Alican MERTAN

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EDUCATION

University of Vermont GPA: 3.80/4.00
Ph. D., Computer Science
Advisor: Nick Cheney
September 2021 - to date

Istanbul Technical University GPA: 4.00/4.00
M. Sc., Computer Engineering
Advisors: Gozde Unal, Damien Jade Duff
August 2020

Istanbul Technical University GPA: 3.18/4.00
B. Sc., Computer Engineering
Advisor: Damien Jade Duff
January 2018

CURRENT RESEARCH

Design and Control of Soft Robots: Integrating Morphological Design and Controlling Algorithms for Advancements in Intelligent Systems
Sep 21 - to date

As a Ph.D. student at the Neurobotics Lab at the University of Vermont under the guidance of Professor Nick Cheney, I am engaged in cutting-edge research on the optimal design and control of soft robots. The nature of this problem poses significant challenges, as the solution requires the integration of two interdependent components - robot design and control algorithms - that possess distinct characteristics. Through my work, I aim to contribute to the field of optimization by shedding light on these types of complex optimization problems. Additionally, I have a keen interest in intelligence and its various forms, and I firmly believe that exploring a broader approach encompassing both the morphological design and controlling algorithms of soft robots presents numerous opportunities in this regard. I am excited to continue my research in this field and contribute to advancements in intelligent systems.

PAST EXPERIENCE

Developing Computational Methods for Modeling Building Components Using Photogrammetry Data for the Purpose of Documenting Historical Buildings **Aug 20 - September 21**

Worked on a research project (funded by The Scientific and Technological Research Council of Turkey, project no:119K896) with a multidisciplinary team led by the Faculty of Architecture of Istanbul Technical University. I was responsible for developing deep learning models that can process historical buildings' point cloud data and identify the buildings' components [2, 3, 4]. The project involves dealing with limited and noisy real-world data.

Relative Depth Estimation **Sep 19 - Sep 21**

At Computer Vision and Artificial Intelligence Lab of Istanbul Technical University, I worked as a researcher. Particularly, I investigated single image depth estimation in the wild problem. I am developed deep learning-based solutions that improve upon different aspects of the existing solutions [5, 6, 7, 10]. Additionally, I supervised two students' undergraduate theses [1].

Air Pollution Forecasting **Sep 19 - Mar 20**

Worked on a research project with a multidisciplinary team led by Eurasia Institute of Earth Sciences of Istanbul Technical University. I was responsible for devising deep learning-based methods for air pollution forecasting. RNNs and their variants were utilized since the nature of the data is sequential. Our work is accepted at the CMAS conference 2020 [9]. Additionally, I developed a framework where one can experiment with different hyperparameter settings, learning algorithms, architectures, formulations of the problem, and additional inputs such as weather, humidity, etc., through

command line arguments. I documented my work for other researchers with Sphinx.

Investigation of Depth Reconstruction from Single Views and Application to Autonomous Robots **Jan 18 - Sep 19**
Worked on a The Scientific and Technological Research Council of Turkey funded deep learning project, project no: 116E167. In the project, I replicated several papers from the field of depth estimation from a single image using Pytorch, analyzed their performances beyond conventional metrics [11], and attempted to apply new technologies and design new architectures to achieve a state of the art results.

PROJECTS

Autonomous Driving Agent in TORCS environment **Jan 19 - June 19**
As a doctoral level deep reinforcement learning course project, I have participated in a competition, held by Istanbul Technical University and Eatron Technologies, where participants designed an agent to autonomously drive a racing car and achieve the fastest lap time in the TORCS environment. Worked in a 2-person team where I implemented several reinforcement learning algorithms; DQN and its variants double DQN, DDQN, and prioritized experience replay. As a team, we have ranked 3$^{\text{rd}}$ in the competition. Additionally, we have published our findings [8].

PUBLICATIONS

[1] V. B. Yesilkaynak, E. Dari, **A. Mertan**, and G. Unal, "GaussianMLR: Learning Implicit Class Significance via Calibrated Multi-Label Ranking", *arXiv preprint arXiv:2303.03907*, 2023.

[2] S. Altun, M. C. Gunes, Y. H. Sahin, **A. Mertan**, M. Ozkar, and G. Unal. Symmetry and Variance. Generative Parametric Modelling of Historical Brick Wall Patterns, *FAUP - Artigo em Livro de Atas de Conferncia Internacional*, 2022.

[3] M. C. Gunes, **A. Mertan**, Y. H. Sahin, G. Unal, and M. Ozkar, "Synthesizing Point Cloud Data Set for Historical Dome Systems.", *Computer-Aided Architectural Design. Design Imperatives: The Future is Now: 19th International Conference, CAAD Futures 2021, Los Angeles, CA, USA, July 1618, 2021, Selected Papers. Singapore: Springer Singapore*, 2022.

[4] Y. H. Sahin, **A. Mertan**, and G. Unal, "ODFNet: Using orientation distribution functions to characterize 3D point clouds.", *Computers & Graphics 102*, 2022.

[5] **A. Mertan**, D. J. Duff, and G. Unal. "Single image depth estimation: An overview.", *Digital Signal Processing*, 2022.

[6] **A. Mertan**, Y. H. Sahin, D. J. Duff, and G. Unal, "A New Distributional Ranking Loss with Uncertainty: Illustrated in Relative Depth Estimation", *2020 International Conference on 3D Vision (3DV)* IEEE, 2020.

[7] **A. Mertan**, D. J. Duff, and G. Unal, "Relative Depth Estimation as a Ranking Problem", *28th Signal Processing and Communications Applications Conference (SIU)*, 2020.

[8] D. Kamar, G. Akyol, **A. Mertan**, and A. Inceoglu, "Comparative Analysis of Reinforcement Learning Algorithms on TORCS Environment", *28th Signal Processing and Communications Applications Conference (SIU)*, 2020.

[9] **A. Mertan** and A. Unal, "Air Quality Forecasting Using Deep Learning Techniques", *CMAS conference*, 2020.

[10] **A. Mertan**, "Application and analysis of deep learning techniques on the problem of depth estimation from a single image", *Institute of Science And Technology*, 2020 (Master's Thesis).

[11] **A. Mertan** and D. J. Duff, "Analysis of Neural Networks for Depth Estimation", *27th Signal Processing and Communications Applications Conference (SIU)*, 2019, (Poster).

GRANTS AND HONORS

Won the University of Vermont Graduate College Mini-grant in the 2023 Spring cycle.
Ranked 914 among 305.436 participants in the nationwide Selection Exam for Academic Personnel and Graduate Studies, 2017 Spring.
Ranked 808 among 1.805.433 participants in the nationwide university entrance exam for B.Sc. degree, (known as Higher Education Exam), 2012.

REFERENCES

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Prof. Dr. Gozde Unal
Faculty of Computer and Informatics, Istanbul Technical University, 34469 Maslak, Istanbul.
Email: gozde.unal@itu.edu.tr

Dr. Damien Jade Duff
Faculty of Computer and Informatics, Istanbul Technical University, 34469 Maslak, Istanbul.
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