

Busra Tegin, Ph.D.

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Google Scholar



Employment History

- 2023 – **Postdoctoral Researcher**, Bilkent University, Ankara, Turkey.
I am working on the ERC Advanced Grant TRANCIDS: Transmission over Channels with Insertions and Deletions, specifically on the capacity approximation of the insertion channel with applications in DNA storage.
- 2020 – 2023 **Research Engineer**, Huawei Turkey Research and Development Center (HTRDC).
I worked on a research project supported by both Huawei Ottawa/Canada and Huawei Turkey through my PhD advisor's collaborative project on future generation semantic communications.
- 2017 – 2023 **Teaching Assistant**, Bilkent University, Ankara, Turkey.
- Signals and Systems (6 semesters)
Explanation: I have been awarded for Exceptional Teaching Assistant Performance four times (2018/19 Spring, 2019/20 Fall, 2020/21 Fall, 2020/21 Spring). I was the head teaching assistant for the course, responsible for quiz/project preparations, grading, laboratory tutorials, recitations, distribution of work among other assistants, and course project/laboratory scheduling.
- Advanced Topics in Machine Learning and Signal Processing (1 semester)
- Digital Communications (3 semesters)
- Advanced Digital Communications (2 semesters)
- Analog Electronics (1 semesters)
- Applied Electromagnetics (1 semester)

Education

- 2020 – 2023 **Ph.D., Bilkent University**, Electrical and Electronics Engineering, GPA: 4.00/4.00
Thesis advisor: *Prof. Tolga M Duman*,
Thesis title: *Federated learning and distributed inference over wireless channels*.
- 2017 – 2020 **M.Sc., Bilkent University**, Electrical and Electronics Engineering, GPA: 4.00/4.00
Thesis advisor: *Prof. Tolga M Duman*,
Thesis title: *Distributed caching and learning over wireless channels*.
- 2012 – 2017 **B.S., Bilkent University**, Electrical and Electronics Engineering, GPA: 3.75/4.00.

Research Interest

- My research interests include wireless communications, federated learning, distributed computing, semantic communications as well as information theory and coding, in particular, for transmission over channels with insertions.

Research Publications

Journal Articles

- 1 F. Bagci, **B. Tegin**, M. Kazemi, and T. M. Duman, "Update estimation and scheduling for over-the-air federated learning with energy harvesting devices," *arXiv preprint arXiv:2501.18298*, 2025.
- 2 **B. Tegin**, M. A. Ali, and T. M. Duman, "Over-the-air multi-sensor inference with neural networks using memristor-based analog computing," *Physical Communication*, vol. 69, p. 102 582, 2025, ISSN: 1874-4907. DOI: <https://doi.org/10.1016/j.phycom.2024.102582>.

- 3 **B. Tegin** and T. M. Duman, "Capacity approximations for insertion channels with small insertion probabilities," *arXiv preprint arXiv:2411.14771*, Submitted to *IEEE Trans. on Information Theory*, 2024.
- 4 **B. Tegin** and T. M. Duman, "Federated learning with over-the-air aggregation over time-varying channels," *IEEE Transactions on Wireless Communications*, vol. 22, no. 8, pp. 5671–5684, Aug. 2023.
- 5 **B. Tegin**, E. E. Hernandez, S. Rini, and T. M. Duman, "Straggler mitigation through unequal error protection for distributed approximate matrix multiplication," *IEEE Journal on Selected Areas in Communications*, vol. 40, no. 2, pp. 468–483, Feb. 2022.
- 6 M. Kalfa, M. Gok, A. Atalik, **B. Tegin**, T. M. Duman, and O. Arikan, "Towards goal-oriented semantic signal processing: Applications and future challenges," *Digital Signal Proc.*, vol. 119, p. 103 134, Dec. 2021.
- 7 **B. Tegin** and T. M. Duman, "Blind federated learning at the wireless edge with low-resolution ADC and DAC," *IEEE Transactions on Wireless Communications*, vol. 20, no. 12, pp. 7786–7798, Dec. 2021.
- 8 **B. Tegin** and T. M. Duman, "Coded caching with user grouping over wireless channels," *IEEE Wireless Communications Letters*, vol. 9, no. 6, pp. 920–923, Jun. 2020.

