# Caleb Hallinan

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## EDUCATION

**PhD in Biomedical Engineering** *August 2023 – Present*
Johns Hopkins University, Baltimore, MD

**Bachelor of Arts in Statistics and Biology** *August 2017 – May 2021*
University of Virginia, Charlottesville, VA

## RESEARCH EXPERIENCE

**Biomedical Engineering Graduate Student** *August 2023 – Present*
*Johns Hopkins University*
*Advisor: Jean Fan, PhD*

- Utilize deep-learning to predict spatial gene expression using features learned from histopathological images

**Research Assistant II** *September 2021 – June 2023*
*Boston Children's Hospital & Harvard Medical School*
*Advisor: Kwonmoo Lee, PhD*

- Developed a feature selection algorithm to discover novel subtypes in gene, protein, and image data
- Investigated live cell images from breast cancer stem cells using machine learning and image analysis techniques
- Employed deep-learning algorithms for cell segmentation and feature extraction
- Managed Linux servers, order materials, and present recent research papers to fellow lab mates

**Undergraduate Research Assistant** *May 2020 – August 2021*
*Focused Ultrasound Foundation & University of Virginia*
*Advisors: Frederic Padilla, PhD & Tianxi Li, PhD*

- Performed statistical analysis on flow cytometry data to deduce the effect of focused ultrasound on mice tumors
- Transformed, analyzed, and visualized brain tumor data to distinguish normal brain matter from tumor tissue
- Developed R and Python files to read in data and implement machine learning techniques
- Transferred R-version of the package 'randnet' to Python

## TEACHING EXPERIENCES

**Teaching Assistant**, Data Science for Public Health I/II *January 2024 – May 2024*
*Biostatistics Department, Johns Hopkins Bloomberg School of Public Health*

- Facilitate student understanding of data science concepts by holding office hours and grading assignments

**Teaching Assistant**, Computational Analysis of Heterogeneity in Cellular Images Nano Course *January 2023*
*Harvard Medical School Curriculum Fellows Program, Harvard Medical School*

- Guided 20 participants in understanding basic algorithms of segmentation, edge detection, and tracking of cells
- Worked with participants in a hands-on experience of analyzing live-cell image datasets

**Teaching Assistant**, Regression Analysis *January 2020 – May 2021*
*Statistics Department, University of Virginia*

- Oversaw 80 students while aiding in their understanding of regression in a SAS, project-based course
- Held office hours, graded assignments, and answered specific questions during class

**Teaching Assistant**, Introduction to Chemistry Lab *September 2019 – December 2019*
*Chemistry Department, University of Virginia*

- Supervised 24 students in weekly labs, designed presentations, graded assignments, and held office hours

## PUBLICATIONS

**Journal Papers:**

**J2.** J. Jang, Y. Kim, B. Westgate, Y. Zong, **C. Hallinan**, A. Akalin, and K. Lee. "Screening Adequacy of Unstained Fine Needle Aspiration Samples Using a Deep Learning-based Classifier." *Scientific Reports, 2023.*
**J1.** J. Jang, **C. Hallinan**, and K. Lee. "Protocol for live cell image segmentation to profile cellular morphodynamics using MARS-Net." *STAR Protocols, 2022.*

**Papers Under Review:**

**P1.** A. Abul-Basher*, **C. Hallinan***, and K. Lee. "Heterogeneity-Preserving Feature Selection for Subtype Discovery." *Equal Contributors

## INVITED TALKS AND PRESENTATIONS

**Poster Presentations:**

**P2.** "Phenotyping of Heterogenous Live Cell Motility and Morphology," Dr. M. Judah Folkman Research Day, Boston Children's Hospital & Harvard Medical School, Boston, MA, 2023.

**P1.** "Deep-Hetero: A Deep Metric Learning with UMAP-based Clustering Approach for Identifying Heterogeneity in Cells," Dr. M. Judah Folkman Research Day, Boston Children's Hospital & Harvard Medical School, Boston, MA, 2022.

**Oral Presentations:**

**O3.** "Deconvolution of Cellular Heterogeneity for Sub-Type Discovery by Analyzing Feature Variation," Vascular Biology Program Work in Progress, Boston Children's Hospital & Harvard Medical School, Boston, MA, 2022.

**O2. "**Machine Learning Approaches Applied to the Prediction of Covid-19 Spread and Cell Motility Phenotyping," Vascular Biology Program Work in Progress, Boston Children's Hospital & Harvard Medical School, Boston, MA, 2022.

**O1. "**Ultrasound Microbubble Tumor Analysis," Focused Ultrasound Foundation Summer Intern Presentations, Focused Ultrasound Foundation, Charlottesville, VA, 2021.

## VOLUNTEERING AND OUTREACH

**Statistics Alumni Panel & Biostatistics Symposium** *October 2022*
*Statistics Department, University of Virginia*

- Talked about experiences at UVA Statistics Department to 250+ college students
- Engaged with audience regarding questions post graduating and current research work

**Lee Lab Diversity Outreach Video** *March 2022*
*Boston Children's Hospital & Harvard Medical School*

- Created a five-minute introduction of the Lee Lab using videos, images, and an AI generated voice
- Reached out to students from a diverse background in local high schools

**Volunteer Leader** *March 2018 – May 2021*
*Young Life, University of Virginia*

- Lead a collaborative, volunteer leadership team providing guidance to students at The Covenant School
- Coordinated and executed events by creating a safe and encouraging environment for more than 100 students

## HONORS AND AWARDS

- Graduated with Distinction – Highest Honors Possible *May 2021*
- Dean's List – 4/5 Possible Semesters *January 2018 – December 2019*

## SKILLS

- Proficient in: Python, R, R Markdown, TensorFlow, Shell Script, SAS, Word, Excel, ImageJ and PowerPoint
- Experience with: SQL, Git, MATLAB, Mathematica, LaTeX, HTML, CSS, and C
- Machine Learning, Deep Learning, AI, Statistical Analysis, Data Science, Cell Biology, Omics Analysis

## REFERENCES

References available upon request.