Kubilay Ulger

Ph.D. Student - New York University - Electrical and Computer Engineering

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Summary: PhD student in Electrical Engineering at NYU, working on task-oriented multi-terminal compression problems using information theory. Interested in problem-solving, statistics, and probability, with extensive experience in theoretical research, aiming to apply theoretical frameworks to address real-world challenges.

Education

New York University   *Brooklyn, NY*

PH.D. ELECTRICAL ENGINEERING   *Sep 2020 - present*

- Advisor: Prof. Elza Erkip
- GPA: 4.00/4.00
  - **Research Interests**: Task-oriented compression, information theory, statistics and wireless communications.
  - **Notable coursework**: Information theory, Mathematical statistics, Probability and stochastic processes, Detection and estimation theory, Algorithmic machine learning and data science, Deep learning, Data structures and algorithms, Digital signal processing, Image processing, Wireless communications, Statistical signal processing, Real analysis.

Bogazici University   *Istanbul, Turkey*

B.S. ELECTRICAL ENGINEERING AND PHYSICS (DOUBLE MAJOR)   *Sep 2014 - Jun 2020*

- Ranked **6th out of 2 million** in national university admission exam.
- GPA: 3.83/4.00

Skills

Programming	Python, Pytorch, C++, MATLAB, LaTeX
Analytical	**Information theory** (source coding, multi-terminal, task-oriented), **probability theory** and **statistics**, (hypothesis testing, estimation, data analysis), **data compression** (entropy-coding, quantization), **deep learning** (neural compression, classification), **wireless communications** (physical layer, security).

Experience

Communication and Information Theory Group - NYU Wireless   *Brooklyn, NY*

GRADUATE RESEARCH ASSISTANT   *Sep 2020 - present*

- Working on information theoretic task-oriented multi-terminal compression problems.
- Developed robust multi-terminal neural compressors resilient to link failures.
- Proved tight bounds for quantization of a uniform source with side information under entropy constraint.
- Established bounds for a single-shot compression problem with multiple objectives.
- Presented our results in 3 papers.

Bogazici Signal Analysis Research Group   *Istanbul, Turkey*

UNDERGRADUATE RESEARCH ASSISTANT   *Sep 2019 - Jun 2020*

- Advisor: Prof. Ali Emre Pusane
- Studied physical layer based authentication / spoofing detection schemes in wireless networks.
- Worked on a channel state information based physical layer authentication scheme for an autoregressive channel model.
- Published the results in a paper.

Max Planck Institute for Intelligent System   *Stuttgart, Germany*

RESEARCH INTERN   *Jun 2019 - Aug 2019*

- Advisor: Prof. Metin Sitti
- Design and actuation of MRI-driven small-scale robots towards medical applications.
- Experimented on actuation and localization of ferromagnetic micro robots in MRI systems.
- Developed localization algorithm to detect and track artifacts caused by ferromagnetic particles in MRI images.

Selected Projects

Linear time spectral density estimation
- Eigenvalue density estimation algorithm for unitary matrices (extension from symmetric matrices).
- Provably linear time algorithm that closely approximates eigenvalue locations.

Neural image compression for classification task
- Modified well known neural image compressors for classification purpose.
- Trained and tested the network on a large dataset (iNaturalist) containing around 2.7 million images.

Publications

OK Ulger and E Erkip. "One-Shot Wyner-Ziv Compression of a Uniform Source" IEEE International Symposium on Information Theory (ISIT) 2024.

E Tasci, E Ozyilkan, **OK Ulger**, and E Erkip. "Robust Distributed Compression with Learned Heegard–Berger Scheme," IEEE International Symposium on Information Theory Workshops (ISIT-W) 2024.

OK Ulger and E Erkip. "Single-Shot Lossy Compression for Joint Inference and Reconstruction", 59th Annual Allerton Conference on Communication, Control, and Computing (Allerton) 2023.

OK Ulger, MO Demir, OA Topal, GK Kurt, and AE Pusane. "Efficient Physical Layer Spoofing Detection with an Autoregressive Model", 43rd International Conference on Telecommunications and Signal Processing (TSP) 2020.

Honors and Awards

2024	**Student Travel Grant** International Symposium on Information Theory
2022, 2023	**Student Travel Grant** North American School of Information Theory
2020-2022	**School of Engineering (SoE) Fellowship** NYU Tandon School of Engineering
2014-2020	**Outstanding Success Scholarship** Bogazici University
2014-2019	**National University Exam Top 100 Scholarship** Higher Education Institution (Turkish)
2014	**Golden Youth Award** Türkiye İş Bankası (İşBank)

Teaching Experience

Spring 2022	**Information Theory** Course Assistant
Fall 2021	**Introduction to Probability** Course Assistant

Academic Service

Reviewer:	**IEEE Transactions on Information Theory**
Reviewer:	**IEEE Transactions on Wireless Communications**
Reviewer:	**IEEE International Symposium on Information Theory (ISIT)**