Dakota Y. Hawkins

Curriculum Vitae

Contact

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Education

2016 – 2023 Doctor of Philosophy, **Boston University**, Boston, MA
Bioinformatics | Cynthia A. Bradham Laboratory

2010 – 2015 Bachelor of Science, **Westminster College**, Salt Lake City, UT
cum laude | Majors: Biology and Mathematics

Professional History

2016 – 2023 Boston University, Boston, MA
Doctoral Student
Thesis: *Understanding Cell-Type Diversification During Developmental Pattern Formation in Sea urchin Embryos Using Single Cell and Molecular Approaches*

2015 – 2016 Pacific Northwest National Laboratory, Richland, WA
Post Baccalaureate Research Assistant
Worked in the Applied Statistics and Computational Modeling group under the Computational and Statistical Analysis division. Developed new quantitative tools across various projects to analyize -omics datasets, including microbiome, metabolomic, and proteomic projects.

2013 – 2015 Westminster College, Salt Lake City, UT
QUARC Student Statistics Consultant
Helped develop quantitative reasoning on Westminster College Campus. Responsibilities focused on aiding in statistical analysis for local projects, teaching in-class lessons, and devoloping new quantitative literacy courses for Westminster College

Research

May 2017 – Jun. 2023 **Cyndi Bradham Laboratory** Boston University, Boston, MA
- Developed a novel machine learning algorithm to accurately identify cell states in mixed-condition scRNA-seq datasets.
- Mechanisictly characterized cell type diversication of skeletal lineage cells in sea urchins using multi-condition scRNA-seq data consisting of 5 time points and 6 experimental conditions.
- Developed novel computational and machine learning workflows to integrate 3D single-molecule fluorescence imaging data with scRNA-seq data to infer embryonic locations of scRNA-seq defined cell types.

Jan. 2017 – May 2017 **Paola Sebastiani Laboratory** Boston University, Boston, MA
- Performed eQTL analysis on whole-genome and bulk RNA-seq data to establish tissue-specific biomarkers for Alzheimer's disease.

Sept. 2016 – Dec. 2016 **Stefano Monti Laboratory** Boston University, Boston, MA
- Determined cancer-specific immune response in tumor cells by leveraging general linear models to identify key signatures in bulk RNA-seq.

Jul. 2016 – Sept. 2016 **James Galagan Laboratory** Boston University, Boston, MA
- Conducted and analyzed ChIP-seq and RNA-seq experiments to help map the transcriptional regulatory network of *E. coli*.

Jul. 2015 – Jul. 2016	**Pacific Northwest National Laboratory**, Richland, WA • Performed multi-omic analysis to identify key signal differences in metabolomic consumption and microbiome composition between successful and unsuccessful gastric bypass patients. • Ran analysis pipelines for protein-based stable isotope experiments to generate final results and summary statistics. • Created software workflows to visualize and quantify spliceforms in high-throughput proteomic data.
2012 – 2014	**Westminster College**, Salt Lake City, UT • Developed a novel Python program to algorithmically identify singing on the nest in hundreds of field recordings of Northern Mockingbirds. • Collected and and performed signal processing on hundreds of field recordings to compare urban and non-urban House Finch song dialects.
Jan. 2012 – Jun. 2012	**University of Utah Health Care**, Salt Lake City, UT • Performed reverse transcription and PCR experiments to help identify genetic components of fibromyalgia and chronic fatigue

Programming Languages and Tooling

Python:	Used for data analysis, machine learning, and package development. https://github.com/BradhamLab/icat
R:	Used for -omics data analysis and visualization. https://github.com/BradhamLab/scPipe
Snakemake:	Used to generate stable and modular pipeline workflows. https://github.com/BradhamLab/indrops-star
C++:	Extended existing Louvain library for semi-supervised clustering. https://github.com/BradhamLab/sslouvain
git:	Used for version control and collaboration. https://github.com/dakota-hawkins
conda:	Environment handling and package installation for reproducible analysis.
linux:	Used for analysis in a high-performance cluster as well as daily use.
SQL:	Used to create lab databases for dataset annotation.

Publications

2023 *ICAT: A Novel Algorithm to Identify Cell-types in scRNA-seq Perturbation Experiments*
Bioinformatics https://doi.org/10.1093/bioinformatics/btad278
Hawkins DY, Zuch DT, Huth J, Rodríguez-Sastre N, McCutcheon KR, Glick A, Lion AT, Thomas CF, Descoteaux AE, Johnson WE, and Bradham CA

2023 *Voltage-gated sodium channel activity mediates sea urchin larval skeletal patterning through spatial regulation of Wnt5 expression*
Development https://doi.org/10.1242/dev.201460
Thomas CF, **Hawkins DY**, Skidanova V, Marrujo SR, Gibson J, Ye Z, and Bradham CA

2023 *Ethanol exposure perturbs sea urchin development and disrupts developmental timing*
Developmental Biology https://doi.org/10.1016/j.ydbio.2022.11.001
Rodríguez-Sastre N, Shapiro N, **Hawkins DY**, Lion AT, Peyreau M, Correa AE, Dionne K, and Bradham CA

2023 *Singing on the nest is a widespread behavior in incubating Northern Mockingbirds and increases probability of nest predation*
Ornithology https://doi.org/10.1093/ornithology/ukad010
Stracey CM, Sanchez K, Brown B, **Hawkins DY**, and Shepherd T

