Fatih Ilhan
Resume

School of Computer Science, College of Computing
Georgia Institute of Technology, Atlanta, GA, USA

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Research Interests

- AI-Powered Big Data Systems
- Computation-Efficient Deep Learning Systems
- Distributed / Federated Learning
- Anomaly Detection, Time Series Prediction, Spatio-temporal Event Modeling

Education

Georgia Institute of Technology, Atlanta, GA, USA — August 2021 – Present

Ph.D. in Computer Science

- Conducting research on computationally efficient deep learning systems and applications in computer vision, natural language processing and federated learning. Supervisor: Prof. Ling Liu
- Head GTA for Advanced Internet Systems and Applications course

Bilkent University, Ankara, Turkey — September 2019 – August 2021

M.Sc. in Electrical and Electronics Engineering, CGPA: **3.58 / 4.00**

- Full Scholarship from Bilkent University
- Thesis Title: Nonstationary Time Series Prediction with Markovian Switching RNNs

Bilkent University, Ankara, Turkey — February 2015 – June 2019

B.S. in Electrical and Electronics Engineering, CGPA: **3.81 / 4.00**

- Senior Project: 2D outdoor localization system completely independent of GPS. The system uses CDMA and TDOA techniques and provides precise localization ($\pm$ 2 meters) within 6 kilometers.
- Comprehensive Full Merit Scholarship based on University Entrance Exam rank
- High Honor Student at all semesters, undergraduate researcher during the senior year

Nagoya University, Nagoya, Japan — April 2018 – August 2018

Exchange Program in Electrical and Electronics Engineering

- Studied intelligent systems for automobiles and traffic management systems.

Ankara Science High School, Ankara, Turkey — September 2010 – June 2014

High School Degree, Natural Sciences Field, CGPA: **95.26 / 100**

Awards and Honors

- Received the **191st** rank among 2M high school graduates in University Entrance Examination.
- Received the **80th** rank among 0.2M university graduates in ALES (National GRE).
- Full **TUBITAK Scholarship** for the M.Sc. studies.
- **JASSO Scholarship** for Exchange Program at Nagoya University.
- **Full Scholarship** from Bilkent University during M.Sc. and Ph.D. Studies.
- **Comprehensive Full Scholarship** from Bilkent University during B.S. studies.
- Bilkent University High Honor Student during B.S. Studies.

Academic Experience

Head Teaching Assistant
Georgia Institute of Technology, Atlanta, GA, USA — January 2022 – Present
- Head TA for the Advanced Internet Systems and Applications course (CS6675)

Research Assistant
Georgia Institute of Technology, Atlanta, GA, USA — August 2021 – Present
- Big data systems, efficient inference, federated learning, adversarial machine learning
- Reviewer for CVPR, AAAI, ICML, IEEE ICDCS, IEEE TOIT, IEEE TNNLS, IEEE TSP

Research Assistant
Bilkent University, Ankara, Turkey — September 2019 – August 2021
- Efficient and convergent neural network learning for recurrent neural networks such as LSTMs
- Point process based spatio-temporal modeling of events with applications on spatio-temporal traffic, weather, event (crime, earthquake) forecasting
- Online switching time-series prediction algorithms for non-stationary environments with applications on finance and business

Grader
Bilkent University, Ankara, Turkey — September 2019 – August 2021
- EEE 585 (Statistical Learning and Data Analytics) in Spring 2020 and Fall 2020
- EEE 543 (Neural Networks) in Fall 2019

Undergraduate Researcher
Bilkent University, Ankara, Turkey — August 2018 – June 2019
- Conducted research on unsupervised video anomaly detection under the supervision of Asst. Prof. Hamdi Dibeklioglu and Prof. Suleyman Serdar Kozat.
- Developed novel statistical models to represent spatio-temporal event data.

Industrial Experience

Research Scientist Intern
IBM Thomas J. Watson Research Center, Yorktown Heights, NY — May 2023 – Aug 2023
- Conducted research on efficient finetuning of large language models in resource-constrained environments

Research Scientist Intern
IBM Thomas J. Watson Research Center, Yorktown Heights, NY — May 2022 – Aug 2022
- Conducted research on computation-efficient federated learning under heterogeneous settings with resource-constrained devices (Filed a patent, and published two papers at CVPR23 and ICDCS23)

Machine Learning Engineer
DataBoss Analytics, Ankara, Turkey — June 2019 – July 2021
- Built end-to-end machine learning architectures for large-scale online temporal/spatio-temporal prediction and anomaly detection systems
- Worked in a DevOps environment managing purpose-built, distributable and scalable services.

Data Scientist
DataBoss Analytics, Ankara, Turkey — August 2018 – June 2019
- Analyzed complex spatio-temporal data, including traffic, crime and weather data.
- Reported and presented the results to project managers, engineers and clients.

