Selim Kuzucu

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Education

- **CS @ Max Planck Doctoral Program** — Saarbrücken, DE
  PhD in Computer Science (Prepatory Phase) — Sept 2024 - Current
- **Middle East Technical University** — Ankara, TR
  Bachelor of Science - Computer Engineering; GPA: 3.66/4.00, **top 5% of the class** — Aug 2019 - June 2023
  Activities: *Founder of Management Consulting Club, Member of ACM Student Chapter, Former Member at Robotics Club*

Publications

- **S. Kuzucu***, K. Oksuz*, J. Sadeghi, P. K. Dokania, *"On Calibration of Object Detectors: Pitfalls, Evaluation and Baselines"*, accepted as Oral Presentation (top 2.3% of valid submissions) at **European Conference on Computer Vision (ECCV) 2024** *Oct 2024*
- K. Oksuz, **S. Kuzucu**, T. Joy, P. K. Dokania, *"MoCaE: Mixture of Calibrated Experts Significantly Improves Object Detection"*, published at **Transactions on Machine Learning Research (TMLR)**, reviewed on Openreview *Oct. 2024*
- **S. Kuzucu**, J. Cheong, S. Kalkan, H. Gunes, *"Uncertainty-based Fairness Measures"*, published at **ACM Journal of Artifical Intelligence Research (JAIR)** *Oct. 2024*
- J. Cheong, **S. Kuzucu**, S. Kalkan, H. Gunes, *"Bias and Fairness in Mental Wellbeing Analysis"*, published at **International Joint Conference on Artificial Intelligence (IJCAI) 2023 - AI and Social Good Track** *May 2023*
- Z. S. Baltacı, K. Öksüz, **S. Kuzucu**, K. Tezören, B. K. Konar, A. Özkan, E. Akbaş, S. Kalkan, *"Class Uncertainty: A Measure to Mitigate Class Imbalance"*, under review at **IEEE Computational Intelligence Magazine**, available at arXiv
- S. Song, Y. Song, C. Luo, Z. Song, **S. Kuzucu**, X. Jia, Z. Guo, W. Xie, L. Shen, H. Gunes, *"Deep Learning Graph Representation with Task-specific Topology and Multi-dimensional Edge Features"*, under review at **Journal of Machine Learning Research (JMLR)**, available at arXiv

Experience

- **Max Planck Institute for Informatics** — September 2024 - Present
  Doctoral Researcher — **Advisor: Prof. Dr. Bernt Schiele**
  - **Research Topic - Improving visual perception with large language models**
  - **Contributions:** Currently working on improving the efficiency and performance of vision models with large language models, with a particular focus on efficiency.
- **Five AI (Bosch UK)- Oxford Applied Research Center** — September 2023 - June 2024
  Intern Research Scientist — **Supervisor: Dr. Puneet K. Dokania**
  - **Research Topic - Calibration and Evaluation of Object Detectors**
  - **Contributions:** Lead a project concerning proper performance and reliability benchmarking of object detectors, where we laid down the proper principles to evaluate, confidence-threshold and calibrate object detectors. Showed that simple post-hoc calibrators can beat the existing *state-of-the-art* training-time calibration techniques by more than 90%. Developed and released a fully open-source Python library where anybody can calibrate and benchmark any given detector for any of the existing calibration errors and performance measures. Available at GitHub .
  - **Research Topic - Mixture of Calibrated Experts for Object Detection**
  - **Contributions:** Worked on forming a Deep Ensembles-style Mixture of Experts for any given set of object detectors using calibration and proposed a novel post-hoc technique called Refining NMS. Our model is currently the *state-of-the-art* on DOTA Rotated Object Detection Benchmark and it is the best publicly available model on COCO test-dev (the forthcoming object detection benchmark) and ODinW-35 (the forthcoming open-vocabulary object detection benchmark).
- **AFAR Lab at University of Cambridge** — February 2022 - August 2023
  Undergraduate Student Researcher — **Supervisor: Prof. Hatice Gunes**
  - **Research Topic - Uncertainty-based Fairness Measures**
  - **Contributions:** Lead the project and showed that the existing point-based fairness measures can cause potential pitfalls to miss the existing biases. Proposed a new notion for fairness gap based on uncertainty discrepancies across subgroups, and evidenced the need for them through extensive experiments on three proposed synthethic datasets and three real-life datasets.
  - **Research Topic - Investigating Fairness in Mental Well-being Through Bias Mitigation**
  - **Contributions:** Investigated the fairness issues in mental well-being as one of the first comprehensive studies in the field, such as D-Vlog Depression Detection Video Dataset. Experimented with an highlighted the inefficiency of the existing bias mitigation techniques.

