Oguzhan Karaahmetoglu
Resume

Department of Electrical and Electronics Engineering
Bilkent University, Ankara 06800, Turkey

e-mail: koguzhan@ee.bilkent.edu.tr

Research Interests

machine learning, deep learning, federated machine learning, distributed optimization, reinforcement learning, spatio-temporal prediction, online learning, time-series modeling, point process modeling, optimization, big data. (See https://oguzhanka.github.io/oguzhanka/ for details)

Education

Carnegie Mellon University, Pittsburgh, PA

Ph.D. in Electrical and Computer Engineering, August 2021

Accepted with CIT Dean's **Fellowship**.

Bilkent University, Ankara, Turkey

M.S. in Electrical and Electronics Engineering, August 2019 – Present

Expected Graduation Date: June 2021
Supervisor: Suleyman Serdar Kozat.
GPA: 3.83/4.00

Middle East Technical University, Ankara, Turkey

B.S. in Electrical and Electronics Engineering, Aug 2015 – Jan. 2019

GPA: 3.80/4.00
Ranked 10th among 268.

Awards and Honors

- **7 journal papers** submitted to highly respected IEEE Transactions.
- **3 conference papers** in high impact IEEE conferences.
- **2 oral presentations**.
- Graduated with **High Honors** from Middle East Technical University. Ranked **10th among 268** students.
- Ranked **23rd** among 2M high school graduates in National University Entrance Examinations.

Journal Papers

1. **O. Karaahmetoglu**, S. S. Kozat "Spatio-temporal Sequence Prediction with Point Processes and Self-organizing Decision Trees" (Submitted to **IEEE Transactions on Neural Networks and Learning Systems**, https://arxiv.org/abs/2006.14426), June 2020.
2. F. Ilhan, **O. Karaahmetoglu**, I. Balaban, S. S. Kozat "Markovian RNN: An Adaptive Time Series Prediction Network with HMM-based Switching for Nonstationary Environments" (Submitted to **IEEE Transactions on Neural Networks and Learning Systems**, https://arxiv.org/abs/2006.10119), June 2020.
3. **O. Karaahmetoglu**, F. Ilhan, I. Balaban, S. S. Kozat "Unsupervised Online Anomaly Detection On Irregularly Sampled Or Missing Valued Time-Series Data Using LSTM Networks" (Submitted to **IEEE Transactions on Neural Networks and Learning Systems**, https://arxiv.org/abs/2005.12005), June 2020.
4. **O. Karaahmetoglu**, S. F. Tekin, S. S. Kozat "Distributed Online Multi-Target Tracking With Switching LSTM Networks" (Submitted to **IEEE Transactions on Neural Networks and Learning Systems**, July 2020.
5. **O. Karaahmetoglu**, S. S. Kozat "Nonstationary Time-Series Data Modeling With Switching Point Processes" (Submitted to **IEEE Transactions on Signal Processing**), July 2020.
6. **O. Karaahmetoglu**, S. F. Tekin and S. S. Kozat, "Image Captioning With Location Embeddings and Self Attention Mechanism", (draft available with the permission of supervisor), July 2020.
7. H. Gokcesu, F. Ilhan, **O. Karaahmetoglu** and S. S. Kozat, "Minimax Optimal Online Stochastic Learning for Sequences of Convex Functions under Sub-Gradient Observation Failures", **IEEE Transactions on Signal Processing**, 2020. (Under review) (draft available with permission of supervisor)

Conference Papers

1. **O. Karaahmetoglu**, and S.S. Kozat, "Unsupervised Time Series Classification With Prototype Learning", (draft available with the permission of the supervisor), July 2020.
2. **O. Karaahmetoglu**, Fatih Irım and S. F. Tekin, "Interpretable Classification And Regression For Time Series Data," **IEEE SIU**, (17 January 2020).
3. **O. Karaahmetoglu**, and Bilgin Aksoy, "Time Series Prediction With Hierarchical Recurrent Models", **IEEE SIU**, 17 January 2020.

Patents

1. **O. Karaahmetoglu**, F. Ilhan, S. F. Tekin, I. Balaban and S. S. Kozat, "Spatio-temporal Sparse Event Prediction with Hierarchical Expert Models", Turkish Patent, 2020.
2. **O. Karaahmetoglu**, F. Ilhan, S. F. Tekin, I. Balaban and S. S. Kozat, "Energy Consumption Forecasting with Time Series Clustering", Turkish Patent, 2020.
3. **O. Karaahmetoglu**, F. Ilhan, S. F. Tekin, I. Balaban and S. S. Kozat, "Crime Analysis Tool for Spatio-temporal and Contextual Link Interpretability", Turkish Patent, 2020.

Presentations

1. "Online Anomaly Detection Under Markov Statistics with Controllable Type-I Error" Bilkent University, 2019.
2. "On Confidence Intervals Of Deep Neural Networks," Bilkent University, Ankara, 2019.

