Mehmed Kerem Uludag

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Research Interests

To conduct research and develop AI-driven innovations that address critical challenges in epidemiological healthcare, with the goal of empowering government officials and policymakers to make more informed decisions and implement effective interventions

Education

University of Michigan, Ann Arbor, MI January 2022-April 2025
B.S.E., Computer Science Engineering
- AI/ML Specialization

B.S.E., Robotics
- Algorithm and Path-Planning Specialization

Honors in Engineering

Peer-Reviewed Publications

[1] **Mehmed Kerem Uludag**, Murat Karakus, Evrim Guler, Furkan Ayaz, Suleyman Uludag. *GTN-QoSCAPE: Graph Transformer Network based QoS-Centric Adaptive Path Engineering with Blockchain-Enabled Deep Reinforcement Learning* October, 2024. Submitted to a journal, under-review.

[2] **Mehmed Kerem Uludag**, Murat Karakus, Evrim Guler, Suleyman Uludag. *Adaptive Mitigation of Blackhole Attacks in Blockchain-Enhanced Software Defined Networks* IEEE, IPCCC, International Performance Computing and Communications Conference, November 2024.

[3] **Mehmed Kerem Uludag**, Maryna Veksler, Yasin Yilmaz, Kemal Akkaya. *Deceptive Skies: Leveraging GANs for Drone Sensor Data Falsification*. Proceedings of the 39th ACM/SIGAPP Symposium on Applied Computing, April 2024, pp. 1606-1613. doi:10.1145/3605098.3636059

On-Going Work

[4] *Diffusion-Based Epidemic Time-Series Data Modeling, Forecasting & Counter-Factual Learning* (UMich) AI Lab with Dr. Alexander Rodríguez

[5] *Adaptive RL-Based Mitigation of Stealth Blackhole Aedverserial Attacks in Software Defined Networks*, Journal Paper

Research Experience

UMich AI & Complexity Lab with Dr. Alexander Rodríguez January 2024-Present
- Research/Develop Timeseries Covid-19 data forecasting using Transformer, Autoformer and Informer Models
- Develop a Neural ODE framework for timeseries data modeling/forecasting to enhance predictive accuracy and efficiency

Michigan Autonomous Aerial Vehicles, Student Project Team Janruary 2022-Present
President, (Previous Software Team Lead)
- Strategize and assign Software tasks to team members, foster engagement among new members through onboarding projects, and provide mentorship to ensure their seamless integration and active contribution to the team's goals
- Develop color masking program with OpenCV and ViSP in Python for object detection to localize drone positioning
- Created simulation for competition run in Gazebo to test and analyze autonomous ROS software

Advanced Wireless & Security Lab with Dr. Kemal Akkaya (FIU) June 2023-October 2023
National Science Foundation, Research Experience for Undergraduates (NSF, REU)

- Developed GAN model (TensorFlow) to construct realistic UAV sensor data to fool modern classification systems
- Recreated a deep learning-based anomaly detection system, contributing to a notable 50% increase in the success rate of Adversarial Attacks
- Led effective meetings with the project advisor and mentor, culminating in the acceptance and publication in The 39th ACM/SIGAPP Symposium On Applied Computing

Secure & Intelligent Systems Lab with Dr. Yasin Yilmaz (USF) August 2023-March 2024
- Assisted in labeling and processing image data to support model training and validation.
- Developed hybrid UNet models for semantic image segmentation
- Utilized AIM for machine learning visualization to enhance image processing techniques.

Kotov Lab with Dr. Nicholas Kotov (UMich) May 2022-August 2022
- Explored, developed, and tested several different machine-learning models with the purpose of using nanoparticles as predictors for protein-protein complexes
- Created programs that utilize Osipov-Pickup-Dunmer indices and Hausdorff distance calculations to estimate the theoretical values of molecule chiralities and compare them with physical experimental data

PROJECTS

University of Michigan

EventsHub ~ MHacks Competition September 2023
- Built full-stack UMich event recommender using Microsoft Azure hosted GPT-4 API during MHacks Hackathon
- Offered tailored event recommendations based on users' interests and updated JSON event data online in real time

Eye/Gaze Detector and Tracker ~ Computer Vision February 2023-April 2023
- Implemented real-time algorithm to track the eyes of the user and project the gaze onto the screen being looked at
- Wrote and documented a report of related work, motivations, and conclusion to emulate a miniature publication

