

# ERKAN BAYRAM

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## EDUCATION

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

Working on the efficient utilization of NN under communication and control constraints for edge applications.

**Bilkent University** Aug 2016 - June 2021  
*B.S. in Electrical and Electronics Engineering (with Tuition Fee Scholarship, CGPA: 3.94/4.00 )* Ankara, Turkey

## PROFESSIONAL EXPERIENCE

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

- Developed **ultra-low latency** and **low power neural networks** for audio noise cancellation.
- Applied **pruning, quantization** and **knowledge distillation** to reduced model size **x25** w.r.t the SOTA.
- Showed  $\sim 5\text{dB}$  marginal SNR improvement under 10ms latency compared to SOTA.
- Utilized **AzureML** for model development and Emulated the model on an **NPU** for real-time deployment.
- Developed a novel approach for training of ultra-low latency NNs to overcome frequency-power discrepancy.

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

- Developed probabilistic ML models for performance analysis of athletes on sEMG via **TensorFlow** and **PyTorch**.
- Developed a novel artifact denoising model (e.g. attention-Unet), achieved **17dB** SNR improvement on **sEMG**.
- Implemented **Metric-Based Meta-learning** for gesture classification on sEMG sensor data on the edge device.
- Forecasting fatigue level via probabilistic models and generative AI to estimate return-to-play time.
- Utilized **AWS** for ML model deployment and cloud computing.

**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 System 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.

**Tübitak Sage** August - September 2019  
*Summer Intern in Simulation Engineering* Ankara, Turkey

- Simulated the physical characteristics sound behavior for a flight simulator in **MATLAB**.

## TECHNICAL SKILLS

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

## PROJECTS

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**Ultra Low Latency Audio Noise Cancellation on an Edge Device** (Patent Pending) 2024

- Compared frequency & time based approaches in low-latency denoising for size and power consumption.
- Evaluted the model performance by using ITU-T Rec. P.808 standards for audio signal processing.
- Conducted stability analysis on feedback-loop of neural network based filters for environmental changes.

**Tuning without Forgetting for Continual Learning** *View the Publication* 2024 -

- Developed an iterative algorithm to tune the DL system parameters when the training set expands whereby points already memorized remain so.

- Proved provable guarantees on the model performance.

**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* 2023-

- Measure age of information on a sensor network for coded updates under memory schemes.
- Provided the strict upper and lower bound on AoI for  $k$ -out-of- $n$  systems.
- 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 size channel-attention**.

**UWB Based Multi-Robot Coordination** *View project video* 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.

## TEACHING EXPERIENCE

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

**Teaching Assistant** ECE555 Control of Stochastic Systems *Fall 2024*  
MATH595/ECE553 Optimum Control Systems *Spring 2023*

## PUBLICATIONS AND PREPRINTS

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**Bayram E.**, Baştopçu M., Belabbas M.-A., Başar T., *Age of Coded Updates on Gossip Network Under Memory and Memoryless Scheme.*

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

**Bayram E.**, Baştopçu M., Belabbas M.-A., Başar T., *Age of  $k$ -out-of- $n$  Systems a Gossip Network.*

**Bayram E.**, Belabbas M.-A., Başar T., *Vector-Valued Gossip over  $w$ -Holonomic Networks.*

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

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

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

Ergeneçi M., **Bayram E.**, Carter D. *The Cooperation of Isometric Force Test and EMG for Hamstring Injury Prevention.*

## HONORS & ACADEMIC ACHIEVEMENTS

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- Academic Excellence Award, Bilkent University EEE Department. 2021
- Social Awareness and Activity Award, Bilkent University EEE Department. 2021
- Recipient of the Undergraduate Industrial Project Grant, 2209B Tübitak Grant for an R&D project. 2021
- National Merit Scholarships - Stipend for successful precollege students in Turkey. 2009-2016
- Ranked **252nd** among 2 million students in the National University Placement Exam (YGS-LYS) 2016