Cem Okan Yaldiz

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Education

Georgia Institute of Technology • Atlanta/GA — August 2021 - (Expected) May 2026
Doctor of Philosophy • *Robotics* • *CGPA: 4.0/4.0*
Advisor: Prof. Omer Inan
Research Areas: Applied Machine/Deep Learning, Time Series, Biosensors, Signal Processing, Multimodal Fusion

Georgia Institute of Technology • Atlanta/GA — August 2021 – December 2024
Master of Science • *Computer Science* • *CGPA: 4.0/4.0*

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

Experience

Summer Associate - Quantitative Strategist – Credit Risk — June 2025 - August 2025
Goldman Sachs, Dallas

- Designed and validated a proof-of-concept mathematical model to evaluate credit risk for structured finance products backed by commercial real estate.
- Explored the use of various time series models for scenario generation and conducted quantitative risk analysis.

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

- Conducting advanced research at the intersection of physiological computing, wearables and machine learning, specializing in *time series representation learning*, *multimodal fusion*, and *self-supervised learning* for health-centric, non-invasive monitoring systems.
- Developing and evaluating state-of-the-art algorithms for biosensors to enhance diagnostic capabilities and enable real-time deployment on wearable devices in everyday settings.
- Collecting and processing human-subject data, transforming unstructured and noisy physiological signals into analysis-ready formats, and collaborating with clinical partners to guide algorithm development and validation.

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

- Conducted research on behavioral human driver models to simulate traffic situations where autonomous and human agents coexist.
- Applied *reinforcement learning* (e.g., DQN), *probabilistic modeling* (e.g., Gaussian processes), and game-theoretic approaches (e.g., level-k behavioral models).

Machine Learning Engineer Intern — June 2019 – July 2019
Argedor Information Technologies, Ankara

- Developed an automated FOREX trading bot leveraging deep reinforcement learning (e.g., DQN) to translate financial signal patterns into buy/sell actions.

Journal Articles

J1. **C.O. Yaldiz**, M. Buller, K. Richardson, S. An, D.J. Lin, A. Satish, K. Driver, E. Atkinson, T. Mesite, C. King, M. Bursey, M. Galer, M. Millard-Stafford, M.N. Sawka, A. Medda, O.T. Inan. "Early prediction of impending exertional heat stroke with wearable multimodal sensing and anomaly detection".
IEEE Journal of Biomedical and Health Informatics (2023)

J2. **C.O. Yaldiz**, N. Sebkhi, A. Bhavsar, J. Wang and O.T. Inan. "Improving Reliability of Magnetic Localization Using Input Space Transformation".
IEEE Sensors Journal (2023)

J3. **C.O. Yaldiz** and Y. Yildiz. "Driver Modeling Using a Continuous Policy Space: Theory and Traffic Data Validation".
IEEE Transactions on Intelligent Vehicles (2023)

J4. **C.O. Yaldiz**, D.J. Lin, A.H. Gazi, G. Cestero, C. Chen, B.K. Bracken, A. Winder, S. Lynn, R. Sameni and O.T. Inan. "Real-Time Autoregressive Forecast of Cardiac Features for Psychophysiological Applications".
IEEE Journal of Biomedical and Health Informatics (2025)

J5. A.R. Emirdagi, **C.O. Yaldiz**, O.S. Kilic, M. Cho and O.T. Inan. "EffSCG: An Efficient Framework for Real-Time Seismocardiogram Denoising on Resource-Constrained Edge Devices".
Manuscript under preparation (2025)

J6. D. Tangolar, Z. Bouzid, **C.O. Yaldiz**, O.S. Kilic, J.P. Kimball, P. Rezaei, S.M. Shahrbabak, Y. Zhou, J. Vandenberge, J. Hahn and O.T. Inan. "Establishing Generalizability of Wearable-Enabled Blood Volume Decompensation Status Estimation Algorithms Using Transfer Learning".
Under review (2025)

J7. M. Cho, **C.O. Yaldiz**, A. Nawar, V. Abbaraju, R. Emadi, O.S. Kilic, Z. Bouzid, F. Rahman, C. Chen, J. Cook, A.R. Emirdagi, R. Saigal, M. Paulus and O.T. Inan. "Seismocardiography Pig Hypovolemia Dataset for Signal Quality Indexing and Validated Cardiac Timings".
Under review (2025)

J8. S.Karimi, M. Nateghi, G. Cestero, L. Chitadze, Y. Yang, J. Vyas, C. Chen, Z. Bouzid, **C. O. Yaldiz**, N. Harris, R. Bull, B.T. Stone, S.K. Lynn, B.K. Bracken, O.T. Inan, D. Bremner and Reza Sameni. "Prescreening Depression Using Wearable Electrocardiogram and Photoplethysmogram Data from a Psycholinguistic Experiment".
Physiological Measurement (2025)

