Andrew Balch

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EDUCATION

University of Virginia, Charlottesville, VA Spring 2025
Bachelor of Science, Computer Science, 3.92 GPA
Relevant Graduate Courses: *Human-Computer Interaction, Machine Learning*
Relevant Undergraduate Courses: *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

- Awarded $9,600 in funding through two UVA Dean's Research Fellowships (2023, 2024)
- 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
- 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 multi-year, 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 3D-printed smartphone attachment to measure the concentration of a key micronutrient from an image with an accuracy of 91.3%
- Demonstrated the prototype at the *ACM Conference on Mobile Computing and Networking*
- 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

- Collaborated with the Chief of Colorectal Surgery at Emory Cancer Center, using detailed patient treatment data from 6 cancer hospitals
- 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
- Proposed a novel feature selection technique for identifying meaningful features across an event-sequence, without being biased towards earlier events
- Presented a poster at the *UVA Engineering Research Expo*
- Wrote a research-focused technical report, to be included in my undergraduate 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 using PyTorch, 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 with Java, C++, and Python

PAPERS

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.

ACCEPTED POSTERSS & DEMOS

Balch, Andrew, Doryab, Afsaneh. (Nov. 2024). "Feasibility of Smartphones for Accessible, Noninvasive Micronutrient Assessment." A*bstract and demo presentation 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 (unable to attend).*

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

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

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

HONORS & AWARDS

Student Research Competition – 3rd Place, Undergraduate Category November 2024
ACM Conference on Mobile Computing and Networking

Outstanding Undergraduate Researcher – Nominee October 2024
Computing Research Association

Dean's Undergraduate Research Fellowship Summer 2024
UVA School of Engineering and Applied Science

Dean's Undergraduate Research Fellowship Summer 2023
UVA School of Engineering and Applied Science

Outstanding Undergraduate Research April 2023
UVA Computer Science Department

Outstanding Undergraduate Research – Honorable Mention April 2024
UVA Computer Science Department

Dean's List Fall 2021 – Present

Highest Honors in Research Methodology and Ethics Spring 2021
Governor's School for Science and Technology

First Place at Tidewater Science and Engineering Fair March 2020

SKILLS

Research: Qualtrics, exploratory data analysis, visualization, regression analysis, statistical testing

Programming Languages: Python, Java, C, C++, Prolog, OCaml, R, SAS

Software Development: Git, Django, SQL, Heroku, Google Cloud, AWS, Kubernetes

Data Analysis: Pandas, TensorFlow, PyTorch, Sci-Kit Learn, Seaborn, MatPlotLib, Plot.ly, SciPy

Prototyping: Autodesk Inventor, SolidWorks, 3D printing, Arduino, Raspberry Pi

Languages: Spanish at an intermediate level