Baturalp Buyukates

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EDUCATION

University of Maryland — College Park, MD, USA
Ph.D., Electrical and Computer Engineering — Aug 2016 – Dec 2021
Advisor: Prof. Sennur Ulukus
Thesis: Age of Information in Large Networks, Distributed Computation, and Learning

Bilkent University — Ankara, Turkey
Bachelor of Science, Electrical and Electronics Engineering — Sep 2011 - Jan 2016
Minor, Economics

Telecom SudParis — Evry, France
Exchange Student, Computer and Communication Networks — Jan 2014 - Jun 2014

RESEARCH INTERESTS

Machine Learning, Distributed Computation, Wireless Communications, Networks, Information Theory
Current Focus: Secure, trustworthy, and verifiable federated learning, privacy-preserving machine learning, responsible data economics and valuation for collaborative artificial intelligence, blockchain systems, timely information exchange in distributed systems

ACADEMIC & PROFESSIONAL EXPERIENCE

Postdoctoral Research Associate — Los Angeles, CA, USA
University of Southern California — Jan 2022 - Present
Information Theory and Machine Learning (vITAL) Research Lab
Host: Prof. A. Salman Avestimehr

- Proposed a scalable, lightweight, and verifiable secure aggregation protocol for federated learning *(NeurIPS Workshop)*
- Proposed the first federated clustering algorithm with formal data privacy and lossless performance guarantees compared to centralized clustering
- Designed a proof-of-contribution-based trustworthy data market for federated learning on blockchain

Future IP Networking Research Intern — Murray Hill, NJ, USA
Nokia Bell Labs — Jun 2021 - Aug 2021

- Implemented a reinforcement learning-based framework for network optimization for hyperconnectivity

Graduate Research Assistant — College Park, MD, USA
University of Maryland — Aug 2016 - Dec 2021

- Designed a timely communication framework for federated learning with performance guarantees
- Introduced age-based coded computation for bias reduction in distributed learning
- Investigated timely information delivery in distributed computing systems with stragglers *(Asilomar Conference - Best Student Paper - Second Place)*
- Proposed scalable transmission schemes for timeliness in large distributed networks and clustered gossip networks *(IEEE SPAWC - Best Student Paper - First Place)*

HONORS & AWARDS

- **George Harhalakis Outstanding Graduate Student Award** — Sep 2021
  Awarded by Institute of Systems Research, University of Maryland
- **Best Student Paper Award - First Place** — Sep 2021
  IEEE International Workshop on Signal Processing Advances in Wireless Communications

- **IEEE International Conference on Communications (ICC) Student Grant** May 2021
  Awarded by the US National Science Foundation (NSF)
- **Best Student Paper Award - Second Place** Nov 2020
  54th Asilomar Conference on Signals, Systems, and Computers
- **Future Faculty Program Fellowship, University of Maryland** Jan 2020 - Dec 2021
  Selected to receive a comprehensive training on career-long success in academia
- **Jacob K. Goldhaber Travel Grant, University of Maryland** Dec 2019
  For travels to scholarly, scientific, or professional conferences
- **Best Student Paper Award - Finalist** Nov 2019
  53rd Asilomar Conference on Signals, Systems, and Computers
- **Distinguished Graduate Fellowship, University of Maryland** Aug 2016 - Aug 2017
  Awarded by the Clark School of Engineering for Ph.D. studies
- **Research Excellence Award, Bilkent University** May 2016
  Awarded by the Department of Electrical and Electronics Engineering
- **Bilkent University Undergraduate Fellowship** Sep 2011 - Jun 2016
  Awarded for Bachelor's degree studies
- **Ranked 360th in Turkey's National University Entrance Examination** Jul 2011
  Among 1.5 million participants

PUBLICATIONS

Google Scholar: https://scholar.google.com/citations?user=JjASH4UAAAAJ&hl=en&oi=ao

Book Chapters:

1. M. Bastopcu, **B. Buyukates,** and S. Ulukus, *Age of Information in Source Coding,* in Age of Information: Foundations and Applications, N. Pappas, M. A. Abd-Elmagid, B. Zhou, W. Saad, H. S. Dhillon, Eds., Cambridge Univ. Press, 2022.

