Michael Cardei

https://michaelcardei.github.io/ ntr2rm@virginia.edu linkedin.com/in/michael-cardei

Education

University of Virginia, | Ph.D. in Computer Science August 2024 – Present
School of Engineering and Applied Science
Research Focus: Responsible Generative AI (*Advisor: Professor Ferdinando Fioretto*)

University of Florida, | B.S, *Cum Laude* in Computer Science June 2020 – May 2024
Herbert Wertheim College of Engineering | **GPA:** 3.92/4.00
Relevant Courses: Trustworthy Machine Learning (Graduate Course), Applied Machine Learning, Natural Language Processing, Introduction to Multi-Modal Machine Learning, Programming Language Concepts, Engineering Statistics, Operating Systems, Data Structures and Algorithms
Relevant Associations: Gator AI Club, ACM

Research Experience

Graduate Research Assistant August 2024 – Present
University of Virginia, RAISE Lab, Advised by Dr. Fioretto

- Developing foundational methodologies to enable the integration of **constrained optimization within LLMs**.

Research Assistant August 2023 – May 2024
University of Florida, Adaptive Learning and Optimization Lab, Advised by Dr. Thai

- Investigating **privacy vulnerabilities** and exploring implementation strategies within Federated Learning for **Large Language Models**.
- Examining neuron-based explainable AI methods for network intrusion anomaly detection mechanism analysis.

AI/Robotics Research Intern (RISS) June 2023 – August 2023
Carnegie Mellon University Robotics Institution, ILIM Lab, Advised by Dr. Narasimhan

- Researched methods for context-driven road work-zone detection and localization for autonomous vehicles.
- Leveraged advanced **Computer Vision, Deep Learning, and NLP** techniques—including detection, instance segmentation, scene text recognition, and transfer learning.
- Poster, and video available Here, Poster

Research Intern August 2022 – June 2023
Wake Forest University, Advised by Dr. Topaloglu

- Researched novel methods for **bias mitigation and fairness** in medical deep learning applications
- Implemented, optimized, and tested deep learning algorithms while also performing feature engineering, model creation, and model evaluation
- Used multiple Machine Learning frameworks such as TensorFlow, PyTorch, and Keras for the creation and implementation of Deep Neural Networks

Research Intern (REU) May 2022 – August 2022
Wake Forest University School of Medicine, Advised by Dr. Topaloglu

- Researched novel approaches for **Privacy Preserved Machine Learning** based upon data frequency domain transformations
- Created and tested multiple adversarial attacks along with implementing the privacy methods in a **Federated learning** environment. Utilized TensorFlow Federated and TensorFlow Privacy along with other machine learning libraries.
- Presented my research at the Wake Forest REU summer symposium winning 2nd place in the "Cancer, Imaging, and Informatics" session

Publications

1. Ay, S., **Cardei, M.**, Meyer, AM. et al. "Improving Equity in Deep Learning Medical Applications with the Gerchberg-Saxton Algorithm". *Journal of Healthcare Informatics Research* (2024). https://doi.org/10.1007/s41666-024-00163-8 (Full Version)

2. Ghosh, A, Tamburo, R, Zheng, S, Alvarez-Padilla, J, Zhu, H, **Cardei, M**, Dunn, M, Mertz, C, Narasimhan, S, "ROADWork Dataset: Learning to Recognize, Observe, Analyze and Drive Through Work Zones", *arXiv preprint arXiv:2406.07661.*

3. S. Ay, **M. Cardei**, A. Meyer, W. Zhang and U. Topaloglu, "Improving Equity in Deep Learning Medical Applications with the Gerchberg-Saxton Algorithm," in *2023 IEEE 11th International Conference on Healthcare Informatics (ICHI)*, Houston, TX, USA, 2023 pp. 692-694. doi: 10.1109/ICHI57859.2023.00123

4. Narasimhan, S, Tamburo, R, Mertz, C, Reddy, D, Vuong, K, Ghosh, A, Srivastava, S, Boloor, N, Ma, T, **Cardei, M**, Dunn, N, Zhu, H, Automatic Detection and Localization of Roadwork, *Mobility21, Carnegie Mellon University, 2023.*

5. Jacob K Christopher, Brian R. Bartoldson, Tal Ben-Nun, **Michael Cardei**, Bhavya Kailkhura, Ferdinando Fioretto, Speculative Diffusion Decoding: Accelerating Language Generation through Diffusion, *Under Review NAACL.*

6. Seha Ay, Can-Bora Unal, **Michael Cardei**, Suraj Rajendran, Wei Zhang, and Umit Topaloglu, "Advancing Privacy in Deep Learning Through Data Transformations", **Under Review**. Preprint available Here.

Achievements and Awards

Carnegie Mellon University Robotics Institute Summer Scholar June 2023

WeatherOrNot, University of Florida Artificial Intelligence Hackathon Finalist, 3rd Place October 2022

Wake Forest University BME and Informatics Summer Research Scholar May 2022

Skills

- Languages: C++, Python, Java, R, SQL
- Tools/Frameworks: TensorFlow, PyTorch, Keras, MMDetection, Mask2Former, Scikit-Learn, TensorFlow Federated, TensorFlow Privacy, MongoDB, GitHub