Jeffrey Allen Haltom

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SUMMARY:

Bioinformatician with over 13 years of experience in handling **large biological datasets** with **high-performance computing**. Strong background in **disease genomics/transcriptomics** and **molecular genetics**. Adept programmer who designs flexible pipelines that implement **parallel** computing for fast analysis. Experienced in **machine learning** and statistical analysis.

SKILLS

- **Programming:** Python, R, Bash, Java, HTML
- **Bioinformatics Analysis:** GATK, miRNA-Seq, scRNA-seq, scATAC-seq, eQTL, Multiomics analysis
- **Machine Learning and Data Analysis:** TensorFlow, Keras, NumPy, Pandas, Sklearn, Tidyverse
- **Workflow Management and Scaling:** NextFlow, Snakemake, Anaconda, HPC, Git
- **Database:** MySql

EDUCATION

Ph.D. in Genetics and Genomics, *Iowa State University*		*2018 –2022*
M.Sc. in Genetics and Genomics, *Iowa State University*		*2015-2018*
B.Sc. in Biology, *Iowa State University*	*Cum Laude*	*2012-2015*
A.G.S. in Liberal Arts, *Des Moines Area Community College*	*Honors*	*2010-2012*

RESEARCH EXPERIENCE:

Senior Scientist Bioinformatician II - *Children's Hospital of Philadelphia*   *October 2022 – Present*
Center for Mitochondrial and Epigenomic Medicine

- Conducted single-cell multimodal analyses for projects on long COVID and neurodevelopment, uncovering key disease mechanisms.
- Applied machine learning to analyze 20,000+ whole mitochondrial genomes alongside socioeconomic and environmental metadata, identifying associations between mitochondrial haplogroups and preterm birth risk.
- Discovered mutations in SARS-CoV-2 ORF10 linked to improved clinical outcomes using data from 210,000+ COVID-19 patients.
- Computationally predicted 3D protein and 2D transcript structures for ORF10 and investigated its bioenergetic and immune effects in human cells.
- Managed and optimized operations at the PacBio sequencing facility, ensuring high-efficiency and high-quality sequencing output.
- Analyzed transcriptomic data from Arabidopsis grown on the International Space Station

Bioinformatics Graduate Research Assistant - *Iowa State University*   *May 2021-December 2022*
Eve Syrkin Wurtele (Major Professor)

- Developed RIAD, a novel human RNA-Seq ancestry inference tool that implements machine learning, achieving >97% accuracy; expanded to detect disease variants as well as germline and somatic mutations.

- Created a pipeline to concurrently quantify human and SARS-CoV-2 transcript expression, analyzing over 4,300 COVID-19 RNA-Seq samples and identifying novel human orphan genes linked to COVID-19.
- Collaborated with NASA on a project focused on mitigating cosmic radiation damage by inhibiting key spaceflight-associated miRNAs
- Worked with the COVID-19 International Research Team (COVIRT) to publish influential articles and enhance public datasets, aiming to uncover host infection dynamics and improve COVID-19 treatment.

Bioinformatics Experimental Intern - *AbbVie*   *June – August 2020*
- Conducted eQTL analysis on ileum and rectum samples from a Crohn's disease patient cohort:
    - Developed a pipeline that implements FastQTL for cis-eQTL discovery.
    - Compared significant eQTL findings to known eQTL databases (DICE, eQTLGen, EMBLEBI) as well as GWAS variants associated with Crohn's disease.
    - Performed cross-tissue analysis using eQTL findings and GTEx database; found overlap among several tissues
- O-Group Leader: Led and coordinated meetings with other interns to reflect on internship experience.

Bioinformatics Graduate Research Assistant - *Iowa State University*   *July 2018 – December 2022*
Xun Gu (Major Professor)
- Developed a statistical method for predicting cancer driver somatic mutations in TCGA database based off recurrent mutations. This method utilizes a two-component mixture model along with an empirical Bayesian procedure to statistically calculate the posterior probabilities.
- Established a pipeline that compares predicted Human cancer driver sites across species/gene families in Ensemble and TreeFam databases and looks for site conservation.
    - Evolutionary analysis of predicted driver sites. Tracing origin of driver site to ether a duplication or speciation event.
    - Assessing functional divergence of driver sites between paralogs as well as between Human and species orthologs.
- Demonstrated that conservation and functional divergence analysis of gene families could identify functional residues that may cause cancer driver or drug resistant mutations or could be used as inhibiters either specific or broad spectrum.

Molecular Biology Graduate Research Assistant - *Iowa State University*   *May 2015 – June 2018*
Maura McGrail (Major Professor)

- Researched role of RB1 tumor suppressor in brain tumorigenesis and neurodevelopment using the zebrafish model system.
- Implemented reverse genetics with CRISPR/Cas9 and precision genome editing tools to examine gene function.

Molecular Biology Undergraduate Research Assistant - *Iowa State University*   *August 2014 – May 2015*
McGrail Lab
- Developed a pipeline for identifying *sleeping beauty transposon* insertion hotspots in the zebrafish genome.
- Confirmed findings experimentally via PCR.

Bioinformatics Undergraduate Research Assistant - *Iowa State University*   *August 2012 – May 2015*
Genome Informatics Facility

- Performed genome assemblies, sequence alignments, and RNA-Seq analyses of multiple species.
- Promoted the services of the Genome Informatics Facility at Iowa State University.