Journal Papers:

1. **B. Buyukates,** J. So, H. Mahdavifar, and A. S. Avestimehr, *LightVeriFL: A Lightweight and Verifiable Secure Aggregation for Federated Learning*, submitted, January 2023.
2. **B. Buyukates,** E. Ozfatura, S. Ulukus, and D. Gunduz, *Gradient Coding with Dynamic Clustering for Straggler-Tolerant Distributed Learning,* IEEE Transactions on Communications, to appear.
3. **B. Buyukates,** M. Bastopcu, and S. Ulukus, *Version Age of Information in Clustered Gossip Networks,* IEEE Journal on Selected Areas in Information Theory, 3(1):85-97, March 2022.
4. M. Bastopcu, **B. Buyukates,** and S. Ulukus, *Selective Encoding Policies for Maximizing Information Freshness*, IEEE Transactions on Communications, 69(9):5714-5726, September 2021.
5. **B. Buyukates,** A. Soysal, and S. Ulukus, *Scaling Laws for Age of Information in Wireless Networks,* IEEE Transactions on Wireless Communications, 20(4):2413-2427, April 2021.
6. **B. Buyukates** and S. Ulukus, *Timely Distributed Computation with Stragglers,* IEEE Transactions on Communications, 68(9):5273-5282, September 2020.
7. **B. Buyukates,** A. Soysal, and S. Ulukus, *Age of Information in Multihop Multicast Networks,* Journal of Communications and Networks, special issue on Age of Information, 21(3):256-267, June 2019.

Peer-Reviewed Conference & Workshop Papers:

1. **B. Buyukates***, C.He*, S. Han, Z. Fang, Y. Zhang, J. Long, A. Farahanchi, and A. S. Avestimehr, *A Trustworthy Proof-of-Contribution-Based Market Design for Federated Learning on Blockchain,* submitted, December 2022. *: equal contribution.
2. **B. Buyukates,** J. So, H. Mahdavifar, and A. S. Avestimehr, *LightVeriFL: Lightweight and Verifiable Secure Federated Learning,* International Workshop on Federated Learning: Recent Advances and New Challenges in Conjunction with NeurIPS 2022 (FL-NeurIPS22), December 2022. **(Oral presentation)**
3. S. Li, S. Hou, **B. Buyukates,** and A. S. Avestimehr, *Secure Federated Clustering,* submitted, May 2022. Available on ArXiv: 2205.15564.

4. **B. Buyukates,** M. Bastopcu, and S. Ulukus, *Age of Gossip in Networks with Community Structure,* IEEE International Workshop on Signal Processing Advances in Wireless Communications, Lucca, Italy, September 2021. **(Best Student Paper Award Winner)**
5. **B. Buyukates,** E. Ozfatura, S. Ulukus, and D. Gunduz, *Gradient Coding with Dynamic Clustering for Straggler Mitigation,* IEEE International Conference on Communications, Montreal, Canada, June 2021.
6. **B. Buyukates** and S. Ulukus, *Timely Communication in Federated Learning,* IEEE INFOCOM Workshop on Age of Information, May 2021.
7. E. Ozfatura, **B. Buyukates,** D. Gunduz, and S. Ulukus, *Age-Based Coded Computation for Bias Reduction in Distributed Learning,* IEEE Global Communications Conference, Taipei, Taiwan, December 2020.
8. **B. Buyukates** and S. Ulukus, *Timely Updates in Distributed Computation Systems with Stragglers,* 54th Asilomar Conference on Signals, Systems and Computers, Pacific Grove, CA, November 2020. **(Best Student Paper Award Second Place)**
9. **B. Buyukates,** M. Bastopcu, and S. Ulukus, *Optimal Selective Encoding for Timely Updates with Empty Symbol,* IEEE International Symposium on Information Theory, Los Angeles, CA, June 2020.
10. **B. Buyukates** and S. Ulukus, *Age of Information with Gilbert-Elliot Servers and Samplers,* Conference on Information Sciences and Systems, Princeton, NJ, March 2020.
11. M. Bastopcu, **B. Buyukates,** and S. Ulukus, *Optimal Selective Encoding for Timely Updates,* Conference on Information Sciences and Systems, Princeton, NJ, March 2020.
12. **B. Buyukates,** A. Soysal, and S. Ulukus, *Age of Information Scaling in Large Networks with Hierarchical Cooperation,* IEEE Global Communications Conference, Waikoloa, HI, December 2019.
13. **B. Buyukates,** A. Soysal, and S. Ulukus, *Age of Information in Multicast Networks with Multiple Update Streams,* 53rd Asilomar Conference on Signals, Systems and Computers, Pacific Grove, CA, November 2019. **(Best Student Paper Award Finalist)**
14. **B. Buyukates,** A. Soysal, and S. Ulukus, *Age of Information Scaling in Large Networks,* IEEE International Conference on Communications, Shanghai, China, May 2019.
15. **B. Buyukates,** A. Soysal, and S. Ulukus, *Age of Information in Two-Hop Multicast Networks,* 52nd Asilomar Conference on Signals, Systems and Computers, Pacific Grove, CA, October 2018.
16. **B. Buyukates,** D. Sarica, and E. U. Saritas, *Self Calibration for Relaxation- and System-Induced Delays in X-space MPI,* 6th International Workshop on Magnetic Particle Imaging, Lubeck, Germany, March 2016.

