# Fatih Ilhan
# Resume

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

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## Research Interests

1. AI-Powered Big Data Systems
2. Distributed / Federated Learning
3. 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

- Supervisor: Prof. Ling Liu

**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 Recurrent Neural Networks

**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 (± 2 meters) within 6 kilometers.
- Comprehensive Full Merit Scholarship based on University Entrance Exam rank
- High Honor Student at all semesters, undergraduate researcher and part-time data scientist during the senior year

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

Exchange Program in Electrical and Electronics Engineering

- Studied on 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.

## Industrial Experience

**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 through reproducing academic papers.

**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.
- Evaluated the GPS receiver under different simulations.
- Worked on integration of GPS and INS using Extended Kalman Filter.

## Academic Experience

**Research Assistant**
Georgia Institute of Technology, Atlanta, GA, USA — August 2021 – Present
- Big data systems, federated learning, adversarial machine learning, interpretable machine learning

**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.

## Projects

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

**Time Series Prediction and Anomaly Detection**:
- Preddy: Worked in the design and development of a time series prediction framework for data from business domains such as economy, retail and energy. *(See J1, J2 for research outputs)*
- Real-time Anomaly Detection: Worked in the design and development of a anomaly detection framework for time series and social media data. *(See J4, C4 for research outputs)*

**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. *(See J3, C1 for research outputs)*
- 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**:

- 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)*

## Journal Papers

Description of my research and corresponding PDFs are also available on: *fatih-ilhan.github.io*

J1 **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.

J3 **F. Ilhan** and S. S. Kozat, "Modeling of Spatio-Temporal Hawkes Processes with Randomized Kernels", **IEEE Transactions on Signal Processing**, 2020.

J4 O. Karaahmetoglu, **F. Ilhan** and S. S. Kozat, "Unsupervised Online Anomaly Detection On Irregularly Sampled Or Missing Valued Time-Series Data Using LSTM Networks", **IEEE Transactions on Neural Networks and Learning Systems**, 2020. *(accepted to the second round)*

## Conference Papers

C1 **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.

C2 **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.

C3 **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.

C4 **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)*

C5 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.

C6 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.

## Presentations

P1 "Neyman-Pearson Detection of Gauss-Markov Signals: Closed-Form Error Exponent and Properties", Bilkent University, Ankara, 2020.

P2 "On the Independence of Classifiers", DataBoss Analytics Inc., Ankara, 2019.

P3 "The Future of Automated Driving Cars: Worldwide Availability Forecast", Nagoya University, Nagoya, 2018.

## Skills

**Programming:** Python, MATLAB, SQL, R, C++, Java, Assembly (8051), VHDL *(Open-source projects are available on github.com/fatih-ilhan)*

**Tools:** Deep Learning Libraries (Tensorflow, PyTorch, Keras), MLOps Tools (Kubernetes, Polyaxon, MLFlow), Development and Big Data Tools (Docker, Flask, Kafka, Spark), Agile (Gitlab, Atlassian Tools), OS (Windows, Linux), Cubase, Garageband

**Test Scores:** TOEFL iBT: 108, GRE: 149/170/3.5
**Languages:** Turkish (Native), English (Advanced), Japanese (Lower intermediate ∼N4)

## Social Activities

- 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