Andrew Balch

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EDUCATION

University of Virginia, Charlottesville, VA Spring 2025
Bachelor of Science, Computer Science, 3.92 GPA
Relevant Courses: *Human-Computer Interaction (Graduate), Machine Learning (Graduate), Mathematical Statistics, Data to Knowledge, Systems of Inequality, Politics of Modernity*

Universitat Politécnica de Valéncia, Valéncia, Spain Fall 2022
Engineering study abroad program

Governor's School for Science and Technology | York High School, Yorktown, VA Spring 2021
Advanced Diploma, Dual-enrolled, 4.75 GPA

RESEARCH EXPERIENCE

Undergraduate Researcher, *UVA Human-AI Technology Lab* May 2022 - Present

- Wrote 3 papers and 2 conference abstracts as a first author, incl. a scoping literature review
- Collaborated with PhD students on 3 diverse research projects aimed at addressing social issues, as both a project leader and a contributor
- Onboarded and managed 62 participants for a semester-long Human-Computer Interaction study on communicating wellness information through music
- Supported by $9,600 in funding across two UVA Dean's Research Fellowships
- Served as a peer reviewer for ACM Transactions on Computing for Healthcare

Micronutrient Status Assessment, *advised by Professor Afsaneh Doryab* May 2022 – Present

- Lead a team of 3 PhD and undergrad students on a 2.5 year-long, interdisciplinary project leveraging ubiquitous devices and machine learning to gain insights into micronutrient status
- Prioritized accessible design to lower barriers to assessment in underserved communities
- Analyzed the state-of-the-art literature in the field and consulted with domain experts to write a comprehensive survey paper
- Coordinated an inter-lab, inter-departmental collaboration to explore the potential of smartphone-based spectrophotometry for micronutrient quantification
- Prototyped a smartphone attachment to measure the concentration of a key micronutrient with an accuracy of 91.3% using only a simple image
- Mentored a high school student as they contributed to a signal analysis pipeline

B.S.C.S. Capstone Research, *advised by Professor Afsaneh Doryab* Dec. 2023 – Apr. 2024

- Integrated machine learning and statistical analysis into a Sankey diagram to give surgeons and clinicians more valuable and actionable information about rectal cancer treatment
- Leveraged ensemble ML techniques and feature selection to identify and model critical treatment pathways associated with specific clinical outcomes

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- Proposed a novel feature selection technique for identifying meaningful features across an event-sequence, without being biased towards earlier events
- Developed in collaboration with the Chief of Colorectal Surgery at Emory Cancer Center, using detailed patient treatment data from 6 cancer hospitals
- Wrote a research-focused technical report, to be included in my engineering thesis

Reinforcement Learning, *advised by Professor Afsaneh Doryab* May 2023 – Dec. 2023

- Researched knowledge transfer between RL policies in safety-constrained environments
- Implemented and evaluated state-of-the-art and novel approaches to this problem, including Model-Agnostic Meta Learning, Policy Distillation, and Successor Features-based techniques

Research Mentorship, *The MITRE Corporation* Sep. 2020 – Apr. 2021

- Mentored under a software engineer and cybersecurity expert at The MITRE Corporation
- Analyzed behavior of 17,000 Android malware samples scraped from database
- Presented a novel, deep learning-based behavior forecasting solution in TensorFlow to industry professionals

Cancer Treatment Modeling, *Emory Cancer Center* Apr. 2020 – Sep. 2020

- Cleaned and analyzed treatment data set with Excel, Pandas, Sci-Kit Learn, MatPlotLib
- Aimed to understand prognoses and infer optimal treatment plans for over 1,800 patients

International Science and Engineering Fair Project Aug. 2019 – Feb. 2020

- Designed, developed, and tested an autonomous robotics system powered by induction
- Proved wireless power would cut cycle time by > 50%, built system infrastructure on AWS

PUBLICATIONS

Balch, Andrew, Cardei, Maria A., Doryab, Afsaneh. (2024). "Exploring Smartphone-based Spectrophotometry for Nutrient Identification and Quantification." *arXiv preprint arXiv:2410.11027*.

Under review at IEEE International Conference on Pervasive Computing and Communications.

Balch, Andrew, Cardei, Maria A., Kranz, Sibylle, Doryab, Afsaneh. (2024). "Towards an Accessible, Noninvasive Micronutrient Status Assessment Method: A Comprehensive Review of Existing Techniques." *arXiv preprint arXiv:2408.11877*.

Under review at ACM Transactions on Computing for Healthcare.

Balch, Andrew. (2024). "Why Algorithms Remain Unjust: Power Structures Surrounding Algorithmic Inequality." *arXiv preprint arXiv:2405.18461*.

Pending submission to ACM Conference on Human Factors in Computing Systems.

PRESENTATIONS & DEMOS

Balch, Andrew, Doryab, Afsaneh. (Nov. 2024). "Feasibility of Smartphones for Accessible, Noninvasive Micronutrient Assessment." *Abstract and demo at ACM International Conference on Mobile Computing and Networking.*

Balch, Andrew, Doryab, Afsaneh. (Nov. 2024). "Towards Smartphone-Based Monitoring of Micronutrient Status." *Abstract and poster at ACM International Conference on Bioinformatics, Computational Biology and Health Informatics.*

Balch, Andrew, Doryab, Afsaneh. (Oct. 2024). "Data-Driven Event Sequence Visualization of Rectal Cancer Outcomes" *Poster session at UVA Engineering Research Expo, Charlottesville, VA*.

Balch, Andrew, Doryab, Afsaneh. (Apr. 2024). "Using Smartphones to Hack Human Micronutrition." *Poster session at Commonwealth Cyber Initiative Symposium, Richmond, VA*.

Balch, Andrew, Doryab, Afsaneh. (Oct. 2023). "Smartphone-Based Spectrophotometer for Vitamin B12 Quantification" *Poster session at UVA Engineering Research Expo, Charlottesville, VA*.

HONORS & AWARDS

Outstanding Undergraduate Researcher – Nominee *Computing Research Association*	October 2024
Dean's Undergraduate Research Fellowship	Summer 2024
Outstanding Undergraduate Research - Honorable Mention *Computer Science Department*	April 2024
Dean's List	Fall 2021 – Spring 2024
Dean's Undergraduate Research Fellowship	Summer 2023
Outstanding Undergraduate Research *UVA Computer Science Department*	April 2023
Highest Honors in Research Methodology and Ethics *Governor's School for Science and Technology*	Spring 2021
First Place at Tidewater Science and Engineering Fair	March 2020

SKILLS

Research: Experienced taking an interdisciplinary, critical approach to addressing social problems

Programming: Adept in Python, R, Java, and C/C++ as well as Git, AWS, and Kubernetes

Analysis Tools: Developed projects with TensorFlow and PyTorch, proficient in MatLab, SAS, Excel, and SQL

Data Science: Applied exploratory data analysis, regression analysis, data embedding, etc. in professional contexts

Prototyping: Hands-on experience building devices with 3D printing, microcontrollers, sensors, IoT

Languages: Spanish at an intermediate level

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