Alper Kayabaşı

E-mail · GitHub · Web page

Research interests

Few-shot Semantic Segmentation, Video Action Recognition, and Deep Metric Learning

Education

2020 – now **Middle East Technical University** – Ankara, Turkey
M.S. in Electrical and Electronical Engineering
Thesis: Few-shot Segmentation by Enhanced Ensemble of Base and Meta Predictions
GPA: 3.79.
Supervisor: Prof. Dr. İlkay Ulusoy

2015 – 2020 **Hacettepe University** – Ankara, Turkey
B.S. in Electrical and Electronical Engineering
Capstone Project: Laser Range Finder with Image Tracking
GPA: 3.64 - ranked 1st.
Advisor: Prof. Dr. Feza Arıkan

Course Projects

Machine Vision:
I successfully reproduced the iconic 'Fully Convolutional Neural Network' paper and further improved its performance by incorporating a Conditional Random Field. Video Presentation.

Deep Learning:
1. I implemented the 'Moving in the Right Direction: A Regularization for Deep Metric Learning' paper published at CVPR 2020, even though no published code was available. *GitHub Repository*.
2. I derived the backpropagation equations for the fully connected layer, and convolutional layer. Following this, I implemented their forward and backward pass using only NumPy. Furthermore, I coded forward pass of LSTM with Pytorch.
Jupyter Notebooks.

Sequence Models in Multimedia:

I implemented the "Scale-Aware Graph Neural Network for Few-Shot Semantic Segmentation" paper, which did not have any published code, and was published at CVPR 2021. *GitHub Repository*.

Introduction to Robotics:

Sea-Urchin robot design including derivation of kinematics, inverse kinematics, dynamic, and trajectory with gait planing. GitHub Repository and Video for simulation.

Optimization:

I implemented various optimization methods, including Zoutendijik, Two-Phase Simplex, Penalty, Barrier, Steepest Gradient Descent, BFGS, Fletcher Reeves, and Davidon Fletcher Powell, along with various 1-D search methods such as Golden Search, from scratch using MATLAB.

Microprocessor Architecture and Programming:

Implementation of maze game in Assembly Language. Video for Game.

Embedded System Design:

Design of IoT Communication Device. Video for the Design.

Advanced Digital Design:

16 bit RISC architecture CPU design in VHDL.

Publications

WACV 2023	**Elimination of Non-Novel Segments at Multi-Scale for Few-Shot Segmentation** - [Paper] Alper Kayabaşı, Gülin Tüfekci, İlkay Ulusoy.
ECCV W, 2022	**Detecting Driver Drowsiness as an Anomaly Using LSTM Autoencoders** - [Paper] Gülin Tüfekci*, Alper Kayabaşı*, Erdem Akagündüz, İlkay Ulusoy. (*Equal Contribution) *European Conference on Computer Vision - In-Vehicle Sensing and Monitorization Workshop.*
SIU, 2022	**A Comparative Analysis of Revealing Temporal Patterns for Driver Drowsiness Detection** - [Paper] Gülin Tüfekci, Alper Kayabaşı, İlkay Ulusoy. *Signal Processing and Communications Applications Conference.*

SPIE, 2021	**Comparison of distance metric learning methods against label noise for fine-grained recognition** - [Paper]

Alper Kayabaşı, Kaan Karaman, İbrahim Batuhan Akkaya.

Society of Photo-Optical Instrumentation Engineers- Automatic Target Recognition XXXI Conference.

Honors

2020	Ranked 3rd in capstone projects amongst Department of Electrical and Electronical Engineering at Hacettepe University.
2020	Ranked 1st among 132 undergraduate students of Electrical and Electronical Engineering.

Research experience

2019 – now	**ASELSAN Research Center**

Research Engineer

- I was involved in the development of an autofocus algorithm for a microscopy imaging application, during which I conducted a comprehensive analysis of various metrics measuring image sharpness and detail level. Upon identifying the metric that clearly indicated a nearly unimodal peak on the in-focus position, I implemented a searching algorithm that efficiently approached the optimal position with minimal steps possible.

- I conducted a rigorous analysis of the robustness of metric learning methods against label noise. Through comprehensive experimentation, I successfully identified the triplet and angular methods as the most sensitive and insensitive methods to noise, respectively. Additionally, our findings shed light on the performance of metric learning methods under pseudo-labeling

- I trained various video action recognition models, including I3D, ResNet with LSTM Autoencoder, and FrozenCLIP, for the detection of drowsy and distracted drivers. I played a key role in the coding of a modular framework that facilitated easy testing of different models by our team. Moreover, I contributed to the development of a prototype that optimized inference speed.

Industry experience

2019   **ASELSAN, Summer Internship** – Ankara, Turkey
Design and test of raised cosine type finite impulse response filter in VHDL language.

Attended events

2023   Winter Conference on Applications of Computer Vision (In-person)

2022   European Conference on Computer Vision (In-person)

2021   International Conference on Computer Vision (Virtual)

2021   Computer Vision and Pattern Recognition Conference (Virtual)

Technical skills

Programming languages and Libraries
Proficient in: Python, PyTorch, NumPy, MATLAB

Languages
English (IELTS Overall Band Score: 7.0)

Other interests

Skiing.