/2021), Facebook, \$25,000. (co-PI)
6. DARPA: INTEGRAL: A Foundational Approach to Label Complexity via Information Theory and Graph Signal Processing (9/1/2019-08/31/2022), DARPA, \$1,500,000. (PI)
7. DARPA: APaC: Adaptive Pricing and Coding for Dispersed Computing (03/31/2017-02/38/2021), DARPA, \$8,317,754 (PI).
8. Coded Computing: A Joint Computing and Communication Design Framework for Tactical Wireless Edge (5/1/2019-4/30/2022), ONR, \$300,000 (sole-PI).
9. DARPA: Coded Dispersed Computing Expansion (10/1/2018-03/31/2021), DARPA, \$1,196,559 (PI).
10. NSF: CIF: Coded Computing for Large-Scale Machine Learning (07/01/2018-06/30/2022), NSF, \$1,200,000 (co-PI) .
11. ARO: Coded Computing: A Transformative Framework for Tactical Wireless Edge Computing (07/1/2018-06/30/2021), ARO, \$375,000 (sole PI) .
12. NSF: CCF: Foundations of Coding for Modern Distributed Computing (05/01/2017-04/31/2021), NSF, \$1,050,000 (co-PI) .
13. An Information Theoretic Framework to Device-to-Device Communication Networks (02/01/2016-01/31/2019), DOD (NAVY-ONR), \$300,000 (sole PI).
14. Wireless Edge Computing (09/28/2016-03/31/2018), National Security Agency (NSA), \$235,125 (sole PI).
15. DENO: Distributed Encoded Optimization for Cybersecurity Data Analytics (08/30/2017-08/30/2018), Northrop Grumman, \$100,000 (PI).
16. NSF: NeTS: Medium: Collaborative Research: Information Architectures for Femto-aided Cellular Networks (09/01/2012-08/31/2018), NSF, \$1,128,000 (co-PI).
17. Wireless Edge Computing (01/01/2016), Unrestricted Gift from Intel, \$125,000 (sole PI).
18. NSF: EARS: Interference-Aware RF Theory and Design (01/01/2013-01/01/2017), NSF, \$458,187 (PI, my portion \$347,789, co-PI: Al Molnar (Cornell)).
19. Okawa Foundation Research Award (1/1/2016), Unrestricted Gift, \$10,000 (sole PI).

20. Dynamics of Wireless Network Information Flow (01/01/2013-01/01/2016), DOD (NAVY-ONR), \$300,000 (sole PI).
21. NSF: CAREER: Breaking the Barriers in Wireless Network Information Theory: A Deterministic Approach (02/01/2010-01/31/2017), NSF, \$441,876 (sole PI).
22. NSF: CCF: Medium: Collaborative Research: Multihop Multiflow Wireless Networks: A Treasure Hunt (07/01/2012-06/30/2016), NSF, \$750,000 (co-PI) .
23. Mars Relay Network (01/01/2014-6/01/2016), JPL, \$90,000 (sole PI)
24. RV 1: Multi-Network Delivery (01/01/2014-8/16/2015), Verizon, \$102,952 (sole PI).
25. Spectrum Sharing for Device-to-device communication in 5G networks (01/01/2014), Unrestricted Gift from Intel, \$50,000 (sole PI).
26. CISCO: VAWN (01/01/2014), Unrestricted Gift from Cisco, \$60,000 (sole PI).
27. Interference Management with Local Network Views (01/01/2014), Unrestricted Gift from Qualcomm, \$55,000 (sole PI).
28. Video Aware Wireless Networks (01/01/2011-12/31/2013), Verizon, Intel, and Cisco, \$700,000 (PI).
29. Qualcomm Innovation Award (08/01/2013-08/01/2014), Qualcomm, \$100,000.
30. Information Flow over Networks with Large Dynamic Range of Variation: Impacts of Local Network-State Information (05/15/2011-05/14/2014), DOD (AFOSR-YIP), \$360,000 (sole PI).
31. Robustness and Security of Wireless Networks (08/01/2010-12/31/2013), NSF TRUST Center, \$170,000 (sole PI).
32. Degrees-of-freedom of Multi-hop Wireless Networks (04/01/2012 - 3/31/2013), Samsung Electronics, \$90,000 (sole PI).

## Publications

Bold font indicates the student or postdoc co-author who was advised by me.

## Books, Monographs, and Book Chapters

1. “Coded Computing: Mitigating Fundamental Bottlenecks in Large-scale Distributed Computing and Machine Learning,” by **S. Li** and **A. S. Avestimehr**, Foundations and Trends in Communications and Information Theory, Now Publishing, 2020.
2. “Problem Solving Strategies for Elementary-School Math,” by K. Avestimehr and **A. S. Avestimehr**, Now Publishers, June 2020. ISBN 978-1680839845.