Intern Engineer
DataBoss Analytics, Ankara, Turkey — January 2018 – March 2018
- Implemented models for face detection and panic detection in crowd scenes.

Intern Engineer
Roketsan, Ankara, Turkey — June 2017 – July 2017
- Wrote a Labview program that enables communication with a GPS receiver and displays/records the position, velocity, heading and time data.
- Worked on integration of GPS and INS using Extended Kalman Filter.

Conference Papers

[C12] T. Huang, S. Hu, KH. Chow, **F. Ilhan**, S. F. Tekin and L. Liu, "Lockdown: Backdoor Defense for Federated Learning with Isolated Subspace Training", *Thirty-seventh Conference on Neural Information Processing Systems (NeurIPS)*, 2023.

[C11] W. Wei, L. Liu, KH. Chow, **F. Ilhan** and Y. Wu, "Model Cloaking against Gradient Leakage", *IEEE International Conference on Data Mining (ICDM)*, 2023.

[C10] **F. Ilhan**, G. Su, Q. Wang and L. Liu, "Scalable Federated Learning with System Heterogeneity", *IEEE International Conference on Distributed Computing Systems (ICDCS)*, 2023. *(demo)*

[C9] **F. Ilhan**, G. Su and L. Liu, "ScaleFL: Resource-Adaptive Federated Learning with Heterogeneous Clients", *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2023.

[C8] KH. Chow, L. Liu, W. Wei, **F. Ilhan** and Y. Wu, "STDLens: Securing Federated Learning Against Model Hijacking Attacks", *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2023.

[C7] **F. Ilhan**, S. F. Tekin, S. Hu, T. Huang, KH Chow, L. Liu, "Hierarchical Deep Neural Network Inference for Device-Edge-Cloud Systems", *ACM International World Wide Web Conference (WWW)*, 2023. *(poster)*

[C6] **F. Ilhan**, S. F. Tekin and B. Aksoy, "Spatio-Temporal Crime Prediction via Temporally Hierarchical Convolutional Neural Networks", *28th IEEE Signal Processing and Communications Applications Conference*, 2020.

[C5] **F. Ilhan**, N. M. Vural and S. S. Kozat, "LSTM-Based Online Learning with Extended Kalman Filter Based Training Algorithm", *28th IEEE Signal Processing and Communications Applications Conference*, 2020.

[C4] **F. Ilhan** and E. Mumcuoglu, "Performance Analysis of Semi-Supervised Learning Methods under Different Missing Label Patterns", *28th IEEE Signal Processing and Communications Applications Conference*, 2020.

[C3] **F. Ilhan**, S. F. Yilmaz and S. S. Kozat, "A Two-Stage Multi-Class Classification Approach Based on Anomaly Detection", *28th IEEE Signal Processing and Communications Applications Conference*, 2020. *(poster)*

[C2] N. M. Vural, B. Altas, **F. Ilhan** and S. S. Kozat, "Shortest Path Learning in Non-Stationary Environments via Online Convex Optimization", *28th IEEE Signal Processing and Communications Applications Conference*, 2020.

[C1] N. M. Vural, B. Altas, **F. Ilhan** and S. S. Kozat, "Online Shortest Path Learning via Convex Optimization", *28th IEEE Signal Processing and Communications Applications Conference*, 2020.

Journal Papers

[J3] **F. Ilhan**, O. Karaahmetoglu, I. Balaban and S. S. Kozat, "Markovian RNN: An Adaptive Time Series Prediction Network with HMM-based Switching for Nonstationary Environments", *IEEE Transactions on Neural Networks and Learning Systems*, 2021.

[J2] N. M. Vural, **F. Ilhan**, S. F. Yilmaz, S. Ergüt and S. S. Kozat, "Achieving Online Regression Performance of LSTMs with Simple RNNs", *IEEE Transactions on Neural Networks and Learning Systems*, 2021.

[J1] **F. Ilhan** and S. S. Kozat, "Modeling of Spatio-Temporal Hawkes Processes with Randomized Kernels", *IEEE Transactions on Signal Processing*, 2020.

Preprints

[P8] **F. Ilhan**, L. Liu et. al., "Learning to Early Exit for Adaptive Inference", *under review*, 2023.

[P7] **F. Ilhan**, L. Liu et. al., "Resource-Efficient Pruning for Transformer Finetuning", *under review*, 2023.

[P6] T. Huang, S. Hu, **F. Ilhan**, S. F. Tekin, W. Wei, and L. Liu, "Silencer: Pruning-aware Backdoor Defense for Decentralized Federated Learning", *under review*, 2023.

[P5] KH. Chow, C. Guerin, S. Hu, T. Huang, **F. Ilhan**, S. F. Tekin and L. Liu, "PMask: Diversity-driven Privacy Protection Masks Against Unauthorized Face Recognition", *under review*, 2023.