MBot development ~ SLAM and Navigation August 2022-December 2022
- Developed A* search algorithm in C and CNN image classification (Pytorch) for robot to navigate and map a maze

Among Us ~ Data Structure and Algorithms October 2022-November 2022
- Implemented Traveling Salesman algorithm and various heuristics to simulate Among Us game in C++

INDUSTRY EXPERIENCE

Bosch, Cross Computing May 2024-August 2024
Automatic Park Assist, Simulation Team Intern
- Developed a Python-based Database Parser, incorporating methods for synthetic data generation and TF-IDF-based tokenization, alongside a user-friendly GUI.
- Contributed to the Ford DAT3 NFM Project by collecting, organizing, and labeling traces of obstacles using Python and PyVisu tools.
- Gained proficiency in Vector CANape tool developing a bounding box Auto Labeler for vehicle traces & height classification

Utilidata Janruary 2024-December 2024
Perot Jain Tech Lab Team
- EV Charger raw current and voltage Raw data collection and Visualization tool development
- Custom Data tagging and labeling for time, ROS vehicle data, and external weather data

UMich ITS, Advanced Research Computing March 2022-Present
Helpdesk Team & Consultant
- Organize, distribute and manage incoming support tickets for questions/issues with High-Performance Cluster

- Develop several shell scripts with API calls to automate creating user logins, Slurm accounts, and class accounts
- Utilize Slurm-sbatch jobs via remote connection to run tests on CPU and GPU nodes to expand research work

Awards & Recognitions

University of Michigan College of Engineering Honors Program — November 2022-Present

Google Computer Science Research Mentorship Program — September 2022-December 2022

Washtenaw Community College Dean's High Honor Roll — May 2021-December 2021

Huron HS Intl. Baccalaureate Career-Related Program — September 2019-June 2021

Scholarships

University of Michigan Grant - $28,000

Michigan EV Scholar Program Scholarship - $5,000

Michigan Comp Scholarship - $6,000

Than N. and Ross A. Barna Scholarship - $1,000

G106781-Thomas Zurbuchen Scholarship - $5,000

Experimental Aviation Association Ray Scholarship Grant - $10,000

Community College Scholar Award - $5,000

Relevant Coursework

Computer Vision: Naive & Machine Learning methods for understanding and tokenizing images

Foundations of AI: Multi-System Agents, Machine & Deep Learning

Large Language Models: Language Tokenization, NLP Scalability, Chain-of-Thought, Prompt-Engineering

SLAM & Navigation: real-time robot navigation & mapping of unknown environments using LiDAR

Robot Operating Systems: ROS framework for various applications

Deep Perception for Robotics: Deep learning methodologies for small robot environment perception

Languages & Skills

- **Languages:** C/C++ (proficient), Python (proficient), Bash (advanced), JavaScript, R
- **Platforms:** Windows, Linux (Ubuntu, Redhat & CentOS), Great Lakes (High-Performance Cluster), Slurm-sbatch jobs
- **Libraries:** PyTorch, TensorFlow, sklearn, OpenCV, ViSP
- **Learning Models:** Convolutional Neural Networks, Generative Adversarial Networks, Transformers
- **Applications:** Docker, Gazebo, Robot Operating System (ROS), GitHub/Version Control, API

Activities

- **Private Pilot Certificate** — June 2020 - Present
  - Pursuing a private pilot certificate via Experimental Aviation Association Ray Scholarship Grant
  - Contributed news pieces to Chapter 333 monthly newsletter about training progress June 2020 - July 2021

- **University of Michigan Men's Rowing Team** August 2022 - May 2023
  - ACRA 2023 National Championship Gold Medal Winner
- **Richmond Park International Secondary School**, Bosnia August 2018 - April 2019
  - Co-founded a Coding Club with IT teacher to inspire coding with classmates
- **Huron High School**, Ann Arbor, MI August 2019 - December 2019
  - Leader of Logistics Team in Library Reform Project
  - Huron High School Men's Rowing Team
- **High School Drone Club, Team Member**, Ann Arbor, MI October 2017 - June 2018
  - Built, programmed, and flight tested a quadcopter for autonomous competition

REFERENCES

Dr. Alexander Rodríguez
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Email: alrodri@umich.edu
Phone: (734) 647-0674

Dr. Kemal Akkaya
Department of Electrical & Computer Engineering at Florida International University
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Dr. Todd J Raeker
Research User Experience Manager for Advanced Research Computing
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