- **Research Topic - Deep Learning Graph Representations with Task-specific Topology and Multi-dimensional Edge Features**
- **Contributions:** Devised the link prediction task for the co-occurrence patterns of facial activation units for emotion recognition. Also took part in developing the Multi-Dimensional Edge Feature Generation module. Utilized **G-GCN** and **GAT** to achieve top notch predictions in BP4D and DISFA non-graph datasets. Used **PyTorch** and various visualization methods such as **Grad-CAM** and other saliency-based mappings.

- **METU Image Lab** October 2021 - September 2022
  Undergraduate Student Researcher **Supervisor: Prof. Sinan Kalkan**
  - **Research Topic - Uncertainty As A Measure to Mitigate Class Imbalance**
  - **Contributions** Worked with various uncertainty quantification methods such as Deep Ensembles (Lakshminarayanan B. et al., 2017) and DDU (Mukhoti et al. 2021) to overcome the class imbalance problem. Furthermore, curated a novel semantically-imbalanced dataset called "SVCI'20" and performed various imbalance mitigation techniques on it.

- **General Electric** June 2021 - December 2021
  Software Engineer Intern
  - **Onboarding Documentation with a Bash Script** Designed and created an onboarding documentation with a multi-purpose bash script for the team that reduced the average technical onboarding time for new members from 10+ days to about 2 days.
  - **User Stories and Other Work** Earned about 10 story points on average of 58 average total points of the entire team of 11 people during the sprints. Enhanced 15+ different features, from minor UI changes to entire component changes and resolved 10+ bugs.

Projects

- **Code Implementation for Uncertainty-Aware Learning Against Label Noise on Imbalanced Datasets (AAAI'22)** Provided the unofficial implementation for all of the methods described in the work as the official code was not released. Conducted as part of the graduate course CENG502: Advanced Deep Learning. Available at GitHub (June, 2023)
- **Code Implementation for Uncertainty Quantification in CNN Through the Bootstrap of Convex Neural Networks (AAAI'21)** Provided the unofficial implementation for all of the methods described in the work as the official code was not released. Available at GitHub (June, 2022)
- **Gomoku San - Gomoku Player** Used the ultimate solution proposed by Allis et al. to implement an artifically intelligent gaming bot that would beat anyone daring to play the game. Developed with **Python** and **C++** (July, 2021)
- **Log File Examiner** A log file examiner that examines errors (by using regular expressions) and users from log files (syslog etc.) and stores them in a reverse sorted order with respect to their frequency to 2 separate csv files, developed with **Python** and **Bash**. (March, 2020)

Honors, Awards & Test Scores

- Scored 328/340 in GRE (Verbal: 160 (85%), Quantitative: 168 (90%), Analytical Writing: 4.5 (79%)) - October 2022
- First place in Guided Research Symposium at METU Computer Engineering Department out of 30 different undergraduate research projects with my work in developing a novel one-pass uncertainty quantification method - June 2022
- Finalist (Top 10 out of 150 teams) at the Swarm Robotics Competition at Teknofest 2021- August 2021
- Scored 118/120 in TOEFL (R: 30, L: 29, S: 30, W: 29) - August 2021
- Earned METU Development Foundation's Academic Merit Scholarship - September 2019
- Ranked in top 0.01 % (270^{th}) at Turkish university entrance exam amongst 2.5 million test takers - July 2019

Skills Summary

- **Fluent Languages** Python, C++, JavaScript, C#, C, Bash, MySQL
- **Frameworks and Platforms** PyTorch, MMDetection & MMCV, ROS, Angular, Flask, Linux
- **Miscellaneous** Playing bass and electric guitar, playing Baduk (or Go-Weiqi), learning about Chinese language and culture (Mo Yan, Yu Hua and Cixin Liu are some of my favorite), reading-researching on gothic and far-eastern literatures