ERKAN BAYRAM

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EDUCATION

University of Illinois Urbana-Champaign Aug 2021 - Present
Ph.D. Candidate *in Electrical and Computer Engineering* *Urbana,IL*

Research Statement: Working on the efficient utilization of neural networks under communication and control constraints for edge devices applications e.g. sEMG sensor, audio-noise cancellation.

University of Illinois Urbana-Champaign Aug 2025
M.Sc. in Electrical and Computer Engineering *Urbana,IL*

Bilkent University June 2021
B.Sc. in Electrical and Electronics Engineering (with Tuition Fee Scholarship, CGPA: 3.94/4.00) Ankara,Turkey

PROFESSIONAL EXPERIENCE

Analog Devices Inc. May 2025 - Agu 2025
Machine Learning Intern in Edge AI *Boston, MA*

- Designed a neural network–based signal chain for real-time audio noise cancellation
- Integrated reinforcement learning (Deep-Q-Learning) to speculatively decide signal chain updates via in-loop, control-aware training.
- Achieved **10 percent** power reduction over SoTA models without compromising audio quality
- Reduced end-to-end system latency by **50 percent**, enabling ultra-low-latency performance
- Deployed the solution using Azure ML pipelines for robust, scalable signal processing on edge devices

Analog Devices Inc. May 2024 - Agu 2024
Machine Learning Intern in Core AI Lab *Boston, MA*

- Built an ultra low latency and ultra low power audio noise reduction model.
- Outperformed the SOTA by 5dB in wind noise reduction within **10 ms** latency constraint.
- Reduced **FLOPs x4** with respect to the SOTA to have power efficiency.
- Applied **pruning, quantization** and **knowledge distillation** to reduced model size **x25** w.r.t the SOTA.
- Utilized **AzureML** for model development and Emulated the model on an **NPU** for real-time deployment.

Neurocess, Co. May 2021 - Dec 2023
Machine Learning Engineer *Remote, London, UK*

- Developed probabilistic ML models for performance analysis of athletes on sEMG via **TensorFlow** and **PyTorch**.
- Developed a novel artifact denoising model, achieved **17dB** SNR improvement on **sEMG** sensor data.
- Implemented **Metric-Based Meta-learning** edge device rare gesture classification on the edge device.
- Utilized **AWS** for ML model deployment and cloud computing.

Coordinated Science Lab (UIUC) Aug 2021 - Present
Research Assistant at Decision and Control Group *Urbana, IL*

- Proficient in advanced control theory, optimizing system performance.
- Control guarantee neural networks and closed-loop analysis of neural networks.

Tübitak SAGE Jan 2021 - June 2021
Researcher (at Scientific and Technological Research Council of Turkey) *Ankara, Turkey*

- Used **C++** and **.NET** to create the simulation environment for navigation algorithms for cruise missiles.

ASELSAN June - August 2020
Summer Intern in Systems Engineering *Ankara, Turkey*

- Worked on a nonlinear radar tracking problem and obtained **% 5.2** increase in filtering performance.
- Compared the performance of iterative and non-iterative **Kalman Filters** (e.g. EKF, UKF, PLF) in MATLAB.

TECHNICAL SKILLS

Languages	Python, C++, .NET, MATLAB
Frameworks	PyTorch(lightning), TensorFlow, Qualcomm AIMET
Platforms	AzureML, AWS (EC2 and Sagemaker)

PROJECTS

Ultra Low Latency Audio Noise Cancellation on an Edge Device(patent pending) *2024*

- Developed a novel approach for training of ultra-low latency neural networks.
- Achieved **5.2dB** marginal SNR improvement compare to SOTA models under **10ms** latency.

Detection and Denoising of Motion Artifact in sEMG View the Publication *2023 - 2024*

- Developed a novel metric combining spectral and temporal evaluations for sEMG denoising by Unet.
- Introduced a motion artifact model providing a significant **17dB** SNR improvement for denoising.
- Compared state-of-the-art noise cancellation techniques with VISA (**Variable Input Size Attention**).

Meta Learning for Rare Lower Extremity Motions to Detect Injury View the Publication *2021-2022*

- Applied Metric-Based Meta-learning and Transfer Learning techniques for rare motion classification.
- Aimed to identify rare lower extremity motions using a novel feature extractor.

Decentralized Control Under Communication Constraints *View the Pub. 1 ,Pub.2 ,Pub.3 ,Pub.4 2023*

- Measure age of information on a sensor network for coded updates.
- Develop sufficient conditions for convergence of non-homogenous Markov chains

Motion Classification with Temporal sEMG Signal View the Publication *2021-2022*

- Improved over SOTA motion classification models by 5.3% in accuracy
- Introduced a novel approach, COZDAL net, within **variable attenuation channel-attention**.

UWB Based Multi-Robot Coordination *2020-2021*

- Implemented swarm robotic operations in different formations for indoor applications via TDoA and AoA.
- Responsible for measurement noise filtering for **IMU** and **Tof Module**, the design of nonlinear controllers.

SELECTED PUBLICATIONS

Bayram E., Belabbas M.-A., Başar T., *Geometric Foundations of Tuning without Forgetting in Neural ODEs.* (under review)

Bayram E., Belabbas M.-A., Başar T., *Control Disturbance Rejection in Neural ODEs.* (to be appeared CDC'25)

Bayram E., Liu S., Belabbas M.-A., Başar T., *Control Theoretic Approach to Fine-Tuning and Transfer Learning.* View on ArXiv

Ergeneci M., **Bayram E.**, Carter D., Kosmas P., *A Novel Framework for Motion-Induced Artefact Cancellation in sEMG: Evaluation on EPL and Ninapro Datasets.* IEEE Sensors Journal

Ergeneci M., **Bayram E.**, Carter D., Kosmas P., *Attention-Enhanced Frequency-Split Convolution Block for sEMG Motion Classification: Experiments on Premier League and Ninapro Datasets.* IEEE Sensors Journal.

Ergeneci M, **Bayram E.**. Carter D., Kosmas P., *sEMG Motion Classification Via Few-Shot Learning With Applications To Sports Science.* (prePrint)

Bayram E., Belabbas M.-A., *Constructing Stochastic Matrices for Weighted Averaging in Gossip Networks.* View on ArXiv

Bayram E., Başlopçu M., Belabbas M.-A., Başar T., *Age of Coded Updates in Gossip Networks under Memory and Memoryless Schemes.*View on IEEE

Bayram E., Başlopçu M., Belabbas M.-A., Başar T., *Age of k-out-of-n Systems a Gossip Network.*View on IEEE

Bayram E., Belabbas M.-Ali, Başar T., *Vector-Valued Gossip over w-Holonomic Networks.* (Under review)