TEACHING EXPERIENCE

Graduate Teaching Assistant College Park, MD, USA
University of Maryland
Fall 2019, Signal and System Theory (ENEE 322),
Spring 2019, Information Theory (ENEE 627),
Fall 2018, Convex Optimization (ENEE 662),
Spring 2018, Digital Circuits and Systems Laboratory (ENEE 245).

MENTORING & ADVISING

Yavuz Faruk Bakman (PhD Student, USC)
Emir Ceyani (PhD Student, USC)
Shanshan Han (PhD Student, UC Irvine)
Sizai Hou (PhD Student, HKUST)
Jinhyun So (PhD Student, USC. Now with Samsung Labs)

SELECTED TALKS & PRESENTATIONS

- "LightVeriFL: Lightweight and Verifiable Secure Federated Learning"
  - NeurIPS Workshop on Federated Learning, Dec 2022
- "A Trustworthy Proof-of-Contribution-Based Data Marketplace Design for Federated Learning on Blockchain"
  - Crypto Economics Security Conference, Nov 2022

- "Reinforcement Learning-Based Network Optimization for Hyper Connectivity"
  - Nokia Bell Labs, Aug 2021
- "Gradient Coding with Dynamic Clustering for Straggler Mitigation"
  - IEEE ICC, Jun 2021
- "Timely Communication in Federated Learning"
  - IEEE INFOCOM Workshop on Age of Information, May 2021

SKILLS

- **Programming:** MATLAB, Python, C, LaTeX
- **Framework:** PyTorch, TensorFlow, Message Passing Interface (MPI)
- **Languages:** Turkish (Native), English (Fluent), French (Beginner)

SERVICE

Technical Committee Member

- IEEE INFOCOM - Age of Information (AoI) Workshop 2023

Technical Reviewer (journals):

- IEEE/ACM Transactions on Networking, IEEE Transactions on Communications, IEEE Transactions on Wireless Communications, IEEE Communications Letters, IEEE Access, IEEE Journal on Selected Areas in Communications (JSAC), IEEE JSAC Series on Machine Learning for Communications and Networks, IEEE Internet of Things Journal, IEEE Transactions on Parallel and Distributed Systems, Journal of Parallel and Distributed Computing, Journal of Communications and Networks, Computer Networks and Communications, China Communications, IEEE Transactions on Vehicular Technology

Technical Reviewer (conferences):

- IEEE Global Communications Conference (GLOBECOM), IEEE Information Theory Workshop (ITW), IEEE International Symposium on Information Theory (ISIT), IEEE International Conference on Communications (ICC), IEEE International Conference on Computer Communications (INFOCOM), IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)

AFFILIATIONS

Member of IEEE
Member of IEEE Communications Society

SELECTED COURSEWORK

Machine Learning, Convex Optimization, Digital Communications, Multi-user Communications, Real Analysis I & II, Information Theory, System Theory, Random Processes in Communication and Control, Estimation and Detection Theory, Nonlinear Control Systems, Optimal Control

VOLUNTEER WORK

Mentor at Bilkent University Alumni Student Mentoring Program
Judge for USC ECE 12th Annual Research Festival, Oct 2022
Judge for Stuart-Hobson Middle School, Washington D.C. Science Fair, Feb 2021
Committee Member in Bilkent University IEEE & Women in Engineering (WiE) Student Branches

REFERENCES

- **Salman Avestimehr**
  Dean's Professor
  Department of Electrical and Computer Engineering & Computer Science
  University of Southern California
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- **Sennur Ulukus**
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  Anthony Ephremides Professor in Information Sciences and Systems
  Department of Electrical and Computer Engineering
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- **Deniz Gunduz**
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  Imperial College London
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  Department of Electrical and Computer Engineering
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Last updated: January 2023