Adnan Harun Dogan

CONTACT INFORMATION

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EDUCATION

Master of Science in Computer Engineering **Present**
Middle East Technical University (METU), Ankara, Turkey
- **Thesis**: *Differentiating Through Combinatorial Algorithms Incorporated into Deep Neural Networks*
- **Advisors**: Prof. Dr. Sinan Kalkan, Assist. Prof. Dr. Emre Akbas
- **Focus Areas**: Optimal transport, ranking-based losses, object detection

Bachelor of Science in Computer Engineering **2018 – 2022**
Middle East Technical University (METU), Ankara, Turkey
- **Graduation Project**: Developed a Transformer-based large language model (T5-pretrained) for generating online question answers from input text.

SELECTED RESEARCH PROJECTS

Continuous Cybersickness Detection Using EEG-based Multitaper Spectrum Estimation **Dec 2023 – Mar 2024**
Sensing, Interaction, & Perception Lab. (SIPLab), ETH Zürich, Switzerland
- **Supervisor**: Prof. Dr. Christian Holz
- Developed a deep learning architecture to detect cybersickness levels from EEG-based sensory data with 30% improvement in real-time in VR environments.
- Implemented a novel preprocessing method for Vision Transformers (**ViT** and **Swin**) to achieve input shift invariance.

Differentiating Through Combinatorial Optimization Algorithms Incorporated into Deep Neural Networks **Feb 2022 – Present**
Image Processing and Pattern Recognition Lab. (ImageLab), METU, Ankara, Turkey
- **Supervisors**: Prof. Dr. Sinan Kalkan, Assist. Prof. Dr. Emre Akbas
- **Funding**: TUBITAK C 2247 STAR Scholarship
- Designed and implemented a differentiable framework that integrates combinatorial algorithms, including *traveling salesman* and *graph matching*, into deep neural networks using **PyTorch**.
- Integrated the Sinkhorn-Knopp algorithm into ranking-based losses within Detection Transformers (DETR).
- Enhanced end-to-end training capabilities, facilitating the seamless incorporation of complex algorithmic decision-making within neural architectures.

CNNFOIL: *Approximating HLLC Riemann Solver for Flow Prediction around Airfoils via Encoder-Decoder Neural Networks* **2020 – 2022**
- **Supervisors**: Assist. Prof. Dr. Hande Alemdar, Assist. Prof. Dr. Baran Ugras
- Created deep neural network models to approximate the HLLC Riemann solver for efficient flow field predictions around airfoils in **PyTorch**.
- Achieved a 4.4% improvement in predicting pressure, velocity, and temperature field coefficients using our neural network **CNNFOIL**.

CarRL: Reinforcement Autonomous Driving **Jun 2021 – Jul 2022**
Center for Artificial Intelligence and Robotics (ROMER), METU, Ankara, Turkey
- **Supervisor(s)**: Assist. Prof. Dr. E. Sahin, Assoc. Prof. Dr. B. Koku.
- Integrated ROS2 pipelines with RL/DL models implemented in **Gym** and **PyTorch** for *autonomous navigation*, enhancing real-time decision-making capabilities. GitHub

Publications

Conference Publications

- Yavuz, F., Cam B.C., **Dogan, A. H.**, Oksuz, K., Kalkan, S., & Akbas, E. (2024). *Bucketed Ranking Loss for Efficient Ranking-based Training of Object Detectors.* In *European Conference on Computer Vision (ECCV).* PDF

  Amin M. A., **Dogan A. H.**, Kuru E. S., Sever Y., Angin P. (2024). *Misuse Detection and Response for Orchestrated Microservices Based Software.* In *International Conference on Advanced Information Networking and Applications (AINA 2024).* pp 217–226.

- Demirel, B. U., **Dogan, A. H.**, & Al-Faruque, M. A. (2021). *Two Might Do: A Beat-by-Beat Classification of Cardiac Abnormalities using Deep Learning and Domain-Specific Features. Computing in Cardiology (CinC)*, 2021. PDF

- Buyukbas, E. B., **Dogan, A. H.**, Ozturk, A. U., & Karagoz, P. (2021). *Explainability in Irony Detection. Big Data Analytics and Knowledge Discovery (DaWaK 2021)*, Lecture Notes in Computer Science, vol 12925, pp. 61-92. Springer, Cham. DOI

Journal Publications

- Sever Y., and **Dogan A. H.** (2023). *A Kubernetes dataset for misuse detection. ITU Journal of FET.* PDF

Workshop Publications

- Sever, Y., Ekinci, G., **Dogan, A. H.**, Alparslan, B., Gurbuz, A. S., Jabrayilov, V., Angin, P. (2022). *An Empirical Analysis of IDS Approaches in Container Security. IEEE/SRMC'22*, September 2022. **Best Paper Award**. PDF

Books & Edited Volumes

- Karagoz, P., Cekinel, R. F., **Dogan, A. H.**, Oktay, B., Ozturk, A. U., Tonay, S. T., Tunel, B. M. (2024). *Enhancing Underground Built Heritage Analysis with Text Mining: A Case Study on Cappadocia.* In M. Golfarelli, R. Wrembel, G. Kotsis, A. M. Tjoa, & I. Khalil (Eds.), *Valorising Underground Built Heritage in Cappadocia*, pp. 61-92. PDF

Technical Reports

- **Dogan, A. H.**, & Dogan, A. (2021, June). *An Assembled Deep Learning Approach for Flow Field Prediction.* PDF.

