Seiyun SHIN

Curriculum Vitae

Department of Electrical and Computer Engineering
University of Illinois Urbana-Champaign (UIUC)
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Research Interests

My research interests lie at the intersection of theoretical machine learning, algorithm design, and information theory. Within these disciplines, I seek to achieve two closely-related goals. One is to characterize the fundamental limits of estimation and learning from data; the other is to develop efficient algorithms that approach these limits. Specifically, I am working on establishing *sample complexity* in GraphML (e.g., graph neural networks), instance-adaptive algorithms, and online learning and multi-armed bandits.

Education

Ph.D. Electrical and Computer Engineering **Aug. 2019–Present**
University of Illinois Urbana-Champaign (UIUC), Urbana, IL
Advisor: Ilan Shomorony and Han Zhao

M.S. Electrical Engineering **Feb. 2015**
Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea
Advisor: Changho Suh

B.S. Electrical Engineering **Aug. 2012**
Mathematical Sciences
Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea
Summa Cum Laude

Honors and Awards

- **Awarded Mavis Future Faculty Fellow** 2023–2024
- **Nominated Olesen Award for Excellence in Undergraduate Teaching** 2022
- **Awarded Kwanjeong Educational Foundation Fellowship** 2019–Present
- **Awarded Academic Excellence Scholarship from KAIST EE Department** 2009–2011
- Awarded Korea Government Fellowship 2008–2015
- Graduated early from Hansung Science High School **(2-year completion)** 2008

Selected Publications

Conference Papers

[C-7] **Seiyun Shin***, Ilan Shomorony, and Han Zhao, "Efficient learning of linear graph neural networks via node subsampling," *In Proceedings of the 37th Advances in Neural Information Processing Systems (NeurIPS), Dec. 2023.*

[C-6] **Seiyun Shin***, Han Zhao, and Ilan Shomorony, "Adaptive power method: Eigenvector estimation from sampled data," *International Conference on Algorithmic Learning Theory, Feb. 2023.*

[C-5] Hyejin Park*, **Seiyun Shin***, Kwang-Sung Jun, and Jungseul Ok, "Transfer learning in bandits with latent continuity," *International Symposium on Information Theory (ISIT),* July 2021. (*equal contributions)

[C-4] **Seiyun Shin**, Reinhard Heckel, and Ilan Shomorony, "Capacity of the erasure shuffling channel," *International Conference on Acoustics, Speech, and Signal Processing,* May 2020.

[C-3] **Seiyun Shin** and Changho Suh, "Capacity of a two-way function multicast channel," *Allerton Conference on Communication, Control, and Computing,* Oct. 2017.

[C-2] Kyungsik Min, Minchae Jung, **Seiyun Shin**, Seokki Kim, and Sooyong Choi, "System level simulation of mmWave based mobile Xhaul networks," *IEEE Vehicular Technology Conference (VTC Spring),* June 2017.

[C-1] **Seiyun Shin** and Changho Suh, "Two-way function computation," *Allerton Conference on Communication, Control, and Computing,* Oct. 2014.

Journal Papers

[J-2] Hyejin Park, **Seiyun Shin**, Kwang-Sung Jun, and Jungseul Ok, "Transfer learning in bandits with latent continuity," *submitted to the IEEE Transactions on Information Theory,* Dec. 2021.

[J-1] **Seiyun Shin** and Changho Suh, "Two-way function computation," *IEEE Transactions on Information Theory,* Vol 66, No 2, Feb. 2020.

Courses in UIUC

CS443 Reinforcement Learning (currently taking), ECE598 Fundamental Limits in Data Science (A+/A), CS598 Transfer Learning (A/A), CS598 Deep Learning Theory (A/A), CS598 Statistical Reinforcement Learning (A/A), ECE586 MDPs and Reinforcement Learning (A/A), ECE580 Optimization by Vector Space Method (A+/A), CS583 Approximation Algorithms (A-/A), ECE563 Information Theory (A+/A), ECE543 Statistical Learning Theory (A/A), ECE534 Random Processes (A/A), IE521 Convex Optimization (A/A), CS498 Algorithms for Big Data (A/A), CS498 Trustworthy Machine Learning (A/A), IE498 Online Learning (A/A), CS446 Machine Learning (A/A), CS445 Computational Photography (A/A)