Industrial Experience

Data Scientist
Databoss Analytics, Ankara, Turkey — Sep 2018 – Now
- Used Machine Learning and Statistical models to design spatio-temporal forecasting models for various real life applications.
- Developed software with the state of the art versioning and continuous integration tools.
- Implemented mathematical models using the state of the art Python APIs such as PyTorch, TensorFlow.
- Designed an automated feature extraction and analysis tool, which significantly improved the overall performance.
- Developed a hierarchical prediction ensemble structure that handles prediction merging at different spatial and temporal resolutions and from different sources.
- Participated in a research team to collaboratively share ideas and knowledge about various research topics and development tools.
- Developed purpose-built, distributable and scalable services such as prediction systems and exploratory data analysis tools.
- Agile software development.

Intern Engineer
Databoss Analytics, Ankara, Turkey *(Supervisor: S. Serdar Kozat)* — Jun 2018 – Sep 2018
- Designed and implemented an online anomaly detection system.
- Optimized the implemented algorithm and managed the adaptation to the real world settings.

Intern Engineer
Darkblue Telecommunications, Ankara, Turkey — Jun 2017 – Sep 2017
- Designed a face recognition system based on deep neural architectures.
- Designed a local server to process customer requests.
- Designed an Android Mobile App to connect and send face images to the server.
- Worked in a software development team and used versioning and deployment tools such as Git and Docker.

Academic Experience

Research Assistant
Bilkent University, Ankara, Turkey — Sep 2019 – Present
- Spatiotemporal sequence prediction
- Point Process Modeling in spatio-temporal domains
- Non-stationary time series prediction
- Non-stationary and online filtering
- Applied prediction and filtering on event and crime data

- Target tracking with event prediction and dynamic behavior modelling applications

Grader
Bilkent University, Ankara, Turkey Sep 2019 – Present
- EEE 485 (Statistical Learning and Data Analytics) in Spring 2020
- EEE 391 (Basics of Signals and Systems) in Fall 2019

Undergraduate Researcher
Bilkent University, Ankara, Turkey Sept 2017 – Aug 2019
- Online anomaly detection on non-stationary time series data

Skills

Programming:

- **Python** Professional work experience in a large-scale ML framework,
- **C, C++, C#** Experience with socket programming and parallel programming,
- **Matlab, R** Experience with various statistical libraries, signal processing tools and neural systems toolboxes,
- **Verilog HDL, ARM Assembly** Learned during undergraduate years as a part of the core Computer Engineering field courses,
- **JavaScript, Prolog**

Tools:

- **Pytorch** Main tool used in the industrial experience,
- **TensorFlow** Experience with deep learning applications,
- **GDAL and OpenWeather** Geospatial and weather feature extraction for ML applications,
- **PySpark and Flask**,
- **MySQL and PostgreSQL**,
- **Docker and Git**

Projects

Spatio-temporal Crime Prediction with Adaptive Spatial Partitioning: Implementation of a crime prediction model based on joint optimization of deep learning algorithms and decision tree spatial partitioning mechanism. The algorithm is capable of modeling spatial behaviors in different regions with different models. Surpasses the standard approaches applied on the same problem.

Omen: Probabilistic time-series prediction and optimization framework. Model parameters and state vectors are jointly optimized via filtering approaches. Also incorporates the uncertainty from the hyperparameter selection via Bayesian Hyperparameter Optimization. The framework is capable of jointly updating statistical time series models with deep feature extraction models.

Capstone Project (Middle East Technical University): Design and implementation of a omni-directional tele-operated robot. The robot is controlled by a player to play hockey in a hexagonal playing field. Awarded by the faculty members.

FastCap: Design and implementation of a lightweight image captioning model. Both training and captioning of the designed model are significantly faster than the standard approaches. Model is based on multiple pretrained networks merged together.

SpectrogramUI: Design and implementation of a spectrogram application written in Matlab. The project offers a user interface that allows user to record or load an audio signal and draw spectrograms with various different configurations.

Multi-Cycle Microprocessor Design: Design and implementation of a multi-cycle microprocessor. Written in Verilog HDL. This project offers a minimalist multi-cycle microprocessor that is able to perform simple load/store instructions, arithmetic instructions and i/o instructions.

Digital Signal Oscilloscope: Design and implementation of a digital signal oscilloscope. Written in Verilog HDL. This project offers a digital signal oscilloscope that has almost the same functionality as a standard DSO. Implemented the design on an Altera Cyclone V FPGA board. Projected the oscilloscope screen on a VGA monitor.

FMCW Distance Sensor: Designed a distance measurement sensor using frequency modulated continuous sound waves. The design is tested and implemented on a circuit board as a module.

Languages: Turkish (Native), English (Fluent), Russian (Beginner)

Hobbies

Baglama Player:
- I am a professional Baglama (traditional instrument) player. I have attended to a 5-year course and awarded with a certificate.

Reading:
- I like reading poems in my spare time. My favorite poet is Edgar Allan Poe.
- I also like to read novels, especially if they are related to historical events. However, I am also a good fan of fantasy novels. I personally admire the work of J. R. R. Tolkien.