Selected Courseworks

Machine Learning (CENG561) *Fall 2023*

- Developed a publicly available intrusion detection dataset for ML/DL models.
- Conducted an ablation study using various ML models (Tree-Based, Ensemble, SVM, etc.) with **scikit-learn** and **PyTorch**.
- Implemented "Decision Trees for Decision-Making under the Predict-then-Optimize Framework" (*PMLR'20*) and "Efficient Optimization for Average Precision SVM" (*NeurIPS'14*) to address dataset imbalance issues.

Optimization for Machine Learning (IAM771) *Spring 2023*

- Analyzed the complexity and convergence of main-stream optimizers like **Adam** and **SGD** present in PyTorch.
- Presented convergence and complexity analyses based on "Adan: Adaptive Nesterov Momentum Algorithm for Faster Optimizing Deep Models" (*ICLR'23*) in a 30-minute seminar.

Deep Generative Models (CENG796) *Spring 2023*
- Proposed an unofficial implementation of "Few-shot Cross-Domain Image Generation via Inference-Time Latent-Code Learning" (*ICLR 2023*). GitHub
- Enhanced latent-code learning in **StyleGAN2** for high-quality image generation in few-shot settings.

Advanced Deep Learning (CENG502) *Spring 2023*
- Re-implemented "Decoupled Adversarial Policy" (DAP) from "Attacking Deep Reinforcement Learning with Decoupled Adversarial Policy" (*ICLR'20*).
- Demonstrated DAP's effectiveness in various **Deep Reinforcement Learning** (DRL) environments. GitHub.

Deep Learning (CENG501) *Fall 2022*
- Reproduced *UM-GCN: Uncertainty-Matching Graph Neural Networks to Defend Against Poisoning Attacks* (*AAAI'20*).
- Enhanced model robustness by integrating GNN and FCN with an uncertainty-aware loss function to mitigate poisoning attacks. GitHub

Research Internship Experience

Two Might Do **Feb 2021 – Jun 2022**
Cyber-Physical Lab., University of California, Irvine (UCI), USA
- **Supervisor**: Assist. Prof. Dr. Mohammad Abdullah Al-Faruque.
- Engineered a deep learning architecture for detecting cardiac and sleep-related diseases from sensory data.
- **Publication**: Accepted at Computing in Cardiology (CinC) 2021

CONTSEC: *High-Performance Intrusion Detection for Software-Defined Container Networks* **2021 – 2022**
- **Funding**: TUBITAK 2247 C STAR Scholarship
- Developed an intrusion detection and prevention pipeline tailored for software-defined container environments in cloud infrastructures.
- Published findings in AINA, contributing to the state-of-the-art in the machine learning for cybersecurity.

Textual Analysis for Irony Detection **Oct 2020 – Oct 2021**
Textual Event Graph HUB (TEGHub) Research Group, METU, Ankara, Turkey
- **Supervisor**: **Supervisor(s)**: Prof. Dr. Pinar Karagoz
- Conducted research on textual event graph analysis for enhanced information retrieval and knowledge discovery on Twitter dataset.
- Implemented an end-to-end neural pipeline integrating GCN and Long Short-Term Memory (LSTM) networks to predict the impact of research papers based on citation patterns and textual content.

Changing Trends in Healthcare Management: Simulation Models for Health Policy Decision Making **2020 – 2021**
- **Funding**: TUBITAK 2247 C STAR Scholarship
- Utilized simulation models to inform evidence-based health policy decisions, focusing on mechatronics applications in healthcare.
- Devised a GCN[1], mapping the healthcare policy papers' citation graph into feature embedding.

Hector Quadrotor Swarm Localization **Jul 2020 – Aug 2020**
KOVAN Research Lab, METU, Ankara, Turkey
- **Supervisor**: Assist. Prof. Dr. Erol Sahin.
- Participated in a multi-agent localization project, approximating numerical solvers for optimal drone positioning in 'self organized swarm behavior'.

[1] Graph Convolutional Network

Teaching Experience

Teaching Assistant (20 hours × 16 weeks) **February 2022 - Present**

- CENG223 Discrete Computational Structures **Fall 2024**
- CENG460 Introduction to Robotics for Computer Science **Fall 2024**
- CENG382 Analysis of Dynamical Systems **Spring 2023**
- CENG242 Programming Language Concepts **Spring 2023**
- CENG424 Logic for Computer Science **Fall 2023**
- CENG223 Discrete Computational Structures **Fall 2023**
- CENG242 Programming Language Concepts **Spring 2022**
- CENG334 Introduction to Operating Systems **Spring 2022**

Undergraduate Teaching Assistant (8 hours × 6 weeks)

- CENG240 Programming with Python for Engineers **Fall 2021**
- CENG111 Introduction to Computer Eng. Concepts **Fall 2020**
- CENG230 Introduction to C Programming **Spring 2019**

Industry Experience

Undergraduate Summer Intern
Informatics and Information Security Research Center, Kocaeli, Turkey **Aug 2021 – Oct 2021**

- Developed features for the Sapphire Cloud at the Cloud Computing and Big Data Research Lab.

Undergraduate Summer Intern
Enocta Inc., Ankara, Turkey **Aug 2020 – Oct 2020**

- Implemented GPT-2 and Text-to-Text Transfer Transformer (T5) models using Python and HuggingFace library for advanced NLP applications.

References

Prof. Dr. Sinan Kalkan, skalkan@ceng.metu.edu.tr, +90 312 210 5547
- Assoc. Professor in Computer Engineering Dept., METU, Ankara.

Assist. Prof. Dr. Emre Akbas, emre@ceng.metu.edu.tr, +90 312 210 5522
- Assist. Professor in Computer Engineering Dept., METU, Ankara.

Assist. Prof. Dr. Hande Alemdar, alemdar@metu.edu.tr, +90 312 210 5591
- Assist. Professor in Computer Engineering Dept., METU, Ankara.