3. “Polyshard: Scalable Storage and Computation,” by **A. S. Avestimehr**, S. Kannan, and P. Viswanath, in in Decentralized Payment Systems: Principles and Design (eds G. Fanti and P. Viswanath), The Distributed Technology Research Foundation.
4. “Role of Caching in 5G,” by **N. Naderializadeh**, M. Maddah-Ali, and **A. S. Avestimehr**, to appear in Information-Theoretic Perspectives on 5G Systems and Beyond (eds I. Maric, O. Simeone and S. Shamai), Cambridge University Press.
5. “Distributed Caching for Enhancing Communications Efficiency,” by **A. S. Avestimehr** and A. Molisch, in Fog for 5G and IoT (eds M. Chiang, B. Balasubramanian and F. Bonomi), John Wiley & Sons, Inc., March 2017. doi:10.1002/9781119187202.ch5.
6. “An Approximation Approach to Network Information Theory,” by **A. S. Avestimehr**, S. Diggavi, C. Tian and D. Tse, Foundations and Trends in Communications and Information Theory, 2015. doi: 10.1561/01000000042.
7. “Multihop Wireless Networks: A Unified Approach to Relaying and Interference Management,” by **I. Shomorony** and **A. S. Avestimehr**, Foundations and Trends in Networking, Now Publishing, Dec. 2014. doi: 10.1561/13000000044.

## Published and Accepted Journal Publications

1. **J. So, B. Guler, and A.S. Avestimehr**, “Turbo-Aggregate: Breaking the Quadratic Aggregation Barrier in Secure Federated Learning,” accepted for publication *IEEE Journal on Selected Areas in Information Theory (JSAIT): Special issue on Privacy and Security of Information Systems*, 2021.
2. **J. So, B. Guler, and A.S. Avestimehr**, “CodedPrivateML: A Fast and Privacy-Preserving Framework for Distributed Machine Learning ,” accepted for publication *IEEE Journal on Selected Areas in Information Theory (JSAIT): Special issue on Privacy and Security of Information Systems*, 2021.
3. **S. Sahraei**, M. Maddah-Ali, and **A.S. Avestimehr**, “Interactive Verifiable Polynomial Evaluation,” accepted for publication *IEEE Journal on Selected Areas in Information Theory (JSAIT): Special issue on Privacy and Security of Information Systems*, 2021.
4. M. Soleymani, M. Mahdavifar, and **A.S. Avestimehr**, “Analog Lagrange Coded Computing,” accepted for publication *IEEE Journal on Selected Areas in Information Theory (JSAIT): Special issue on Privacy and Security of Information Systems*, 2021.
5. **C. Yang and A.S. Avestimehr**, “Coded Computing for Secure Boolean Computations,” accepted for publication *IEEE Journal on Selected Areas in Information Theory (JSAIT): Special issue on Privacy and Security of Information Systems*, 2021.
6. **J. So, B. Guler, and A.S. Avestimehr**, “Byzantine-Resilient Secure Federated Learning,” accepted for publication *IEEE JSAC Series on Machine Learning for Communications and Networks*, 2020.
7. **S. Prakash**, S. Dhakal, M. Akdeniz, **A.S. Avestimehr**, and N. Himayat, “Coded Computing for Low-Latency Federated Learning over Wireless Edge Networks” accepted for publication *IEEE JSAC Series on Machine Learning for Communications and Networks*, 2020.



8. **Q. Yu and A.S. Avestimehr**, “Coded Computing for Resilient, Secure, and Privacy-Preserving Distributed Matrix Multiplication,” accepted for publication *IEEE Transactions on Communications*, 2020. (*Invited Paper*)
9. **Q. Yu**, M. A. Maddah-Ali, and **A.S. Avestimehr**, “Straggler Mitigation in Distributed Matrix Multiplication: Fundamental Limits and Optimal Coding,” in *IEEE Transactions on Information Theory*, vol. 66, no. 3, pp. 1920-1933, March 2020.
10. **A. S. Avestimehr**, **M. Mousavi Kalan**, and M. Soltanolkotabi, “Fundamental Resource Trade-offs for Encoded Distributed Optimization,” accepted to *Information and Inference Journal*, 2020.
11. **B. Guler**, **A. S. Avestimehr**, A. Ortega, “TACC: Topology-Aware Coded Computing for Distributed Graph Processing,” in *IEEE Transactions on Signal and Information Processing over Networks*, vol. 6, pp. 508-525, 2020.
12. **S. Li**, **M. Yu**, **C. Yang**, **A.S. Avestimehr**, S. Kannan and P. Viswanath, “PolyShard: Coded Sharding Achieves Linearly Scaling Efficiency and Security Simultaneously,” in *IEEE Transactions on Information Forensics and Security*, vol. 16, pp. 249-261, 2020.
13. **S. Prakash**, A. Reisizadeh, R. Pedarsani, and **A.S. Avestimehr** “Coded Computing for Distributed Graph Analytics,” in *IEEE Transactions on Information Theory*, to appear.
14. **C. Yang**, R. Pedarsani, and **A.S. Avestimehr**, “Communication-Aware Scheduling of Serial Tasks for Dispersed Computing,” in *IEEE/ACM Transactions on Networking*, vol. 27, no. 4, Aug. 2019.
15. A. Reisizadehmobarakeh, **S. Prakash**, R. Pedarsani, and **A.S. Avestimehr**, “Coded Computation over Heterogeneous Clusters,” to appear in *IEEE Transactions on Information Theory*, 2019.
16. N. Azizan-Ruhi, F. Lahouti, **A. S. Avestimehr**, and B. Hassibi “Distributed Solution of Large-Scale Linear Systems via Accelerated Projection-Based Consensus,” to appear in *IEEE Transactions on Signal Processing*, 2019 .
17. S.M. Asghari, Y.Ouyang, A. Nayyar, and **A. S. Avestimehr** “An Approximation Algorithm for Optimal Coded Multicast in Cache Networks,” to appear in *IEEE Transactions on Communications*. .
18. **N. Naderializadeh**, M. A. Maddah-Ali and **A. S. Avestimehr**, “Cache-Aided Interference Management in Wireless Cellular Networks,” to appear in *IEEE Transactions on Communications*, 2019.
19. “Coding for Distributed Computation on the Edge: Enabling Robust and Resilient Edge Computing in a Service Oriented Network,” by **S. Li** and **A. S. Avestimehr**, IEEE Communications Society Technology News Article (IEEE CTN), Issue: August 2018.
20. **Q. Yu**, M. A. Maddah-Ali and **A. S. Avestimehr**, “Characterizing the Rate-Memory Tradeoff in Cache Networks within a Factor of 2,” to appear in *IEEE Transactions on Information Theory*, 2018.

