

# Ahmet Zahid Balcioglu

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## EDUCATION

**Honours of Bachelors of Science at University of Toronto, Nov 2018**

Major in Physics, Minor in Mathematics, and Minor in Statistics.

**Visiting Student at Boğazici University, Feb 2020-Feb 2021**

**Master of Science in Statistics at Yildiz Technical University, Sep 2019-**

**Present**

Thesis Supervisor: Erhan Çene

Thesis Title: Order Statistics Based Training and Scoring Algorithms for Deep Outlier Detection

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## PREPRINTS

1. *On a notion of outliers based on ratios of order statistics*, joint with Oğuz Gürerk available upon request. Current version 24 pp.
2. *Adaptive Slot-filling for low-resource Natural Language Understanding*; submitted to UBMK 2022 IEEE Xplore conference, available upon request.
3. *Order Statistics Based Training and Scoring Algorithms for Deep Outlier Detection*; presented in ICAS 2022 conference, available upon request.

## IN PREPARATION

1. *Extensions of the stochastic SEIR model with vaccination and heterogeneous mixing, an optimal control approach*, joint with Oğuz Gürerk. Current version 6 pp.
2. *Conditional Random Fields based on Sentence Representations*. Current ver. 5 pp.

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## RESEARCH PROJECTS

As a MS student in Yildiz Technical University, in collaboration with Ümit Işlak of Boğazici University Department of Mathematics:

**Outliers, order statistics, and concentration inequalities    March 2021    Present**

- Main goal of our project is to have a distribution invariant robust estimator for anomalies based on order statistics.

- Studying the distribution and the asymptotic behaviour of the chosen statistic.

- Developing a python library for heavy-tailed data, anomalous data generation and order statistic simulations.

### **Optimal Control in Epidemiological Systems    June 2021    Present**

- Developing a variant of the SIR models that accounts for vaccination, waning immunity in order to do formulate an optimal control problem for best vaccination policies.
- Responsible for simulations of the SIR model and for computationally solution of the optimal control problem.

MS thesis with Erhan Cene:

### **Order statistics guided deep outlier detection    March 2021    Present**

- Main goal of the thesis is to incorporate my previously done research in ‘*Outliers, order statistics, and concentration inequalities*’ project to a deep learning stepping in order to create a robust algorithms that can be successful in high-dimensional setting.
- Main Contributions:
  - Order statistics based early stopping algorithm.
  - Order statistic augmented loss function.
  - An algorithmic outlier scoring and selection method.
  - A research focused python library which implements the proposed algorithms, implements other robust algorithms for autoencoder outlier detection, introduces an autoencoder specific training loop for easier tracking of metrics during training.

As part of the Artificial Intelligence Research and Development team in ETIYA:

### **Distilling transformer models for a low data setting    March 2020    December 2021**

- Main goal of the project is to establish a fast training model for an interactive dialogue system.
- We developed a model which used transfer learning based on pre-trained transformers and used a hyper-parameter optimization like training on Conditional Random Fields.
- Using word-piece tokenization to help differentiate between word roots and suffixes agglutinative languages such as Turkish.

### **Research for an embedding guided RNN    March 2020    December 2021**

- Main goal of the project is to effectively incorporate predetermined memory state based into a recurrent neural network, which can selectively memorise past states in the sequence.
- We expected that with the selection of a good memory state we may in affect reduce the need for training time and data.

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## **RELEVANT COURSEWORK**

### **Boğazici University, Department of Mathematics:**

- ❖ MATH 541 - Graduate Probability Theory (*Durrett, R.. Probability: theory and examples*)
- ❖ MATH 531 - Real Analysis I (*Folland, G. B. Real analysis: modern techniques and their applications*)
- ❖ MATH 532 - Real Analysis II (*Folland, G. B. Real analysis: modern techniques and their applications*)
- ❖ MATH 533 - Complex Analysis (*Stein, E. M., & Shakarchi, R. Complex analysis*)

### **Yildiz Technical University, Department of Statistics:**

- ❖ IST 5115 - Non-Linear Programming
- ❖ IST 6106 - Advanced Multivariate Statistical Methods
- ❖ IST 6115 - Applied Generalised Linear Models I

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## TEACHING EXPERIENCE

**Student Assistant; Yildiz Technical University, Department of Statistics:**

- ❖ IST 3121 - Regression Analysis I, Fall 2019
  - ❖ IST 5110 - Advanced Regression Analysis, Winter 2020
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## SELECTED TALKS