2022 *Lipoxygenase is a Developmental Skeletal Patterning Cue*
(in revision)
Zuch DT, **Hawkins DY**, Huth J, Rose S, Lamba A, Dionne K, Li C, Murray I, Patel V, Piacentino ML, and Bradham CA

Posters and Presentations

2021 *Optimizing Feature Selection in High-Dimensional RNA-seq Data*

Annual Biomedical Research Conference for Minority Students
Baringa ZI, **Hawkins DY**, and Bradham CA
Award winning research presented by student mentee, Zoey Baringa

2021 *A Pipeline for Constructing a 3D Coordinate Map of PMCs in Developing Embryos*
Annual Biomedical Research Conference for Minority Students
Hughes MM, **Hawkins DY**, McCutcheon K, Glick A, Rodríguez-Sastre N, Bradham CA
Research presented by student mentee, Madeline Hughes

2020 *ICAT: A Novel Method for Identifying Cell-types across Treatments in Single-cell*
RNA Sequencing Data
Bioinformatics Open House
Hawkins DY, Zuch DT, Huth J, and Bradham CA
Award-winning poster unveiling a new algorithm to accurately identify cell-types across biological conditions.

2019 *Subpopulation Discovery During Patterning-Induced Developmental Diversification in Sea Urchin Embryos via Single-Cell RNA-Seq*
Society for Developmental Biology
Hawkins DY, Zuch DT, Huth J, and Bradham CA
Presented work showcasing subpopulation disruption during perturbation experiments.

2018 *Automated Identification of Primary Mesenchyme Cells in Confocal Images*
International Conference for the Developmental Biology of the Sea Urchin XXV
Hawkins DY and Bradham CA
Presented a computer vision algorithm to identify 3 Dimensional cell boundaries.

2017 *Subpopulation Discovery During Patterning-Induced Developmental Diversification in Sea Urchin Embryos via Single-Cell RNA-Seq*
The International Workshop on Bioinformatics and Systems Biology
Hawkins DY, Shi X, Hackett W, Zuch DT, Huth J, and Bradham CA
Presented work identifying novel subpopulations of Primary Mesenchyme Cells during sea urchin development.

2014 *Detecting Singing on the Nest*
Westminster College Undergraduate Research Conference
Hawkins DY, Sanchez K, Shepherd T, Stracey CM
Presented undergraduate work to automatically isolate bird songs in field recordings.

2014 *An Interdisciplinary Quantitative Analysis and Research Cooperate (QUARC) at*
Westminster College
Electronic Conference on Teaching Statistics
Bynum B and **Hawkins DY**
Helped present current activities and goals of QUARC to promote quantitative reasoning at

2014 *O Captain! My Captain!*
Mathematical Association of America, Intermountain Section
Hawkins DY, Graves A, Knowlton N.
Presented methods to determine the best college sports coach over the past century.

2014 *Introducing QUARC*
Westminster College - Tutorpalooza
Hawkins DY
Presented activities and goals of QUARC to fellow tutors and aids on Westminster campus.

2013 *Frequency Characteristics of Urban House Finch Songs*
Ecological Society of America
Hawkins DY, Shepherd T, Stracey CM
Presented undergraduate research on house finch dialects in urban areas within Salt Lake.

2013 *Frequency Characteristics of Urban House Finch Songs*
Utah Conference on Undergraduate Research
Hawkins DY, Shepherd T, Stracey CM
Presented undergraduate research on house finch dialects in urban areas within Salt Lake.

Mentorship and Management

2017 – 2023 Bradham Lab
Mentored undergraduate researcher projects from inception to presentation at international conferences. Projects ranged from biomedical computer vision and machine learning projects, such as semantic segmentation of cell-types in 3D images, constructing a universal spatial coordinate system for developing embryos, and performance improvements in learning algorithms.

2017 – 2022 BRITE
Mentored Summer undergraduate researchers for the Bioinformatics Research and Interdisciplinary Training Experience (BRITE) REU. Mentorship involved leading and creating workshops, overseeing summer research projects, and coordinating students.

2017 – 2021 BU Bioinformatics Student Association
Organized social and recruiting events for the BU Bioinformatics program. Responsibilities included establishing support networks for PhD students, organizing meetings with faculty to address student concerns, and organizing student advocate groups.

2017 – 2021 First-year PhD Workshops
Organized and created computational workshops to quickly introduce first-year PhD students to common computational tools for bioinformatic research, such R, Python, linux environments, and machine learning.

2018, 2019 BU Student Organized Symposium
Helped organize the annual symposium hosted by the BU Bioinformatics program. Responsibilities included contacting and coordinating with leading researchers to talk at the symposium, leading day-of logistics, and advertising the event to the broader scientific community in Boston.

Honors and Awards

2022 Bioinformatics Service Award
2020 1st Place Poster – Bioinformatics Open House, Boston University
2017 2nd Place Poster – IBSB Conference, Berlin Germany
2016 NIH Trainee Fellowship – Boston University
2016 Outstanding Performance Award – Pacific Northwest National Laboratory
2014, 2015 Honorable Mention – Mathematical Competition in Modeling
2013 – 2015 Gore Math/Science Scholarship – Wesminster College
2013, 2014 Gore Math/Science Summer Research Grant – Westminster College
2012 Scholars Summer Research Grant – Westminster College