CEM OKAN YALDIZ

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EDUCATION

Georgia Institute of Technology • Atlanta/GA   August 2021
PhD in Robotics • *Electrical and Computer Engineering* • CGPA: 4.0/4.0 • • Expected Fall 2025
Master of Science • *Computer Science* • *Computational Perception and Robotics* • Expected Fall 2024
Advisor: Omer Inan
Interest: Applied Machine/Deep Learning, Time Series, Data-Driven Decision-Making, Sensors

Bilkent University • Ankara   August 2016 – June 2021
Bachelor of Science • *Electrical and Electronics Engineering* • *CGPA: 3.94/4.0*

EXPERIENCE

Graduate Research Assistant – Inan Research Lab   August 2021 – Present
Georgia Institute of Technology, Atlanta

- **Exertional Heat Stroke Prediction Through Deep Temporal Learning and Anomaly Detection**

    - Developed an LSTM-based autoencoder model to extract latent space from physiological strain-stress trajectories and combined it with isolation forests for early prediction of exertional heat stroke in soldiers during rucksack marches using wearables' data.

    - Utilized heart rate data to quantify physiological strain and accelerometry measurements to estimate metabolic energy, representing physiological stress.

    - Analyzed approximately 3 hours of unstructured wearable data from 478 soldiers in a real military environment.

    - Achieved prediction capability of **52± 18 minutes in advance** with 1.0 sensitivity and 0.99 AUC. Published in IEEE JBHI (2023).

- **Reducing Post-Deployment Distribution Shift in Magnetic Localization for Tongue Tracking Using 9DOF IMUs**

    - Developed a reliable calibration approach for magnetic localization, mapping magnetic field measurements to 3D coordinate space to achieve *sub-millimeter* accuracy for IMU-based tongue tracking.

    - Extracted and applied a linear transformation between post-deployment measurement data space and pre-deployment training data space, improving model accuracy.

    - Significantly reduced **(up to 7x)** the degree of magnetic localization model's post-deployment distribution shift. Published in IEEE Sensors Journal (2023).

- **Time Series Forecasting for Cardiac Event Timing Prediction**

    - Developed time-invariant/time-varying and unimodal/multimodal Kalman filter-based models for real-time forecasting of cardiac event timings (e.g., R-peak, aortic opening, and closing).

    - Utilized seismocardiogram (SCG) and electrocardiogram (ECG) data for prediction.

    - Evaluated and compared various models (Gaussian processes, ARIMA, Kalman filter-based ARMA, CNN, LSTM, ConvLSTM) under various noise conditions and scenarios to assess robustness, computational efficiency, and accuracy.

    - Time-varying multimodal Kalman filter models achieved prediction errors of **1.73 ms** for R-peak, **2.64 ms** for aortic opening, and **9.44 ms** for aortic closing. Under review at IEEE JBHI.

- **Automated SCG Annotation**

    - Developing a human-in-the-loop reinforcement learning-based system to automatically detect and annotate SCG signals (e.g., aortic opening and closing points), addressing the challenges of inter- and intra-person variability in manual annotation.

    - Exploring an LLM-based automatic annotator to extract text representations from SCG waveforms and perform signal annotation based on the generated text.

- **Automated SCG Signal Quality Indexing**

    - Investigating time series representation learning techniques (e.g., self-supervised learning, contrastive learning) to assess and quantify the quality of SCG signals.

Undergraduate Research Assistant – Systems Lab   February 2019 – August 2021
Bilkent University, Ankara

- **Game Theoretical Behavioral Human Driver Modeling**
  - Developed continuous behavioral human driver models by refining the level-k reasoning concept from game theory.
  - Employed reinforcement learning (e.g., DQN) to derive discrete level-k human driver policies, and extended them to continuous level-k policies using Gaussian processes.
  - Achieved **73% success** in modeling human driver behaviors, approximately **40% more accurate** than discrete-level models.

PUBLICATIONS

- **C.O. Yaldiz** et al., "Real-Time Autoregressive Forecast of Cardiac Features for Psychophysiological Applications", *under review*, 2024.
- **C.O. Yaldiz** et al., "Early prediction of impending exertional heat stroke with wearable multimodal sensing and anomaly detection", *IEEE Journal of Biomedical and Health Informatics*, 2023.
- **C.O. Yaldiz** et al., "Improving Reliability of Magnetic Localization Using Input Space Transformation", *IEEE Sensors Journal*, 2023.
- **C.O. Yaldiz**, Y. Yildiz, "Driver Modeling Using a Continuous Policy Space: Theory and Traffic Data Validation", *IEEE Transactions on Intelligent Vehicles*, 2023, in press.
- D.J. Lin, A. Satish, K.L. Richardson, S. An, **C.O. Yaldiz**, M. Buller, K. Driver, E. Atkinson, T. Mesite, C.King, O.T. Inan, A. Medda, "Predicting Soldier Performance on Structured Military Training Marches with Wearable Accelerometer and Physiological Data", *IEEE Sensors Journal*, 2023.
- **C.O. Yaldiz**, Y. Yildiz, "Driver Modeling Using Continuous Reasoning Levels: A Game Theoretical Approach," *2022 IEEE 61st Conference on Decision and Control (CDC)*, Cancun, Mexico, 2022, pp. 5068-5073, doi: 10.1109/CDC51059.2022.9992839.

SERVICE

- **Reviewer**: IEEE Journal of Biomedical and Health Informatics - 2024
- **Reviewer**: IEEE Conference on Decision and Control - 2024

SKILLS

- **Technical**: Machine Learning, Deep Learning, Data Science, Time Series Analysis/Forecasting, Anomaly Detection, Computer Vision, Reinforcement Learning, Natural Language Processing, Biosensors, Physiological Sensing and Computing, Motion Tracking, Human Activity Recognition, Multi-Modal Fusion, State Space Modeling, Signal Processing
- **Programming**: Python, MATLAB, C++, Pytorch, Pytorch Lightning, Hugging Face, Wandb
- **Tools**: Microsoft Office, Inkscape, LaTeX, Git
- **Languages**: Turkish (Native), English (Fluent)

HONORS & AWARDS

- **Georgia Institute of Technology ECE Fellowship (2022)**: Received a stipend for the first year of study.
- **Bilkent University EEE Graduation Awards (2021)**: Granted for academic excellence.
- **TUBITAK Star Undergraduate Research Award (2021)**: Received monthly stipend during a research project on the subject of behavioral human driver modeling.
- **Turkish Education Foundation (TEV) Outstanding Success Scholarship (2017-2021)**: Granted a scholarship for leadership skills during undergraduate education.
- **Bilkent University Comprehensive Scholarship (2016-2021)**: Granted a full tuition waiver and stipend for achieving a high rank in the nationwide university entrance exam during the B.Sc. program.