- ❖ Martingales and Black-Scholes Equation, Probability and Statistics Seminars, Boğaziçi University, Istanbul — June 2020
  - ❖ Dimension Reduction Techniques for Discrete Data, Graduate Student Seminars, Yildiz Technical University, Istanbul — Nov 2020
  - ❖ Deep Learning Solutions of Differential Equations, Graduate Student Seminars, Yildiz Technical University, Istanbul — Dec 2020
  - ❖ Concentration of Measure and Almost Spherical Sections, Student Seminars in Analysis, Boğaziçi University, Istanbul — Jan 2021
  - ❖ Outliers and Anomalies, Probability and Statistics Seminars, Boğaziçi University, Istanbul — Jan 2021
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## WORK EXPERIENCE

**AI Engineer, Artificial Intelligence Team, ART Labs    January 2022    Present**

- Leading a 3D reconstruction squad which aims to generate high-quality 3d representation of shoes from a few images.

- Creating a neural radiance fields based pipeline of 3d content generation

- Involved in the development of a framework independent 3d research library which is used for fast prototyping of new research in neural rendering.

**Specialist, Artificial Intelligence Research&Development, ETIYA Information Technologies    March 2020    December 2021**

- Involved in the research and development of deep learning and machine learning algorithms for natural language processing and anomaly detection.

- Proposed, led, and prepared biweekly reports for two research projects.

- Worked closely with the product team to build an adaptive slot filling model for natural language understanding.

- Worked in collaboration with the backend team for the development and maintenance of a deep anomaly detection service.

- Certificates from data science, and TM Forum trainings: Blue Mark Academy Practical Machine Learning; TM Forum: Open API Fundamentals, AI in Telecoms Overview, Information Framework (SID) Fundamentals.

**Analyst, R&D Team; Standart Insulation Materials Inc.; Istanbul    Nov 2018  
Sep 2019**

- Communicated with solar power companies, and developed an LSTM based model in order to do a cost-benefit analysis for a company investment solar power.

**Intern, Standart Insulation Materials Inc. ; Istanbul      May 2016    July 2016**  
- Worked as an assistant in the chemical laboratory. Also helped plan for a company project for solar panels.

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## **COMPUTATIONAL & PROGRAMMING SKILLS**

### **❖ Python**

Over 7 years of experience, familiar with libraries used in machine learning, scientific studies, well as some used in web development. Used python at work and at school for physics and statistics courses and projects, which were mainly about deep learning, solving differential equations, machine learning, data analysis, and visualisation &c.

### **❖ R**

Over 5 years of experience, familiar with many different libraries used in scientific studies and statistical analysis. Used throughout statistics courses and projects for various purposes including machine learning, data analysis, and data visualisation &c.

### **❖ HTML, CSS, Javascript**

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## **EXTRACURRICULAR & SKILLS**

### **❖ Yildiz Technical University Data Science Society Datathon, May 2020**

This was a datathon (data science marathon) which I organised in collaboration with the University Data Science student club. Conducted online due to the COVID-19 pandemic.

### **❖ Member, Yildiz Technical University Data Science Society, March 2020    Present**

### **❖ IDAO International Data Science Competition, Feb 2021    Feb 2021**

Joined in a team of three. We were tasked with an image recognition problem involving images H and He atoms. Served as an opportunity to familiarise myself with the basic image processing techniques and models.

### **❖ IDAO International Data Science Competition, Jan 2020    Feb 2020**

Joined in a team of three. We were tasked with a real life problem in astronomical models. We applied machine learning algorithms to find the best applicable solution.

### **❖ Member & Vice President, University of Toronto Go Club;    Sep 2015    Sep 2018**

Member of the Go Club since 2015 and Vice President after Sep 2017. Arranged weekly meetings, prepared annual events such as tournaments, movie screenings, picnics, and other social events.

### **❖ Member, UTFOLD    July 2014    August 2014**

Making origami flowers in order to raise awareness for cancer. Entered the Guinness book of records through making the most origami flowers.

### **❖ Member, Physics and Astronomy Students Association    Sep 2013    Apr 2018**

### **❖ University Physics Competition, Bronze Medal    2013**

### **❖ University of Toronto, Faculty of Arts and Sciences, Dean's List    2013**

### **❖ Languages:**

Proficient in English and Turkish, intermediate knowledge of Arabic.