21. A. Anis, **A. El Gamal**, **A. S. Avestimehr** and Antonio Ortega, “A Sampling Theory Perspective of Graph-based Semi-supervised Learning,” to appear in *IEEE Transactions on Information Theory*.
22. **S. Li**, M. A. Maddah-Ali, **Q. Yu** and **A. S. Avestimehr**, “A Fundamental Tradeoff Between Computation and Communication in Distributed Computing,” in *IEEE Transactions on Information Theory*, vol. 64, no. 1, pp. 109-128, Jan. 2018 .
23. **Q. Yu**, M. A. Maddah-Ali and **A. S. Avestimehr**, “The Exact Rate-Memory Tradeoff for Caching with Uncoded Prefetching,” to appear in *IEEE Transactions on Information Theory* (**conference version received the Jack K. Wolf Student Paper Award at ISIT 2017**).
24. **S. Li**, M. A. Maddah-Ali and **A. S. Avestimehr**, “Coding for Distributed Fog Computing,” *IEEE Communications Magazine*, vol. 55, no. 4, pp. 34-40, April 2017 .
25. **S. Li**, M. A. Maddah-Ali and **A. S. Avestimehr**, “A Scalable Framework for Wireless Distributed Computing,” in *ACM/IEEE Transactions on Networking*, vol. 25, no. 5, pp. 2643-2654, Oct. 2017 .
26. **M. Kiamari** and **A. S. Avestimehr**, “Capacity Region of the Symmetric Injective K-User Deterministic Interference Channel,” to appear in *IEEE Transactions on Information Theory*.
27. **N. Naderializadeh**, M. Maddah-Ali, and **A. S. Avestimehr**, “Fundamental Limits of Cache-Aided Interference Management,” in *IEEE Transactions on Information Theory*, vol. 63, no. 5, pp. 3092-3107, May 2017 .
28. **N. Naderializadeh**, **A. El Gamal**, and **A. S. Avestimehr**, “Fundamental Limits of Non-Coherent Interference Alignment via Matroid Theory,” in *IEEE Transactions on Information Theory*, vol. 63, no. 10, pp. 6573-6586, Oct. 2017 .
29. **S. Lashgari** and **A. S. Avestimehr**, “Secrecy DoF of Blind MIMOME Wiretap Channel With Delayed CSIT,” to appear in *IEEE Transactions on Information Forensics and Security* .
30. H. Yang, **N. Naderializadeh**, **A. S. Avestimehr** and J. Lee, “Topological Interference Management With Reconfigurable Antennas,” in *IEEE Transactions on Communications*, vol. 65, no. 11, pp. 4926-4939, Nov. 2017 .
31. **A. Vahid**, V. Aggarwal, **A. S. Avestimehr**, and A. Sabharwal, “Interference Management with Mismatched Partial Channel State Information,” in *EURASIP Journal on Wireless Communications and Networking*, 2017.
32. **A. Vahid**, M. A. Maddah-Ali, **A. S. Avestimehr** and Y. Zhu, “Binary Fading Interference Channel With No CSIT,” in *IEEE Transactions on Information Theory*, vol. 63, no. 6, pp. 3565-3578, June 2017.
33. **D. Kao**, M. Maddah-Ali, and **A. S. Avestimehr**, “Blind Index Coding,” in *IEEE Transactions on Information Theory*, vol. 63, no. 4, pp. 2076-2097, April 2017. (**conference version selected for semi-plenary presentation at ISIT 2015**).

