Michael Cardei

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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

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,

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.

Publications

1. S. Ay, **M. Cardei**, AM. Meyer, 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. J. Christopher, B. Bartoldson, T. Ben-Nun, **M. Cardei**, B. Kailkhura, F. Fioretto, Speculative Diffusion Decoding: Accelerating Language Generation through Diffusion, *Accepted at ENLSP Workshop - NeurIPS 2024*.

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

4. 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

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

6. A. Seha, U. Can-Bora, **M. Cardei**, S. Rajendran, W. Zhang, and U. Topaloglu, "Advancing Privacy in Deep Learning Through Data Transformations", **Under Review**. Preprint available Here.

Achievements and Awards

Best Paper at UVA LLM Workshop 2024: *Speculative Diffusion Decoding: Accelerating Language Generation through Diffusion*

University of Virginia Computer Science Scholar (2024-2025)

Carnegie Mellon University Robotics Institute Summer Scholar

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

2nd place research presentation in the "Cancer, Imaging, and Informatics" category at the Wake Forest Summer Symposium

Wake Forest University BME and Informatics Summer Research Scholar

Relevant Courses

University of Virginia (Ph.D.)
Graph Machine Learning, Natural Language Processing

University of Florida (B.S.)
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

Skills

- Core Competencies in AI: Constrained Optimization, Privacy, Bias Reduction, Large Language Models, Diffusion Models, Generative AI, Deep Learning, Computer Vision, Federated Learning
- Languages: C++, Python, Java, R, SQL
- Tools/Frameworks: TensorFlow, PyTorch, Keras, MMDetection, Mask2Former, Scikit-Learn, TensorFlow Federated, TensorFlow Privacy, MongoDB, GitHub, Huggingface Transformers