Professional Service

- Reviewer for Conference on Neural Information Processing Systems (NeurIPS)
- Reviewer for International Conference on Machine Learning (ICML)
- Reviewer for International Conference on Learning Representations (ICLR)

- Reviewer for International Conference on Artificial Intelligence and Statistics (AISTATS)
- Reviewer for IEEE Transactions on Information Theory
- Reviewer for IEEE International Symposium on Information Theory (ISIT)
- Reviewer for IEEE Information Theory Workshop (ITW)
- Reviewer for International Conference on Acoustics, Speech, and Signal Processing (ICASSP)
- Reviewer for IEEE Wireless Communications and Networking Conference (WCNC)
- General Chair for the Coordinated Science Laboratory (CSL) Student Conference 2023 in UIUC
- Machine Learning Session Chair for the CSL Student Conference 2023

Work Experience

Research Associate, ETRI, Daejeon, Korea **July 2018–Apr. 2019**

Time-series analysis

- Applied Long Short-Term Memory (LSTM) approach to predict the concentration of PM2.5 from the other air pollutant factors.
- Demonstrated the superiority of the LSTM approach by comparing this with the conventional ARIMA model

Research Associate, ETRI, Daejeon, Korea **Mar. 2015–June 2018**

5G Communication System Design

- Designed physical layer structures for mmWave-based mobile networks.
- Developed an interference alignment technique for multi-hop networks using delayed channel state information.
- Developed a system-level simulator using MATLAB.
- Published a conference paper in IEEE VTC as an outcome [C-2].

Research Assistant, LG Electronics, Seoul, Korea **Feb. 2013–Feb. 2015**

Interference Alignment Techniques Using Delayed Channel State Information

- Developed interference alignment techniques for a 2-cell, K-user cellular network.
- Generalized into G-cell, K-user cellular networks.
- Utilized MATLAB for implementation and performance evaluation.

Summer Intern, ETRI, Daejeon, Korea **June 2011–Aug. 2011**

Implementation of a Satellite Communication Design

- Developed an algorithm that tracks the direction of GPS jamming signals.
- Modeled the algorithm using interferometer technique and multiple antennas.
- Utilized MATLAB for implementation and performance evaluation.

Teaching Experience

- UIUC ECE313: Probability with Engineering Applications Spring 2022
  (**nomination for Olesen Award for excellence in undergraduate teaching**)

- UIUC ECE563: Information Theory — Fall 2021
- KAIST EE321: Communication Engineering — Spring 2014
- KAIST EE623: Information Theory — Fall 2013
- KAIST EE202: Signals and Systems — Fall 2011

Invited Talks

- ML Reading Group Seminar, UIUC — Jan. 2024
  "Inference and Learning on Partially Observed Graphs"
- MLOPT Idea Seminar, UW-Madison — April 2023
  "Adaptive Power Method: Eigenvector Estimation from Sampled Data"
- Qualcomm IT Tour, Qualcomm Head Quarter, San Diego — July 2012
  "When augmented reality meets hope"

References

1. Prof. Ilan Shomorony
Department of Electrical and Computer Engineering — Email: ilans@illinois.edu
University of Illinois Urbana-Champaign
324 Coordinated Science Laboratory
1308 W Main Street MC 228 Urbana, IL 61801, USA

2. Prof. Han Zhao
Department of Computer Science — Email: hanzhao@illinois.edu
University of Illinois Urbana-Champaign
3320 Siebel Center
201 N Goodwin Ave Urbana, IL, 61801, USA

3. Prof. Changho Suh
Department of Electrical Engineering — Email: chsuh@kaist.ac.kr
Korea Advanced Institute of Science and Technology
IT Convergence Building (N1) 912
291 Daehak-ro, Yuseong-gu, Daejeon 34141, Korea

4. Prof. Maxim Raginsky
Department of Electrical and Computer Engineering — Email: maxim@illinois.edu
University of Illinois Urbana-Champaign
162 Coordinated Science Laboratory
1308 W Main Street MC 228 Urbana, IL 61801, USA

5. Prof. Venugopal V. Veeravalli

Department of Electrical and Computer Engineering
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Email: vvv@illinois.edu