34. **D. Kao** and **A.S. Avestimehr**, "Linear Degrees of freedom of MIMO Interference Channel with Delayed CSIT," in *IEEE Transactions on Information Theory*, vol. 63, no. 1, pp. 297-319, Jan. 2017.
35. **A. Vahid**, M. Maddah-Ali, and **A. S. Avestimehr**, "Approximate Capacity Region of the MISO Broadcast Channels with Delayed CSIT," *IEEE Transactions on Communications*, 2016.
36. **S. Lashgari**, R. Tandon, and **A. S. Avestimehr**, "MISO Broadcast Channel with Heterogeneous CSIT: Beyond Two Users," *IEEE Transactions on Information Theory*, 2016.
37. **S. Li**, **D. Kao**, and **A. S. Avestimehr**, "Rover-to-Orbiter Communication in Mars: Taking Advantage of the Varying Topology," *IEEE Transactions on Communications*, 2016.
38. **S. Fong**, **I. Issa**, and **A.S. Avestimehr**, "Two-Hop Interference Channels: Impact of Linear Schemes," *IEEE Transactions on Information Theory*, Vol 61, No 10, 2015.
39. C. Geng, **N. Naderializadeh**, **A. S. Avestimehr**, and S. Jafar, "On the Optimality of Treating Interference as Noise," *IEEE Transactions on Information Theory*, Vol 61, No 7, 2015.
40. H. Asnani, **I. Shomorony**, **A. S. Avestimehr**, and T. Weissman, "Network Compression: Worst Case Analysis," *IEEE Transactions on Information Theory*, Vol 61, No 7, 2015.
41. **N. Naderializadeh** and **A. S. Avestimehr**, "Degrees-of-Freedom of Interference Networks with No CSIT: Impact of Topology," *IEEE Transactions on Information Theory*, Vol 61, No 2, 2015.
42. A. Khajehnejad, W. Xu, **A. S. Avestimehr**, and B. Hassibi, "Improving the Thresholds of Sparse Recovery: an Analysis for Iterative Reweighted Basis Pursuit Algorithm," *IEEE Transactions on Information Theory*, Vol 61, No 9, 2015.
43. **A. S. Avestimehr**, T. Chen, **S. Lashgari**, **A. Nwana**, S. Rahman, S. Unal, and A. Wagner, "Video Delivery over Wireless Networks - Exploiting Network Heterogeneity and Content Commonality," *Intel Technical Journal*, Volume 19, Issue 1, 2015.
44. **A. Vahid**, M. Maddah-Ali, and **A. S. Avestimehr**, "Capacity Results for Binary Fading Interference Channels with Delayed CSIT," *IEEE Transactions on Information Theory*, Vol 60, No 10, October 2014.
45. R. Etkin, F. Parvaresh, **I. Shomorony**, and **A. S. Avestimehr**, "Computing Half-Duplex Schedules in Gaussian Relay Networks via Mincut Approximations," *IEEE Transactions on Information Theory*, Vol 60, No 11, November 2014.
46. **N. Naderializadeh** and **A.S. Avestimehr**, "ITLinQ: A New Approach for Spectrum Sharing in Device-to-Device Communication Systems," *IEEE Journal on Selected Areas in Communications Special Issue on 5G Wireless Communication Systems*, Vol 32, No 6, 2014.
47. **S. Lashgari**, **A.S. Avestimehr**, and C. Suh, "Linear Degrees of Freedom of the X-Channel with Delayed CSIT," *IEEE Transactions on Information Theory*, Vol 60, No 4, April 2014. Available online at: [arXiv:1309.0799](https://arxiv.org/abs/1309.0799).