Conference Proceedings

- 1 **B. Tegin** and T. M. Duman, "Transformation-invariant over-the-air combining for multi-sensor wireless inference," in *IEEE Global Communications Conference (GLOBECOM)*, Kuala Lumpur, Malaysia, Dec. 2023, pp. 2937–2942.
- 2 **B. Tegin** and T. M. Duman, "Blind federated learning with low-cost analog-to-digital converters," in *IEEE Global Communications Conference (GLOBECOM)*, Madrid, Spain, Dec. 2021, pp. 01–06.
- 3 **B. Tegin** and T. M. Duman, "Federated learning over time-varying channels," in *IEEE Global Communications Conference (GLOBECOM)*, Madrid, Spain, Dec. 2021, pp. 01–06.
- 4 **B. Tegin**, E. E. Hernandez, S. Rini, and T. M. Duman, "Straggler mitigation through unequal error protection for distributed matrix multiplication," in *IEEE International Conference on Communications (ICC)*, Montreal, QC, Canada, Jun. 2021, pp. 1–6.

Review for Journals

- 📖 IEEE Transactions on Wireless Communications
- 📖 IEEE Transactions on Communications
- 📖 IEEE Journal on Selected Areas in Communications
- 📖 IEEE Transactions on Cognitive Communications and Networking
- 📖 IEEE Transactions on Green Communications and Networking
- 📖 IEEE Transactions on Vehicular Technology

Invited Talks and Posters

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| 08.07.2024 | <ul style="list-style-type: none"> 📖 Recent Results Session, IEEE International Symposium on Information Theory 2024, Athens, Greece.
Title: Capacity Approximation for the Insertion Channel with Small Insertion Probability. |
| 14.03.2024 | <ul style="list-style-type: none"> 📖 Invited Presentation, Prof. Ayse Melda Yuksel Turgut's Research Group, Middle East Technical University (METU), Ankara, Turkey.
Title: FL over Time Varying Channels and Wireless Inference. |
| 21.02.2024 | <ul style="list-style-type: none"> 📖 Graduation Day - Poster Session, Information Theory and Applications Workshop (ITA), San Diego, USA.
Title: Federated Learning and Distributed Inference over Wireless Channels. |

Cosupervising Activities

- 2023 – 2024  **Muhammad Atif Ali**, Bilkent University (MSc)
Thesis Title: Learning and Inference for Wireless Communications Applications using In-Memory Analog Computing
Main supervisor: Prof. Tolga M Duman
- 2024 – Present  **Furkan Bagci**, Bilkent University (MSc)
Main supervisor: Prof. Tolga M Duman
-  **Omer Faruk Keskin**, Bilkent University (MSc)
Main supervisor: Prof. Tolga M Duman

Skills

- Languages  English (Full Professional Proficiency), Turkish (Native Language)
- Coding  Matlab, Python
- Teaching  Teaching Assistantships on Digital Communications, Advanced Digital Communications, Advanced Topics in Machine Learning and Signal Processing, Signals and Systems, Analog Electronics, Applied Electromagnetics

Awards and Achievements

- 2021  **Student Grant**, 2021 IEEE International Conference on Communications (ICC).
 **Best Oral Presentation Award at Grad. Research Conference**, Bilkent University
- 2019–2020  **Graduate Research Fellowship Program**, Huawei.
- 2019 and 2023  **Best Poster Award at Graduate Research Conference**, Bilkent University.
- 2018–2020  **Exceptional Teaching Assistant Award**, Bilkent University.
- 2013–2017  **High Honor Student**, Bilkent University.
- 2012–2017  **Bachelor Scholarship**, Bilkent University.
- 2012  **Ranked 28th out of 2 million applicants National University Entrance Exam.**

Projects

- 5G Platform  Physical layer design for 5G and beyond communication technologies: Data and control channel coding based on 5G and 3GPP specifications on MATLAB, including LDPC encoding/decoding, Polar encoding/decoding, and their HARQ schemes (Bilkent University and Aselsan).
- Graduation Project  Model, color and license plate recognition system using cameras placed in moving vehicles: Undergraduate Industrial Design Project (*implemented on C++*).

Internships

- Remote Sensing Technologies (RST)  Design of phase-locked dielectric resonator oscillator for X-band transportable polarimetric weather radar (METRAD).
- NanoMagnetic Instruments (NMI)  Analog front-end design of a digital lock-in amplifier including PCB design and testing, and digital design of narrow-band filter followed by phase-sensitive detector and low-pass filter.