

# Andrew Balch

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## EDUCATION

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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:** *Programming Languages, Mathematical Statistics, Data to Knowledge, Systems of Inequality, Politics of Modernity*

Universitat Politècnica de València, València, 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 at Virginia Peninsula Community College, 4.75 GPA**

## RESEARCH EXPERIENCE

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**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 applying computer science tools to address 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

**Cultural Privacy Needs in Mobile Applications, class project (HCI)** Aug. 2024 – Dec. 2024

- Designed a Qualtrics survey to collect demographic data and app permissions granted in a variety of descriptive scenarios
- Analyzed results with statistical testing to understand the needs of diverse groups

**Small Language Model Unlearning, class project (Machine Learning)** Aug. 2024 – Dec. 2024

- Fine-tuned small language models locally on a harmful dataset (hateful tweets)

- Evaluated the real-world effectiveness of unlearning methods for ameliorating harms induced by training data

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

- Collaborated with the Chief of Colorectal Surgery at Emory University Healthcare and Winship 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

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

*Under review at ACM Conference on Human Factors in Computing Systems (alt.chi track).*

**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.*

## ACCEPTED POSTERS & DEMOS

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**Balch, Andrew, Doryab, Afsaneh.** (Nov. 2024). "Feasibility of Smartphones for Accessible, Noninvasive Micronutrient Assessment." *Abstract 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

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<b>Outstanding Undergraduate Researcher – Finalist</b> <i>Computing Research Association</i>	December 2024
<b>Student Research Competition – 3<sup>rd</sup> Place, Undergraduate Category</b> <i>ACM Conference on Mobile Computing and Networking</i>	November 2024
<b>Dean's Undergraduate Research Fellowship</b> <i>UVA School of Engineering and Applied Science</i>	Summer 2023 & 2024
<b>Outstanding Undergraduate Research</b> <i>UVA Computer Science Department</i>	April 2023
<b>Outstanding Undergraduate Research – Honorable Mention</b> <i>UVA Computer Science Department</i>	April 2024
<b>Computer Science Graduate School Application Fund Scholarship</b> <i>UVA School of Engineering and Applied Science</i>	November 2024
<b>Dean's List</b>	Fall 2021 – Present
<b>Highest Honors in Research Methodology and Ethics</b> <i>Governor's School for Science and Technology</i>	Spring 2021
<b>First Place at Tidewater Science and Engineering Fair</b>	March 2020

## SKILLS

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**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

## VOLUNTEERING

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**Phone Bank Volunteer, Democratic National Committee**

Aug. 2020 – Nov. 2020