48. **I. Shomorony** and **A. S. Avestimehr**, “Degrees of Freedom of Two-Hop Wireless Networks: “Everyone Gets the Entire Cake”,” *IEEE Transactions on Information Theory*, Vol 60, No 5, May 2014.
49. J. Abdoli and **A. S. Avestimehr**, “Layered Interference Networks with Delayed CSI: DoF Scaling with Distributed Transmitters,” *IEEE Transactions on Information Theory*, Vol 60, No 3, March 2014.
50. **S. Lashgari** and **A. S. Avestimehr**, “Timely Throughput of Heterogeneous Wireless Networks: Fundamental Limits and Algorithms,” *IEEE Transactions on Information Theory*, Vol 59, No 12, December 2013.
51. **I. Shomorony**, R. Etkin, F. Parvaresh, and **A. S. Avestimehr**, “Diamond Networks with Bursty Traffic: Bounds on the Minimum Energy-Per-Bit,” *IEEE Transactions on Information Theory*, Vol 60, No 1, January 2014.
52. **I. Shomorony** and **A. S. Avestimehr**, “Worst-Case Additive Noise in Wireless Networks,” *IEEE Transactions on Information Theory*, Vol 59, No 6, June 2013.
53. A. Chaaban, A. Sezgin, and **A. S. Avestimehr**, “Approximate Capacity of the Y Channel,” *IEEE Transactions on Information Theory*, Vol 59, No 9, September 2013.
54. **I. Shomorony** and **A. S. Avestimehr**, “Two-Unicast Wireless Networks: Characterizing the Degrees-of-Freedom,” *IEEE Transactions on Information Theory*, Vol 59, No 1, January 2013. (**conference version finalist of the Jack K. Wolf Student Paper Award at ISIT 2011**)
55. **A. Vahid**, C. Suh, and **A. S. Avestimehr**, “Interference Channels with Rate-Limited Feedback,” *IEEE Transactions on Information Theory*, Vol 58, No 5, May 2012.
56. A. Sezgin, **A. S. Avestimehr**, M. Khajehnejad, and B. Hassibi, “Divide-and-conquer: Approaching the capacity of the two-pair bidirectional Gaussian relay network,” *IEEE Transactions on Information Theory*, Vol 58, No 4, April 2012.
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1. **J. So, B. Guler, and A.S. Avestimehr**, “A Scalable Approach for Privacy-Preserving Collaborative Machine Learning,” in *NeurIPS*, 2020.
2. **M. Kalan, Z. Fabian, A.S. Avestimehr**, and M. Soltanolkotabi, “Minimax Lower Bounds for Transfer Learning with Linear and One-hidden Layer Neural Networks,” in *NeurIPS*, 2020.
3. **C. He, M. Annavaram, and A.S. Avestimehr**, “Group Knowledge Transfer: Collaborative Training of Large CNNs on the Edge,” in *NeurIPS*, 2020.
4. K. Narra, Z. Lin, S. Avestimehr, G. Ananthanarayanan, and M. Annavaram, “Collage Inference: Using Coded Redundancy for Lowering Latency Variation in Distributed Image Classification Systems,” in proceedings of *International Conference on Distributed Computing Systems*, 2020.
5. **J. So, B. Guler, and A.S. Avestimehr**, “Turbo-Aggregate: Breaking the Quadratic Aggregation Barrier in Secure Federated Learning,” in *ICML 2020 Workshop on Federated Learning for User Privacy and Data Confidentiality (FL-ICML’20)*, 2020.
6. **C. He, M. Annavaram, and A. S. Avestimehr**, “FedNAS: Federated Deep Learning via Neural Architecture Search,” in *CVPR 2020 Workshop on Neural Architecture Search and Beyond for Representation Learning*, 2020.
7. **S. Prakash, S. Dhakal, M. Akdeniz, A.S. Avestimehr**, and N. Himayat, “Coded Computing for Federated Learning at the Edge,” in *ICML 2020 Workshop on Federated Learning for User Privacy and Data Confidentiality (FL-ICML’20)*, 2020.

8. **Q. Yu and A. S. Avestimehr**, “Entangled Polynomial Codes for Secure, Private, and Batch Distributed Matrix Multiplication: Breaking the “Cubic” Barrier,” in *Proceedings of the IEEE International Symposium on Information Theory (ISIT)*, 2020.
9. **S. Li, M. Yu, C. Yang, A. S. Avestimehr**, S. Kannan and P. Viswanath, “PolyShard: Coded Sharding Achieves Linearly Scaling Efficiency and Security Simultaneously,” in *Proceedings of the IEEE International Symposium on Information Theory (ISIT)*, 2020.
10. **C. Yang**, R. Pedarsani, and **A. S. Avestimehr**, “Coded Computing in Unknown Environment via Online Learning,” in *Proceedings of the IEEE International Symposium on Information Theory (ISIT)*, 2020.
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13. **M. Yu, S. Sahraei, S. Li, A.S. Avestimehr**, S. Kannan, and P. Viswanath, “Coded Merkle Tree: Solving Data Availability Attacks in Blockchains,” accepted to *2020 Financial Cryptography and Data Security Conference (FC20)*, 2020. (a flagship conference in cryptography and blockchain systems, acceptance rate of 22%)
14. K. Narra, Z. Lin, **M. Kiamari, A.S. Avestimehr**, and M. Annavaram “Slack squeeze coded computing for adaptive straggle mitigation,” in *Proceedings of The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC 19)*, 2019. (**Best Paper Award Finalist**)
15. **C. Yang**, R. Pedarsani, and **A.S. Avestimehr**, “Timely-Throughput Optimal Coded Computing over Cloud Networks,” in *Proceedings of the Twentieth ACM International Symposium on Mobile Ad Hoc Networking and Computing (Mobihoc ’19)*, 2019. (**Best Paper Award Finalist**)
16. **Q. Yu, S. Li, N. Raviv, M. Mousavi Kalan, M. Soltanolkotabim and A. S. Avestimehr**, “Lagrange Coded Computing: Optimal Design for Resiliency, Security and Privacy,” in Proc. AISTATS 2019.
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22. **S. Sahraei** and **A.S. Avestimehr**, “INTERPOL: Information Theoretically Verifiable Polynomial Evaluation,” in *Proceedings of the IEEE International Symposium on Information Theory (ISIT)*, 2019.
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86. **S. Lashgari**, **A.S. Avestimehr**, and C. Suh, “Linear Degrees of Freedom of the X-Channel with Delayed CSIT”, in *Proc. of Allerton Conference*, UIUC, October 2013.
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88. C. Geng, **N. Naderializadeh**, **A. S. Avestimehr**, and S. Jafar, “On the Optimality of Treating Interference as Noise”, in *Proc. of Allerton Conference*, UIUC, October 2013.
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92. **N. Naderializadeh** and **A.S. Avestimehr**, “Impact of Topology on Interference Networks with No CSIT,” in *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, 2013.
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94. R. Etkin, F. Parvaresh, **I. Shomorony**, and **A. S. Avestimehr**, “On Efficient Min-Cut Approximations in Half-Duplex Relay Networks,” in *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, 2013.
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120. **A. S. Avestimehr** and T. Ho, "Approximate capacity of the symmetric half-duplex Gaussian butterfly network," in Proceedings of *IEEE Information Theory Workshop*, June 2009.
121. **A. S. Avestimehr**, "Cooperative relaying with side information," in Proceedings of *CAMSAP*, 2009.
122. **A. S. Avestimehr**, A. Sezgin and D N C. Tse, "Approximate capacity of the two-way relay channel: a deterministic approach", in Proceedings of *Allerton Conference*, UIUC, September 2008.

