

Maria Cardei

E-mail: mariacardei7@gmail.com
Website: <https://mariacardei.github.io/>
LinkedIn: www.linkedin.com/in/mariacardei

Education

- **Ph.D. in Computer Science (AI for Computational Behavior Modeling)** — Expected 2028
University of Virginia, Charlottesville, VA, USA (Advisor: Professor Afsaneh Doryab)
 - GPA: 4.0
 - **B.S. in Biomedical Engineering, minor in Computer Science** — May 2023
University of Florida, Gainesville, FL, USA
 - GPA: 3.94
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Research Interests

Computational behavior modeling, AI for health, passive sensing, precision health

Publications

- A. Balch, **M. Cardei**, & A. Doryab, “Exploring Smartphone-based Spectrophotometry for Nutrient Identification and Quantification”, Preprint available at arXiv:2410.11027 [physics.med-ph]. Paper under review.
 - A. Balch, **M. Cardei**, S. Kranz, A. Doryab, "Towards an Accessible, Noninvasive Micronutrient Status Assessment Method: A Comprehensive Review of Existing Techniques", Preprint available at arXiv:2408.11877 [q-bio.QM]. Paper under review.
 - T. Mullick, **M. Cardei**, S. Ahmed, A. Doryab, "Novel Image Representation of Mobile and Wearable Time Series Data to Highlight Differences in Behavioral Patterns." Paper under review.
 - **M. Cardei**, A. Doryab, "Practical Heuristics for Victim Tagging During a Mass Casualty Incident Emergency Medical Response", paper in *2024 IEEE 20th International Conference on Automation Science and Engineering (CASE)*, Bari, Italy 2024.
 - **M. Cardei**, A. Doryab, “Multi-Agent System for Optimizing Victim Tagging in Human/Autonomous Responder Team”, abstract in *2024 15th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS)*, Hong Kong, China 2024.
 - S. Davidashvilly, **M. Cardei**, M. Hssayeni, C. Chi, B. Ghoraani, “Deep neural networks for wearable sensor-based activity recognition in Parkinson's disease: investigating generalizability and model complexity”, paper in *Biomedical Engineering Online*. 2024.
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Research Experience

- Graduate Research Assistant — August 2023-present
University of Virginia, Charlottesville, VA, USA (Advisor: Professor Afsaneh Doryab)
 - Designing an accessible, non-invasive device to assess internal biological processes
 - Detecting movement patterns with a novel framework for partial trajectory matching; utilizing image analysis techniques, object detection, Siamese Neural Networks
 - Divulging and analyzing human behavioral rhythms utilizing machine learning techniques
 - Formally defined a multi-agent problem, and designed and tested on-the-go, distributed heuristics; used agent-based modeling to simulate scalable, generalizable scenarios
 - Assisted in developing and applied a novel image representation technique to human activity recognition data to reveal behavioral differences within a person and between people
 - NSF REU Research Intern — May 2022-January 2023
Florida Atlantic University Institute for Sensing and Embedded Network Systems Engineering (I-SENSE), Boca Raton, FL, USA (Mentor: Professor Behnaz Ghoraani)
 - Researched/applied domain adaptation techniques with Python for human activity recognition to generalize models to the Parkinson's population
 - Evaluated effects of data augmentation and CNN model complexity
 - REU Research Intern — May-August 2021
Wake Forest Center for AI Research, Winston Salem, NC, USA (Mentor: Professor Metin Gurcan)
 - Detected cell nuclei in medical pathology images using deep learning and image processing techniques
 - Implemented a Faster RCNN model using MATLAB and Python
 - Pre-processed input data for a neural network
 - Researched and presented advanced object detection algorithms
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Teaching Experience

- Graduate Teaching Assistant for Computational Behavior Modeling (CS6501) — Fall 2024
University of Virginia, Charlottesville, VA, USA
 - Manage assignments, host office hours, and aid discussion for 17 graduate students
- Teaching Assistant — June-August 2023
Girls Who Code Summer Immersion Program, Virtual
 - Virtually delivered an engaging game design curriculum to high school girls (JavaScript, p5.js library)
 - Collaborated with the teaching team to foster an inclusive environment for students to explore the STEM field
 - Debugged and checked over student projects during office hours, offering personalized assistance

- Teaching Assistant for Elements of Electrical Engineering (EEL3003) — Fall 2020
University of Florida, Gainesville, FL, USA
 - Taught students course material at weekly office hours
 - Responsible for grading assignments and Arduino Build Reports
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Course Experience

Graduate:

Machine Learning for Image Analysis; Natural Language Processing; Machine Learning; Human-Robot Interaction; Cyber-Physical Systems: Formal Methods, Safety and Security; Cyber-Physical Systems: Technology and Ethics; Computational Behavior Modeling; Signal Processing, Machine Learning, and Control

Undergraduate:

Introduction to Data Science, Introduction to Multimodal ML in Python, Operating Systems, Introduction to Computer Organization, Data Structures/Algorithms, Programming Fundamentals 1 & 2, Applied Discrete Structures, Clinical Engineering Design, Quantitative Physiology, Computer Applications for Biomedical Engineering, Biosignals & Systems, Biomedical Instrumentation

Service Experience

- Charlottesville High School Mentorship Program Mentor— August 2024-present
University of Virginia, Charlottesville, VA, USA
 - Co-mentor senior high school student in his engineering capstone project
 - Weekly check-ins with student to assist with technical questions and time management
- Paper Reviewer — March 2024-present
University of Virginia, Charlottesville, VA, USA
 - Provided reviews of 3 potential publications for *ACM Health* and *IMWUT*
- Computer Science Graduate Student Group Social Chair — January 2024-present
University of Virginia, Charlottesville, VA, USA
 - Coordinate, plan, and run 2-3 social events every month for CS graduate students
 - Elected by computer science graduate students for a one-year term
- Outreach Event Volunteer — January 2024-present
University of Virginia, Charlottesville, VA, USA
 - Represented the UVA CS graduate program at 3 graduate and faculty recruitment events
 - Panelist at new graduate student orientation discussion “What to Expect at UVA CS”
- Wake Forest Biomedical Informatics Internship Alumni Panelist — June 2023
Wake Forest University, Winston Salem, NC, USA
 - Invited to speak at “How to Find the Right Career Path” discussion panel for current undergraduate student interns

- Sparked insightful discussion about career paths and inspired students to consider graduate school
- Content Co-developer and Co-teacher — June 2022
Florida Atlantic University I-DeepLearn Summer Outreach Program, Boca Raton, FL, USA
 - Co-developed and delivered curriculum for I-DeepLearn summer outreach program
 - Introduced high school girls to deep learning through hands-on projects

Projects

- Natural Language Processing Course Project – Fall 2024
University of Virginia, Charlottesville, VA, USA
 - Developing a large language model utilizing Retrieval-Augmented Generation (RAG) for STEM tutoring system targeting elementary-aged students
- Machine Learning Course Project — Spring 2024
University of Virginia, Charlottesville, VA, USA
 - Performed image analysis techniques for partial trajectory matching and pattern detection
- Cyber-Physical Systems: Formal Methods, Safety and Security Course Project — Spring 2024
University of Virginia, Charlottesville, VA, USA
 - Applied XAI techniques to depression detection models
- Human-Robot Interaction Course Project — Spring 2024
University of Virginia, Charlottesville, VA, USA
 - Designed and performed controlled user study with NAO robot to test robot persuasiveness in a customer service setting
 - Programmed NAO robot to recognize speech and have an interaction with participants
 - Use statistical analyses to determine robot persuasiveness
- Signal Processing, Machine Learning, and Control Course Project — Fall 2023
University of Virginia, Charlottesville, VA, USA
 - Used a smartwatch (ASUS Zenwatch 2) for human activity recognition
 - Collected and pre-processed data, and implemented more than 10 machine learning models and feature selection for human activity recognition
- Senior Design Project in Collaboration with HangTech LLC — August 2021-May 2022
University of Florida, Gainesville, FL, USA
 - Designed a device and system that detects and classifies tremors for Parkinson's and Essential Tremor patients
 - Collected accelerometer data with Arduino
 - Utilized MATLAB and Python to develop a machine learning classification model
- Shellhacks 2021 Hackathon — September 2021
University of Florida, Gainesville, FL, USA

- Collaborated to develop a website application that suggests recipes from input ingredient items to reduce food waste
 - Utilized HTML, JavaScript, CSS, Python

 - Computer Applications for Biomedical Engineering Course Project — Fall 2020
University of Florida, Gainesville, FL, USA
 - Detected Diabetic Retinopathy (DR) in fundus images using image processing techniques
 - Developed a MATLAB model to import dataset, preprocess images, eliminate vessels, subtract optic disks, segment exudates, and classify DR severities
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Accomplishments, Awards, and Honors

- President's Provost Fellowship — August 2023-August 2028
University of Virginia, Charlottesville, VA, USA

- National Science Foundation National Research Traineeship (NRT) (Cyber-Physical Systems) — August 2023-August 2024
University of Virginia, Charlottesville, VA, USA

- Poster Presentation: **M. Cardei**, H. Binol, M. Gurcan, L. Cooper, D. Jaye, Nuclei Detection in Immunohistochemical Images of Diffuse Large B-Cell Lymphoma using Deep Learning, *Biomedical Engineering Society (BMES) Conference*, October 2021.
Orlando, Florida, USA

- President's Honor Roll — May 2020
University of Florida, Gainesville, FL, USA

- Florida Bright Futures Scholarship – July 2018-May 2023
University of Florida, Gainesville, FL, USA