Ilan Shomorony

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EDUCATION

- **Ph.D. in Electrical and Computer Engineering** — 08/2014
  Cornell University, Ithaca, NY (GPA: 4.17/4.30)
  Minor: Applied Mathematics
  Thesis: Fundamentals of Multi-hop Multi-flow Wireless Networks

- **M.S. in Electrical and Computer Engineering** — 08/2012
  Cornell University, Ithaca, NY

- **B.S. in Mathematics and ECE with high distinction** — 05/2009
  Worcester Polytechnic Institute, Worcester, MA (GPA: 4.0/4.0)
  Thesis: Authentication Schemes based on Physically Unclonable Functions

POSITIONS HELD

- **Assistant Professor** — 08/2018-present
  Department of Electrical and Computer Engineering
  University of Illinois at Urbana-Champaign

- **Data Scientist** — 07/2017-07/2018
  Human Longevity, Inc.

- **Postdoctoral Scholar** — 06/2015-07/2017
  Department of Electrical Engineering and Computer Sciences
  University of California, Berkeley
  Supervisors: Prof. Thomas Courtade and Prof. David Tse

- **Postdoctoral Fellow** — 01/2015-05/2015
  Simons Institute for the Theory of Computing
  University of California, Berkeley

AWARDS

- Best presentation at the UC Berkeley Computational Biology Retreat 2015
- NSF Center for Science of Information Postdoctoral Fellowship, 2015-2016
- Simons Fellowship – Simons Institute for the Theory of Computing, Spring 2015
- Qualcomm Innovation Fellowship, 2013
- ISIT Student Paper Award Finalist, 2011
- Olin Graduate Fellowship – Cornell University, 2009-2010
- Provost's MQP Award (Best Senior Thesis Award) – WPI Math Department, 2009

PUBLICATIONS

Monograph:

[M1] I. Shomorony and A. S. Avestimehr, "Multihop Wireless Networks: A Unified Approach to Relaying and Interference Management," Foundations and Trends in Networking, vol. 8, no. 3, pp. 149-280, Dec. 2014. doi: 10.1561/1300000044.

Journal Papers and preprints:

[J1] T. Baharav, G. Kamath, D. Tse, and I. Shomorony, "Spectral Jaccard Similarity: A new approach to estimating pairwise sequence alignments", (under review, accepted for presentation at RECOMB 2020).

[J2] I. Shomorony and R. Heckel, "DNA-Based Storage: Models and Fundamental Limits" (under review), 2020.

[J3] I. Shomorony, E. Cirulli, et al., Unsupervised integration of multimodal dataset identifies novel signatures of health and disease, *Genome Medicine*, Jan. 2020.

[J4] G. Kamath*, I. Shomorony*, F. Xia*, T. Courtade and D. Tse, "HINGE: Long-Read Assembly Achieves Optimal Repeat Resolution", *Genome Research*, May 2017 (*equal contributions).

[J5] I. Shomorony, T. Courtade and D. Tse, "Fundamental Limits of Genome Assembly under an Adversarial Erasure Model", *IEEE Transactions on Molecular, Biological, and Multi-Scale Communications*, Vol 2, No 2, Dec. 2016.

[J6] I. Shomorony, S. Kim, T. Courtade and D. Tse, "Information-Optimal Genome Assembly via Sparse Read-Overlap Graphs", *Bioinformatics*, Vol 32, No 17, 2016.

[J7] H. Asnani, I. Shomorony, A. S. Avestimehr and T. Weissman, "Network Compression: Worst-Case Analysis", *IEEE Transactions on Information Theory*, Vol 61, No 7, July 2015.

[J8] R. Etkin, F. Parvaresh, I. Shomorony and A. S. Avestimehr, "Computing Half-Duplex Schedules in Gaussian Relay Networks via Min-Cut Approximations", *IEEE Transactions on Information Theory*, Vol 60, No 11, Nov. 2014.

[J9] 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.

[J10] 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, Jan. 2014.

[J11] I. Shomorony and A. S. Avestimehr, "Worst-Case Additive Noise in Wireless Networks", *IEEE Transactions on Information Theory*, Vol 59, No 6, June 2013.

[J12] I. Shomorony and A. S. Avestimehr, "Two-Unicast Wireless Networks: Characterizing the Degrees of Freedom", *IEEE Transactions on Information Theory*, Vol 59, No 1, Jan. 2013.

Conference Papers:

[C1] S. Shin, R. Heckel and I. Shomorony, "Capacity of the Erasure Shuffling Channel", *Proceedings of ICASSP*, 2020.

[C2] G. Greenberg and I. Shomorony, "The Metagenomic Binning Problem: Clustering Markov Sequences", *Proceedings of IEEE Information Theory Workshop*, 2019.

[C3] I. Shomorony and R. Heckel, "Capacity Results for the Noisy Shuffling Channel", *Proceedings of IEEE International Symposium on Information Theory*, 2019.

[C4] R. Heckel, I. Shomorony, K. Ramchandran and D. Tse, "Fundamental Limits of DNA Storage Systems", *Proceedings of IEEE International Symposium on Information Theory*, 2017.

[C5] I. Shomorony, G. Kamath, F. Xia, T. Courtade and D. Tse, "Partial DNA Assembly: A Rate-Distortion Perspective", *Proceedings of IEEE International Symposium on Information Theory*, 2016.

[C6] J. Hui, I. Shomorony, K. Ramchandran and T. Courtade, "Overlap-Based Genome Assembly from Variable-Length Reads", *Proceedings of IEEE International Symposium on Information Theory*, 2016.