123. S. Pawar, **A. S. Avestimehr** and D N C. Tse, "Diversity multiplexing tradeoff of the half-duplex relay channel", Invited paper, in Proceedings of *Allerton Conference*, UIUC, September 2008.
124. **A. S. Avestimehr**, S N. Diggavi and D N C. Tse, "Approximate capacity of Gaussian relay networks", in Proceedings of *IEEE International Symposium on Information Theory (ISIT)*, 2008.
125. **A. S. Avestimehr**, S N. Diggavi and D N C. Tse, "Information flow over compound wireless relay networks", in Proceedings of *IEEE international Zurich seminar (IZS)*, 2008.
126. **A. S. Avestimehr**, S N. Diggavi and D N C. Tse, "Approximate characterization of capacity in Gaussian relay networks", in Proceedings of *IEEE International Wireless Communications and Mobile Computing Conference (IWCMC)*, Crete, August 2008.
127. **A. S. Avestimehr**, S N. Diggavi and D N C. Tse, "Wireless Network Information Flow", in Proceedings of *Allerton Conference*, UIUC, September 2007.
128. **A. S. Avestimehr**, S N. Diggavi and D N C. Tse, "A Deterministic Approach to Wireless Relay Networks", in Proceedings of *Allerton Conference*, UIUC, September 2007.
129. **A. S. Avestimehr**, S N. Diggavi and D N C. Tse, "A deterministic model for wireless relay networks and its capacity", in Proceedings of *IEEE Information Theory Workshop (ITW)*, Bergen, July 2007.
130. **A. S. Avestimehr** and D N C. Tse, "Outage-Optimal Relaying in the Low SNR Regime", in Proceedings of *IEEE International Symposium on Information Theory (ISIT)*, Adelaide, Australia, Sept 2005.
131. A. Sahai, **A. S. Avestimehr** and P. Minero, "Anytime communication over the Gilbert-Eliot channel with noiseless feedback", in Proceedings of *IEEE International Symposium on Information Theory (ISIT)*, Adelaide, Australia, Sept 2005.
132. **S. Avestimehr**, K. Nayebi, and S. Kasaei, "Multirate Structures for Arbitrary Rate Error Control Coding", in Proceedings of *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 2003.

## Patents

1. **A.S. Avestimehr** and **N. Naderializadeh**, "Spectrum sharing in device-to-device communication systems", US20160295419A1, Filed 11/2014, Published 10/2016.
2. W. Shin, **I. Shomorony**, **A.S. Avestimehr**, C. Shin, J. Lim, W. Noh, "Source, relay, and destination executing cooperation transmission and method for controlling each thereof", US20140112340A1, Filed 10/2013, Published 4/2014.
3. W. Shin, **I. Issa**, **S. Fong**, **A.S. Avestimehr**, W. Noh, J. Lim, and K. Jang, "Method and apparatus to control interference in multi-hop network and relay node and node pair using the method", US9698928B2, Filed 3/2014, Published 7/2017.

4. W. Shin, I. Issa, S. Fong, A.S. Avestimehr, W. Noh, J. Lim, and K. Jang, "Method and apparatus to control interference in multi-hop network and relay node and node pair using the method", EP2779479A1, Filed 3/2014, Published 9/2014.