J9. O.S. Kilic, A. Nawar, **C.O. Yaldiz**, F. Rahman, C. Chuoqi, A. Shah and O.T. Inan. "Heart rate informed detection of cardiac events using the Kalman filter".
Computers in Biology and Medicine (2025)

J10. D.J. Lin, A. Satish, K. Richardson, S. An, **C.O. Yaldiz**, M. Buller, K. Driver, E. Atkinson, T. Mesite, C. King, O.T. Inan and A. Medda. "Predicting Soldier Performance on Structured Military Training Marches with Wearable Accelerometer and Physiological Data".
IEEE Sensors Journal (2023)

Conference Papers

C1. **C.O. Yaldiz**, O.S. Kilic and O.T. Inan. "Short-Term Physiological Forecasting with Adaptive Covariance Matrix Estimation".
IEEE-EMBS Body Sensor Networks, Los Angeles, USA (2025)

C2. D. Tangolar, O.S. Kilic, S. Liu, **C.O. Yaldiz**, J.P. Kimball and O.T. Inan. "Enabling Intelligent Resuscitation: Non-Invasive Cardiac Output Monitoring via Physiological Sensing and Machine Learning".
IEEE-EMBS Body Sensor Networks, Los Angeles, USA (2025) **(Best Paper Award)**

C3. **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)

Selected Projects

- **Physiological Foundation Models (2025)**
  - Developing a multi-modal physiological latent space extractor with self-supervised learning using approaches such as vision transformer–based masked autoencoding and cross-modal transformers.
  - Using electroencephalogram (EEG) and wearable-based cardiac signals such as electrocardiogram (ECG), seismocardiogram (SCG) and photoplethysmogram (PPG).
- **Efficient Physiological Signal Denoising with Diffusion Models (2025)**
  - Improving the memory footprint and computational efficiency of an existing seismocardiogram denoising diffusion model through techniques such as pruning, quantization, and model distillation.
- **Representation Learning From Unstructured Real World Time Series Data (2022)**
  - Developed an LSTM-based autoencoder model to extract latent space from physiological strain-stress trajectories and combined it with isolation forests to predict exertional heat stroke in soldiers during rucksack marches.
  - Analyzed approximately 3 hours of unstructured wearable data per soldier from 478 soldiers in real military environments.
  - Achieved prediction capability of **52± 18 minutes in advance** with 1.0 sensitivity and 0.99 AUC.
- **Time Series Forecasting for Cardiac Event Timing Prediction (2024)**
  - 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).
  - Evaluated and compared various models (Gaussian processes, ARIMA, Kalman filter-based ARMA, CNN, LSTM, ConvLSTM) under various 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.

- **Multi-modal Data Collection for Preconscious Response Analysis (2024)**
  - Collected EEG, ECG, PPG, SCG, EDA, and eye-tracking data from 30 participants at Georgia Institute of Technology using an experiment protocol with psycholinguistic stimuli.
  - Integrated eye-tracking, EEG, and Biopac systems to enable seamless synchronized data acquisition.
- **Reducing Post-Deployment Distribution Shift (2022)**
  - Developed a reliable calibration approach for magnetic localization, mapping measurements from 9DoF IMU to 3D coordinate space to achieve *sub-millimeter* accuracy for IMU-based tongue tracking.
  - Extracted and applied a transformation between post-deployment and pre-deployment measurement data spaces, and significantly reduced **(up to 7x)** the degree of post-deployment distribution shift.
- **Game Theoretical Behavioral Human Driver Modeling (2020)**
  - Developed continuous behavioral human driver models by refining level-k game theoretical model.
  - 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.
- **Car Body Damage Detection Using 3D Point Clouds (2021)**
  - Designed a system to detect dents and bumps on vehicle bodies by quantifying discrepancies between RGB-D images (point clouds) captured before and after damage.
  - Utilized Intel RGB-D cameras for data acquisition and leveraged OpenCV, Open3D, and LibRealSense for processing and analysis.
- **6D Pose Estimation (2023)**
  - Developed a deep learning model for 6D pose estimation on point cloud datasets, integrating a novel multi-granular feature extraction mechanism to improve global pose prediction accuracy.
- **Image Captioning (2019)**
  - Developed an image captioning model by fusing state-of-the-art image classification architectures of the time (e.g., ResNet, VGG-Net, Inception-Net) with pretrained word embeddings (e.g., GloVe), exploring foundational approaches before the emergence of large language models (LLMs).

Skills

- **Technical**: Machine Learning, Deep Learning, Data Science, Time Series, Anomaly Detection, Computer Vision, Reinforcement Learning, Natural Language Processing, Generative Modeling, Biosensors, Multi-Modal Fusion, State Space Modeling, Signal Processing
- **Programming**: Python, MATLAB, C++, Pytorch, Pytorch Lightning, Wandb
- **Tools**: Microsoft Office, Inkscape, LaTeX, Git
- **Languages**: Turkish (Native), English (Advanced)

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.