[C7] A. Vahid, I. Shomorony and R. Calderbank, "Informational Bottlenecks in Two-Unicast Wireless Networks with Delayed CSIT", *Proceedings of the Allerton Conference*, October 2015.

[C8] I. Shomorony, T. Courtade and D. Tse, "Do Read Errors Matter for Genome Assembly?", *Proceedings of IEEE International Symposium on Information Theory* 2015.

[C9] I. Shomorony and A. S. Avestimehr, "Sampling Large Data on Graphs", *Proceedings of IEEE Global Conference on Signal and Information Processing*, December 2014.

[C10] I. Shomorony and A. S. Avestimehr, "A Generalized Cut-Set Bound for Deterministic Multi-Flow Networks and its Applications", *Proceedings of IEEE International Symposium on Information Theory*, July 2014.

[C11] R. Etkin, F. Parvaresh, I. Shomorony and A. S. Avestimehr, "On Efficient Min-Cut Approximations in Half-Duplex Relay Networks", *Proceedings of IEEE International Symposium on Information Theory*, July 2013.

[C12] H. Asnani, I. Shomorony, A. S. Avestimehr and T. Weissman, "Network Compression: Worst-Case Analysis", *Proceedings of IEEE International Symposium on Information Theory*, July 2013.

[C13] I. Shomorony and A. S. Avestimehr, "Degrees of Freedom of Two-Hop Wireless Networks: Everybody Gets the Entire Cake", Proceedings of the Allerton Conference, October 2012.

[C14] I. Shomorony and A. S. Avestimehr, "On the Role of Deterministic Models in $K \times K \times K$ Wireless Networks", Proceedings of *IEEE Information Theory Workshop*, September 2012.

[C15] I. Shomorony, A. S. Avestimehr, H. Asnani and T. Weissman, "Worst-Case Source for Distributed Compression with Quadratic Distortion", Proceedings of *IEEE Information Theory Workshop*, September 2012.

[C16] I. Shomorony and A. S. Avestimehr, "Is Gaussian Noise the Worst-Case Additive Noise in Wireless Networks?", *Proceedings of IEEE International Symposium on Information Theory*, July 2012.

[C17] I. Shomorony, R. Etkin, F. Parvaresh and A. S. Avestimehr, "Bounds on the Minimum Energy-Per-Bit for Bursty Traffic in Diamond Networks", *Proceedings of IEEE International Symposium on Information Theory*, July 2012.

[C18] I. Shomorony and A. S. Avestimehr, "Sum Degrees-of-Freedom of Two-Unicast Wireless Networks," *Proceedings of IEEE International Symposium on Information Theory*, August 2011. **(Student Paper Award Finalist)**

SELECTED TALKS

[T1] "DNA Sequencing: From Information Limits to Genome Assembly Software", IEEE Information Theory Meeting, Stanford University, 11/15/2017 (Invited).

[T2] "Storing Information in Short DNA Molecules", Asilomar Conference on Signals, Systems, and Computers, 10/30/2017 (Invited).

[T3] "Is Genome Assembly Really NP-Hard?", Allerton Conference, 10/06/2017 (Invited).

[T4] "Long-Read Assembly via Overlap Graphs with Maximal Repeat Resolution", CSE Colloquium, UCSD, 02/17/2017.

[T5] "Fundamental Limits of DNA Storage Systems", ITA Workshop, 02/16/2017 (Invited).

[T6] "The DNA Assembly Problem: Designing algorithms based on Information Limits", live online talk at the Shannon Channel (YouTube), 03/28/2016 (Invited).

[T7] "The DNA Assembly Problem: Designing algorithms based on Information Limits", Machine Learning Seminar, Duke University, 02/10/2016 (Invited).

[T8] "Optimal Assembly with Read-Overlap Graphs", UC Berkeley Computational Biology Retreat, 11/22/2015 (**Best Presentation Award**).

PATENTS

- Aligned Network Diagonalization (Interference management scheme)
  U.S. Patent US20140112340A1

PROFESSIONAL ACTIVITIES

- Organizer of the Signals, Inference and Networks seminar – UIUC, 2019-2020
- Member of IEEE and the Information Theory Society
- Served as a reviewer for IEEE Trans. on Information Theory, IEEE Trans. on Wireless Communications, IEEE Trans. on Communications, IEEE Trans. on Sensor Networks, IEEE ISIT, IEEE ICC, Mathematical Programming, RECOMB, Journal of Computational Biology

TEACHING EXPERIENCE

- **ECE310 - Digital Signal Processing** — UIUC, Fall 2018
- **ECE534 - Random Processes** — UIUC, Spring and Fall 2019
- **ECE313 - Probability with Engineering Applications** — UIUC, Spring 2019

INTERNSHIP EXPERIENCE

- **Research Associate Intern at HP Labs** — Palo Alto, CA, Summer 2011

  Worked with the Information Theory Group, under the supervision of Dr. Raul Etkin, investigating the fundamental limits on the minimum energy required to synchronize the nodes of a wireless relay network with non-synchronized nodes.

- **Intern at the Redfish Group** — Santa Fe, NM, Summer 2009

  Worked on the development of software for augmented reality-based applications for city planning. Implemented computer-vision algorithms for the VeniceTable project, designed to facilitate the planning of boat traffic in Venice, Italy.

- **Intern at GE Transportation** — Grain Valley, MO, Summer 2008

  Worked in Train Inspection Systems department improving the software for the detection of derailing risk due to overheated wheels.

TECHNICAL SKILLS

- **Programming:** C++, Python
- **Computational software:** MATLAB, Mathematica, MAPLE