[P4] Y. Wu, L. Liu, KH. Chow, **F. Ilhan** and W. Wei, "A Focal Diversity Approach to Amplifying Ensemble Efficiency", *under review*, 2023.

[P3] S. Hu, T. Huang, KH. Chow, C. Guerin, **F. Ilhan**, S. F. Tekin and L. Liu, "Ethereum Account Profiling and De-anonymization via Pseudo-Siamese BERT", *under review*, 2023.

[P2] S. F. Tekin, O. Karaahmetoglu, **F. Ilhan**, I. Balaban and S. S. Kozat, "Spatio-temporal Weather Forecasting and Attention Mechanism on Convolutional LSTMs", 2021.

[P1] O. Karaahmetoglu, **F. Ilhan** and S. S. Kozat, "Unsupervised Online Anomaly Detection On Irregularly Sampled Or Missing Valued Time-Series Data Using LSTM Networks", 2020.

Projects

Source codes of some projects with more details are also available on: *github.com/fatih-ilhan*

Time Series Prediction and Anomaly Detection:

- Predy: Worked in the design and development of a time series prediction framework for data from business domains such as economy, retail and energy.
- Real-time Anomaly Detection: Worked in the design and development of a anomaly detection framework for time series and social media data.

Spatio-temporal Event Modeling:

- Spatio-temporal Crime Analysis and Prediction: Designed and implemented a spatio-temporal crime analysis and prediction framework with statistical and machine learning based approaches.
- Hurricane Trajectory Prediction: Developed a deep learning architecture to predict hurricane trajectories. Introduced model is based on TrajGRU architecture and uses weather images in addition to the past trajectory data. *(Available on: https://github.com/fatih-ilhan/hurricane-hunters)*

Computer Vision Application Systems:

- Facial Attractiveness Estimation: Implemented a CNN-based deep learning architecture to estimate attractiveness from frontal facial images. Currently working on providing more interpretability to help the users to understand which factors (pose, emotion, illumination etc.) make their photos more attractive. *(Available on: https://github.com/fatih-ilhan/facial-attractiveness-prediction)*
- Facial Emotion Recognition: Implemented three machine learning and active appearance modeling based architectures, including CNN-based and autoencoder-based approaches, for emotion recognition from frontal face images.

Electronics:

- LocInCampus: Designed and implemented a 2D outdoor localization system completely independent of GPS, for industrial design project. The system uses TDOA and CDMA techniques to perform robust and precise localization.
- Touchpad Controlled Audio Processing Unit: Designed an audio processing system that consists of active filters and an amplifier controlled by a touchpad. Available features are volume control, equalizer, reverb and delay.
- Levitating Light Bulb: Designed an LED light bulb powered with electromagnetic induction and levitated using electromagnetic suspension. A feedback control system based on magnetic field changes performs high frequency switching to perform stabilization.
- Ion Craft: Designed and made an ion craft which levitates under high voltage between its poles. The designed system utilizes Biefeld-Brown effect to create ion wind.

Miscellaneous:

- Hotel Booking Reservation System: A web application on Django for managing hotel reservations. *(Available on: https://github.com/fatih-ilhan/hotel_booking_system)*
- Pong Game with Gesture Control: Implemented Pong game on a 8x32 LED Matrix coded with assembly language on a 8051 micro controller. Players can control their paddles using hand gestures. *(Available on: https://github.com/fatih-ilhan/pong)*

- Pacman Game: Implemented a full version of the classical game Pacman, coded with VHDL. *(Available on: https://github.com/fatih-ilhan/pacman)*
- Pixelium: Implemented a multi-functional painting application for Android platform. In addition to standard Paint features, Pixelium provides addition features such as note taking, child lock and alarm lock with drawing puzzles. *(Available on: https://github.com/fatih-ilhan/pixelium)*

Skills

Programming: Python, SQL, R, C++, Java, Matlab, Assembly (8051), VHDL
Tools: Deep Learning Libraries (Tensorflow, PyTorch, Keras), MLOps Tools (Kubernetes, Polyaxon, MLFlow), Other Tools (Docker, Flask, Django, Kafka, Spark), Agile (Gitlab, Atlassian Tools)
Test Scores: TOEFL iBT: 108, GRE: 149/170/3.5
Languages: Turkish (Native), English (Advanced), Japanese (Lower intermediate ∼N4)

Social Activities

- Bass Guitarist in "Parallel Park" (2022-2023)
- Bilkent University Music Club Member (2014-2017)
- Bass Guitarist in "Freud Goes Technical" (2014-2017)
- Bilkent IEEE Student Branch Member (2014-2016)
- Bilkent University Open Software and Internet Technologies Club Member (2014-2015)
- Ankara Science High School Electronics Club Member (2012-2014)
- Ankara Science High School Physics Olympiads Team Member (2010-2012)

Hobbies

- Backpacking, overnight camping, being on the road, hoping to travel all over the world
- Playing bass guitar, discovering new music