## Teaching Experiences

- **Electrical Engineering Department** University of Southern California  
*EE599: Foundations of Secure and Private Computing* Spring 2020
- **Electrical Engineering Department** University of Southern California  
*EE364: Introduction to Probability and Statistics* Fall 2018, 2019, 2020
- **Electrical Engineering Department** University of Southern California  
*EE565: Information Theory and Data Compression* Spring 2018
- **Electrical Engineering Department** University of Southern California  
*EE503: Probability for Electrical and Computer Engineers* Fall 2017
- **Electrical Engineering Department** University of Southern California  
*EE565: Information Theory and Data Compression* Spring 2016
- **Electrical Engineering Department** University of Southern California  
*EE503: Probability for Electrical and Computer Engineers* Fall 2015
- **Electrical Engineering Department** University of Southern California  
*EE565a: Information Theory* Spring 2015
- **Electrical Engineering Department** University of Southern California  
*EE562a: Random Processes in Engineering* Fall 2014
- **Electrical Engineering Department** University of Southern California  
*EE565b: Information Theory* Spring 2014
- **School of Electrical and Computer Engineering (ECE)** Cornell University  
*ECE3100: Probability and Inference* Fall 2013
- **School of Electrical and Computer Engineering (ECE)** Cornell University  
*ECE5630: Fundamentals of Information Transmission* Spring 2013
- **School of Electrical and Computer Engineering (ECE)** Cornell University  
*ECE4110: Random Signals in Communications and Signal Processing* Fall 2012
- **School of Electrical and Computer Engineering (ECE)** Cornell University  
*ECE4670/5670: Digital Communications* Spring 2012
- **School of Electrical and Computer Engineering (ECE)** Cornell University  
*ECE4110: Random Signals in Communications and Signal Processing* Fall 2011
- **School of Electrical and Computer Engineering (ECE)** Cornell University  
*ECE5670: Digital Communications* Spring 2011
- **School of Electrical and Computer Engineering (ECE)** Cornell University  
*ECE4110: Random Signals in Communications and Signal Processing* Fall 2010





16. Allerton Conference on Communication, Control, and Computing, “Coded Terasort,” October 2016.
17. Asilomar Conference on Signals, Systems, and Computers, “Coded Distributed Computing: Fundamental Limits and Practical Challenges”, November 2016.
18. Institute Henri Poincare (IHP), “Coded Computing”, February 2016.
19. Semi-Plenary Presentation at IEEE Int. Symp. Inf. Theory (ISIT), “Blind Index Coding”, July 2015.
20. Allerton Conference on Communication, Control, and Computing, “Coded MapReduce,” October 2015.
21. Caltech EE Seminar, “Coded MapReduce,” October 2015.
22. Information Theory and Applications (ITA) Workshop, UCSD: “Label Complexity of Graph-Based Semi-Supervised Learning”, February 2015.
23. Allerton Conference on Communication, Control, and Computing, “How to Utilize Caching to Improve Spectral Efficiency in Device-To-Device Wireless Networks,” October 2014.
24. Illumina, “Sampling Large Data on Graphs”, 2014.
25. Raytheon Fellows Seminar Series, and Aerospace Corporation, “Spectrum Sharing and Secrecy in Communication Systems”, 2014.
26. Information Theory and Applications (ITA) Workshop, UCSD: “ITLinQ: A New Approach for Spectrum Sharing in Device-to-Device Communication Systems”, February 2014.
27. Qualcomm, “ITLinQ: A New Approach for Spectrum Sharing in Device-to-Device Communication Systems”, January 2014.
28. Department Seminar, UCSD: “ITLinQ: A New Approach for Spectrum Sharing in Device-to-Device Communication Systems”, January 2014.
29. Allerton Conference on Communication, Control, and Computing: “Linear Degrees of Freedom of the X-Channel with Delayed CSIT”, October 2013.
30. Communication Theory Workshop (CTW): “Information Flow over Interference Networks: Impacts of Topology and CSI”, June 2013.
31. Information Theory and Applications (ITA) Workshop, UCSD: “Worst-case Noise in Wireless Networks”, February 2013.
32. Allerton Conference on Communication, Control, and Computing: “Degrees of Freedom of Two-Hop Wireless Networks: “Everyone Gets the Entire Cake””, October 2012.
33. Information Theory Workshop (ITW): “On the Role of Deterministic Models in  $K \times K \times K$  Wireless Networks”, September 2012.

