Arda Fazla

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Education

Doctor of Philosophy - **Electrical and Computer Engineering (4.00/4.00)**   2024-Present
Purdue University - The Elmore Family School of Electrical and Computer Engineering   Indiana, US
Advisor: Prof. Abolfazl Hashemi

Master of Science - **Electrical and Electronics Engineering (3.91/4.00)**   2021-2024
Bilkent University - Faculty of Engineering   Ankara, Turkey
Advisor: Prof. Süleyman Serdar Kozat

Bachelor of Science - **Electrical and Electronics Engineering (3.61/4.00)**   2017-2021
Middle East Technical University - Faculty of Engineering   Ankara, Turkey

Research Background & Interests

Research Interests
- Optimization (Constrained and Unconstrained Optimization Theory, Multi-Objective Optimization)
- Trustworthy Machine Learning (Robustness, Fairness, Privacy, and Memorization)
- Distributed and Federated Learning

Previous Background
- Time Series Analysis and Forecasting (Univariate and Multivariate Forecasting, State Space Models, Anomaly Detection)
- Online Learning (Transfer Learning, Online Convex Optimization)

Publications 🎓

Journal Papers

4. S. F. Tekin, **A. Fazla**, S. S. Kozat, *"Numerical Weather Forecasting using Convolutional-LSTM with Attention and Context Matcher Mechanisms"*, IEEE Transactions on Geoscience and Remote Sensing, 2024.
   Available: https://arxiv.org/abs/2102.00696
   Code: https://github.com/sftekin/spatio-temporal-weather-forecasting

3. **A. Fazla**, M. E. Aydin, S. S. Kozat, *"Time-Aware and Context-Sensitive Ensemble Learning for Sequential Data"*, IEEE Transactions on Artificial Intelligence, 2023.
   Available: https://doi.org/10.1109/TAI.2023.3319308
   Code: https://github.com/ardafazla/context-time-aware-ensemble

2. M. E. Aydin, **A. Fazla**, S. S. Kozat, *"Hybrid State Space-based Learning for Sequential Data Prediction with Joint Optimization"*, arXiv preprint arXiv:2309.10553, 2023.
   Available: https://arxiv.org/abs/2309.10553
   Code: https://github.com/mustafaaydn/lstm-sx

1. **A. Fazla**, M. E. Aydin, S. S. Kozat, *"Joint Optimization of Linear and Nonlinear Models for Sequential Regression"*, Digital Signal Processing, Elsevier, 2022.
   Available: https://doi.org/10.1016/j.dsp.2022.103802
   Code: https://github.com/ardafazla/jointoptimization

Conference Papers

1. K. G. Ince, A. Köksal, **A. Fazla**, A. A. Alatan, *"Semi-Automatic Annotation for Object Detection"*, Proceedings of the IEEE/CVF International Conference on Computer Vision, 1233-1239, 2021.
   Available: https://doi.org/10.1109/ICCVW54120.2021.00143

Academic Awards

Elmore Family School of Electrical and Computer Engineering, Purdue University 2024-2029
- Awarded the highly competitive and prestigious Elmore Fellowship Award for my graduate studies, given only to the most outstanding applicants.

Turk Telekom & Information and Communication Technologies Authority 2023-2024
- Awarded 5G and Beyond Joint Graduate Support Programme, a merit-based fellowship of monthly stipend during M.Sc.

Scientific and Technological Research Council of Turkey 2021-2023
- Awarded Directorate of Science Fellowships and Grant Programme, a merit-based monthly stipend and accommodation support during M.Sc.

- Received the **373rd** rank among 2M high school graduates in the University Entrance Examination.

- Received the **11th** rank among 0.2M university graduates in ALES (National GRE).

Academic Duties

Reviewer Duties
Conferences: ICLR25, AAAI25
Journals: IEEE TAI25, IEEE IOT24

Teaching Assistantship 2021-2024
- *Electrical and Electronics Engineering, Bilkent University*
- EEE321 Signals and Systems
- EEE202 Circuit Theory
- MATH255 Probability and Statistics

Relevant Coursework

- Optimization for Deep Learning (4.0/4.0)
- Statistical Learning and Data Analytics (4.0/4.0)
- Random Processes (4.0/4.0)
- Deep Generative Networks (4.0/4.0)
- Data Structures (4.0/4.0)
- Digital Signal Processing (4.0/4.0)

Research Projects

Hourly Wind Energy Prediction 2024
- *Bilkent University*
- Predicted the hourly energy data of multiple wind turbines in Turkey and Europe, showing chaotic and nonstationary behavior in multiple regions.
- Developed a large-scale ML framework consisting of various adaptive feature construction and selection methods with models such as deep-learning (NN, ConvLSTM), machine learning (LightGBM, RandomForest), statistical (SARIMAX) models and state-of-the-art ensembling techniques. Increased the short-term forecasting accuracy over state-of-the-art models by an average of **21%** and long-term forecasting accuracy by an average of **8%**.

Natural Gas Demand Prediction 2023
- *Bilkent University*
- Predicted the daily data of international natural gas demand in Turkey, consisting of nonstationary multivariate time series from multiple sources.
- Developed a large-scale ML framework specifically tailored towards a certain customer profile, where the predictions are obtained for the given data based on key indicators that are automatically extracted from the data itself and/or the user-given side information data. The constructed framework was deployed to various natural gas production companies.

Small-Target Detection & Tracking 2021
- *Middle East Technical University*
- Developed an application in Python environment for real-time small target tracking by leveraging temporal data derived from the output of object detectors, with a superior performance over the widely-known YOLOv3 algorithm by **6%**.
- Constructed a novel multi-hypothesis tracking algorithm with an annotation tool for the semi-automatic correction of mislabeled UAV data. The deployed product decreased the total mislabeled data in various datasets by an average of **13%**.

Course Projects

Multi-modal Photo Upsampling via Latent Space Exploration of StyleGAN 2023
- *Bilkent University*, Deep Generative Networks Course Project
- Adapted the PULSE algorithm for multi-modal image super-resolution by incorporating a variational autoencoder to enhance network diversity.

Image Captioning based on LSTM with Transfer Learning 2022
- *Bilkent University*, Neural Network Course Project
- Constructed a framework, which generates meaningful sentences describing a given image (Image Captioning).
- Employed state-of-the-art models such as ResNet, VGG-16 and InceptionV3, where LSTM is used as the main learning model for transfer learning.
- Used BERT transformers for word embedding.

Software Skills

- **Python:** Professional research and industrial experience based on machine learning. High knowledge and experience in libraries such as *PyTorch*, *Tensorflow*, *Pandas*, *Numpy* and *Scikit-Learn*. I have experience with Docker and Git, via industrial projects.
- **MATLAB:** Professional research experience in signal processing and computer vision. Used for projects during my undergraduate courses, undergraduate research, and internships.
- **R:** Intermediate level experience, employed during research based on time-series forecasting using statistical models.
- **C/C++:** Intermediate experience in Arduino and various undergraduate projects.

Languages

Turkish: Native
English: Conversationally Fluent [TOEFL IBT 108/120 (October 19, 2022)]