

Ammar Haydari

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RESEARCH INTERESTS

Machine learning for control problems, deep reinforcement learning, constrained optimization, geospatial data analysis, non-parametric models, adversarial learning, differential privacy, and network security.

EDUCATION

University of California Davis (UC Davis)

Davis, CA

Ph.D., Electrical & Computer Engineering

September 2019-Present (Fall 2023)

- *Research:* Deep Reinforcement Learning, Constrained Optimization, Differential Privacy

Major Advisors: Prof. Chen-Nee Chuah, Prof. Michael Zhang

University of South Florida

Tampa, FL

M.Sc., Electrical Engineering

August 2017 – August 2019

- *Research:* Deep Reinforcement Learning, Statistical Anomaly Detection, Sequential Data Analysis

Advisor: Dr. Yasin Yilmaz

Uludag University

Bursa, Turkey

B.Sc., Electronic Engineering

July 2014

- *Thesis:* Adaptive intersect controlling for intelligent transportation systems using computer vision

TECHNICAL SKILLS

Programing skills: Python, MATLAB, C/C++

Frameworks: Tensorflow, Keras, PyTorch, Scikit-Learn, OSMnx, OpenCV

Developer Tools: Spyder, OMNET++, SUMO Traffic Simulator, Linux, Git

RESEARCH PROJECTS

Impact of Learning-based Traffic Signal Controllers on Air Quality (UC Davis)

- Studying constrained optimization models for deep reinforcement learning-based Traffic Signal Controllers and their impact on city level air pollution using real traffic networks. The created pipeline dynamically learns how to adjust the traffic flow in different traffic conditions compared to state-of-the-art adaptive controller mechanisms considering the environmental constraints.

Security Vulnerabilities of Deep Reinforcement Learning based Traffic signal controllers (UC Davis)

- Explored the security vulnerabilities of Deep Reinforcement Learning-based Traffic Signal Controllers in the presence of adversarial attacks. The project proposed an ensemble sequential anomaly detection model that handles the different adversarial attacks without any model assumption and provides more robust controlling environment for dynamic traffic signal controllers.

Differential Privacy for Vehicular Mobility Trajectories(UC Davis- LBNL Joint work)

- Exploring differential privacy-based privacy models for mobility datasets in order to protect user's sensitive location at aggregated and individual trajectory level. The proposed solution generates synthetic mobility dataset with respect to baseline real movements using adversarial learning models such as Sequential GAN, conditional GAN, and recent differential privacy advancements such as adaptive noise injection and sensitive aggregation.

Statistical Anomaly Detection for Intelligent Transportation Systems (M. Sc. Thesis at USF)

- We proposed a nonparametric statistical intrusion detection and mitigation system for different attack types in vehicular network communications. The proposed model is capable for false data injection (FDI) attacks and low rate DDoS attacks. We incorporated both synthetic and real datasets for experimental evaluation of detection and mitigation strategy.

Adaptive Traffic Signal Control Mechanism using Video Object Detection Mechanisms (BS Senior Design project)

- Video-based traffic intersection control mechanism is proposed incorporation with adaptive control models. The proposed method prioritizes the emergency vehicles to other moving objects in the signalized traffic intersections. The study was selected as the second best design project.

PROFESSIONAL EXPERIENCE

Graduate Research Assistant at University of California, Davis

Davis, CA

- Reinforcement Learning, Adversarial Machine Learning, Differential Privacy

September 2019-Present

Graduate Research Assistant at University of South Florida

Tampa, FL

- Statistical Anomaly Detection, Network Security, Machine Learning

August 2017-September 2019

Graduate Research Intern at Lawrence Berkeley National Lab

Berkeley, CA

- Differential Privacy Mechanisms for Vehicular Mobility Datasets.

April – September 2020, June – September 2021

Summer Network Engineer Intern at KocSistem Inc.

Istanbul, Turkey

- Worked with variety of network types such as LANs, WANs, WLANs
- Designed and implemented network based solutions and improved resilience of the network infrastructures

June-August 2013

Summer Intern at ISBAK Transportation Engineering Inc.

Istanbul, Turkey

- Adaptive traffic light controller models are analyzed.
- Image processing models are tested for adaptive traffic controlling.

June-August 2014

PUBLICATIONS

(J) **A. Haydari** and CN. Chuah, M. Zhang “Security of Deep Reinforcement Learning (DRL)-Based Traffic Signal Controllers”, *IEEE Transactions on Intelligent Transportation Systems*, 2021

(J) **A. Haydari**, S. Peisert, C. N. Chuah, J. Macfarlane, M. Zhang, “Adaptive Differentially Privacy Mechanism for Aggregated Mobility Dataset”, under review, *IEEE Transactions on Intelligent Transportation Systems*, 2021

(J) **A. Haydari** and Y. Yilmaz, “Online Intrusion Detection and Mitigation for VANET”, Under Review, *Elsevier Computer Communications*, 2021

(J) **A. Haydari** and Y. Yilmaz, “Deep Reinforcement Learning for Intelligent Transportation Systems: A Survey”, *IEEE Transactions on Intelligent Transportation Systems*, 2020

(C) **A. Haydari**, M. Zhang, C. N. Chuah, & D. Ghosal, “Impact of Deep RL-based Traffic Signal Control on Air Quality.” In *2021 IEEE 93rd Vehicular Technology Conference (VTC2021-Spring)* (pp. 1-6). IEEE, (2021, April).

(C) **A. Haydari** and Y. Yilmaz, “Real-Time Detection and Mitigation of DDoS Attacks in Intelligent Transportation Systems”, *IEEE International Conference on Intelligent Transportation Systems (ITSC)*, 2018

HONORS / AWARDS

Scholarship from European Union

2013

- Erasmus Student Exchange Program in Naples, Italy

Scholarship from Ministry of National Education of Turkey

2017

Graduate Student Fellowship

2019

UC Davis Graduate Studies Travel Award

2021

WORKSHOPS AND SEMINARS

- Lawrence Berkeley Lab Summer Seminar Series

June 2020- August 2020

- 10th Annual Graduate Student Research Symposium, Poster Presentation at USF

March 2018

- Florida Center for Cybersecurity

October 2017

- Intensive Italian Course, University of Naples Federico II, Italy

September – December 2012

- Summer IT Seminar Series

July – September 2013

- SQL database controlling and programming

- Social media mining

- Artificial intelligence

- TransIST 2016, 9th Istanbul Transport Congress and Exhibition

December 2016

MEMBERSHIPS

- IEEE graduate student member,
- IEEE ITS society student member,
- The Chamber of Electrical Engineers of Turkey