34. Information Theory Workshop (ITW): “Worst-Case Source for Distributed Compression with Quadratic Distortion”, September 2012.
35. Network Science Workshop, CUHK: “Frontiers of Multihop Multiflow Wireless Networks”, August 2012.
36. One of a Series Seminar, LIDS, MIT: “Network Capacity with Local Network Views”, March 2012.
37. Information Theory and Applications (ITA) Workshop, UCSD: “Network Capacity with Local Network Views”, February 2012.
38. Alcatel-Lucent, Wireless Communications Group: “Interference Management with Local Network Views”, December 2011.
39. Alcatel-Lucent, Bell Labs: “Network Capacity with Local Network Views”, December 2011.
40. WNCG Seminars, UT Austin: “Wireless Network Coding with Local Network Views”, November 2011.
41. Communications Seminar, University of Illinois Urbana-Champaign (UIUC): “Fundamentals of Communication with Local Network Views”, October 2011.
42. Allerton Conference on Communication, Control, and Computing: “Interference Channel with Binary Fading: Effect of Delayed Network State Information”, September 2011.
43. Allerton Conference on Communication, Control, and Computing: “On the Capacity of Multi-Hop Wireless Networks with Partial Network Knowledge”, September 2010.
44. Networking Seminar Series at ECE department of University of Toronto: “Breaking the barriers in wireless network information theory”, April 2010.
45. ECE Department Seminar at Rice University: “Breaking the barriers in wireless network information theory”, March 2010.
46. EECS Department Seminar at Syracuse University: “Breaking the barriers in wireless network information theory”, March 2010.
47. Engineering in Medicine and Biology Society (EMBS) HealthTech Symposium: “Breaking the barriers in wireless network information theory”, 2010.
48. Information Theory and its Applications (ITA) workshop: “On cross-layer optimization for wireless networks”, February 2010.
49. Qualcomm Inc.: “Wireless network information flow: a deterministic approach”, 2009.
50. Department of Electrical and Engineering at Caltech: “Wireless network information flow: a deterministic approach”, 2008.
51. Department of Electrical and Computer Engineering at UIUC: “Wireless network information flow: a deterministic approach”, 2008.

52. Department of Electrical and Engineering at USC: “Wireless network information flow: a deterministic approach”, 2008.
53. Department of Electrical and Systems Engineering at the UPenn: “Wireless network information flow: a deterministic approach”, 2008.

### **Selected Services at the University of Southern California (USC)**

- Executive committee Member of Viterbi School’s Appointment, Promotions, and Tenure (APT) Committee, 2020-2021.
- Faculty Member Representative of ECE on Viterbi School’s Appointment, Promotions, and Tenure (APT) Committee, 2019-now.
- At-Large Faculty Member Representative on Viterbi School’s Appointment, Promotions, and Tenure (APT) Committee, 2015-2016 and 2017-2019.
- Chair of the Joint APT/EFC Merit Review Subcommittee at Viterbi School, 2018.
- Co-Director of the MS in Electrical Engineering – Wireless Health Technology (MSEE-WHT), 2014 - now.
- Co-Director of the Communication Sciences Institute, 2017 - 2018.
- Member of the EE Executive Committee, 2017 - 2018.
- EE Faculty Merit Review Committee Member, 2016-2017 and 2017-2018.
- Member of the EE PhD Fellowship Admissions Committee, 2014 - now.
- EE Faculty Recruiting Committee, 2015-2018.
- Ming Hsieh Institute (MHI) Advisory Board Member, 2016 - now.
- EE Graduate Curriculum Committee, 2016-now.
- EE Research Festival Judge, 2017.
- EE Department Study Group to Understand and Adopt Recent Trends, 2016.
- EE Space Committee Member, 2015.
- Various ad-hoc committees for tenure and 3-year appointment evaluations.
- Various PhD Defense, PhD Qualifying, and PhD Screening Committees at EE Department.

### **Selected Professional Services (Scientific Leadership)**

- Associate Editor for the IEEE Transactions on Information Theory, 2014-2017.
- General co-chair of 2020 IEEE International Symposium on Information Theory (ISIT).
- General co-Chair of the 2012 North American School of Information Theory.
- General co-Chair of the 2010 Workshop on Interference Networks (WINE).
- Program Chair, 1st Workshop on Distributed Machine Learning, co-located with CoNEXT 2020
- Finance Chair of 2017 Communication Theory Workshop (CTW).
- Technical Program Committee (TPC) member of IEEE International Symposium on Information Theory (ISIT), 2009-now.
- Technical Program Committee (TPC) member of various conferences at information theory and communication theory societies, including Information Theory Workshop (ITW), International Conference on Communications (ICC), Globecom, etc.
- Organizer of an invited session at 2017 Communication Theory Workshop (CTW).
- Organizer of an invited session at 2016 and 2015 Asilomar Conference on Signals, Systems, and Computers.
- Panelist on "Tenure and Promotions" at IEEE International Symposium on Information Theory (ISIT).
- Panelist on "Funding" at IEEE International Symposium on Information Theory (ISIT).
- Serving on various proposal reviewing panels at NSF, including CAREER, CCF, ECCS, and PCON panels.
- Serving on various AFOSR proposal reviewing committees, including complex networks program and YIP awards.
- Serving as reviewer of various journals and conferences in information theory, communication theory, signal processing, machine learning, and CS theory communities, including *IEEE Transactions on Information Theory*, *IEEE Transactions on Communications*, *IEEE Communications Magazine*, *IEEE Transactions on Wireless Communications*, *IEEE transactions on Signal Processing*, *ACM Transactions on Sensor Networks (TOSN)*, *Math Programming*, *IEEE International Symposium on Information Theory (ISIT)*, and *ACM-SIAM Symposium on Discrete Algorithms (SODA)*.