TEACHING EXPERIENCE:

Instructor – GENET 591 - *Iowa State University* 									*Fall 2021*

- Instructor for ~25 graduate students in a class covering NIH grant writing and social networking in science.
- Invited speakers to discuss Twitter, LinkedIn, ResearchGate, Google Scholar, and NSF grants.
- Led a weekly book discussion covering NIH Grant writing and conducted 2 mock grant review panels.

Instructor - Principles of Biology Laboratory II - *Iowa State University* 				*Fall 2019 – Fall 2021*

- Instructor of record for ~250 undergraduate students (Spring/Fall 2019-2020, Spring 2021).
- Lectured and guided students through an experimental based biology lab that explored the use of the scientific method in biology.
- Lead students through the exploration of the anatomy and physiology of plants & animals.

Guest Lecturer - Comparative Genomics of Transcriptomes - *Iowa State University* 			*Fall 2008*

- Lectured graduate and undergraduate students on the concept of RNA-Seq analysis. I talked about various tools and statistical aspects.

Instructor - Principles of Biology Laboratory I - *Iowa State University* 				*Fall 2016- Fall2018*

- Instructor of record for ~150 undergraduate students (*Fall 2016, 2017, 2018).*
- Lectured and guided students through an observational based biology lab that explored biological diversity.

PUBLICATIONS

- Galeano, D., Imrat, **Haltom, J.**, Andolino, C., Yousey, A., Zaksas, V., … Beheshti, A. **(2024)**. sChemNET: a deep learning framework for predicting small molecules targeting microRNA function. *Nature Communications, 15*(1), 9149.

- Guarnieri, J. W., **Haltom, J. A.**, Albrecht, Y. E. S., Lie, T., Olali, A. Z., Widjaja, G. A., … Wallace, D. C. **(2024)**. SARS-CoV-2 mitochondrial metabolic and epigenomic reprogramming in COVID-19. *Pharmacological Research, 204*, 107170.

- McDonald, J. T., Kim, J., Farmerie, L., Johnson, M. L., Trovao, N. S., Arif, S., … **Haltom, J. A.**, … Beheshti, A. **(2024)**. Space radiation damage rescued by inhibition of key spaceflight associated miRNAs. *Nature Communications, 15*(1), 4825.

- Topper, M. J., Guarnieri, J. W., **Haltom, J. A.**, Chadburn, A., Cope, H., Frere, J., … Baylin, S. B. **(2024)**. Lethal COVID-19 associates with RAAS-induced inflammation for multiple organ damage including mediastinal lymph nodes. *Proceedings of the National Academy of Sciences, 121*(49), e2401968121.

- Guarnieri, J. W., Dybas, J. M., Fazelinia, H., Kim, M. S., Frere, J., Zhang, Y., … **Haltom, J. A.**, … Wallace, D. C. **(2023).** Core mitochondrial genes are down-regulated during SARS-CoV-2 infection of rodent and human hosts. *Science Translational Medicine, 15*(708), eabq1533.

- Wu, S.*, **Jeffrey, H.***, Wenyi, Z., Jingwen, Y., Zhan, Z., & Gu, X. **(2021)**. [Evolution and Functional Divergence of the ERBB Receptor Family.](#) *Pharmacogenomics, 22*(8), 473–484. ***Equal first authors**

- Zhao, W., Yang, J., Wu, J., Cai, G., Zhang, Y., **Haltom, J.**, … Gu, X. **(2021)**. [CanDriS: posterior profiling of cancer-driving sites based on two-component evolutionary model.](#) *Briefings in Bioinformatics, 22*(5), bbab131.

- Wierson, W. A., Welker, J. M., Almeida, M. P., Mann, C. M., Webster, D. A., Torrie, M. E., … **Haltom, J. A.**, … Essner, J. **(2020)**. [Efficient targeted integration directed by short homology in zebrafish and mammalian cells.](#) *eLife, 9*, e53968.

- Schultz, L. E., **Haltom, J. A.**, Almeida, M. P., Wierson, W. A., Solin, S. L., Weiss, T. J., … McGrail, M. **(2018)**. [Epigenetic regulators Rbbp4 and Hdac1 are overexpressed in a zebrafish model of RB1 embryonal brain tumor, and are required for neural progenitor survival and proliferation.](#) *Disease Models & Mechanisms, 11*(6), dmm034124.

Pre-prints:

- Guarnieri, J. W.,… **Haltom, J. A.** … Beheshti, A. **(2025)**. [Guardians of the Mitochondria: Space Mitochondria 2.0 Systemic Analysis Reveals Bioenergetic Dysregulation Across Species.](#) *Cell.*

- Singh, U., **Haltom, J. A.**, Guarnieri, J. W., Li, J., Seetharam, A., Beheshti, A., … Wurtele, E. S. **(2024)**. [A pan-tissue, pan-disease compendium of human orphan genes.](#) *bioRxiv*.

- **Haltom, J.**, Trovao, N. S., Guarnieri, J., Vincent, P., Singh, U., Tsoy, S., … Wurtele, E. S. **(2023)**. [SARS-CoV-2 Orphan Gene ORF10 Contributes to More Severe COVID-19 Disease.](#) *medRxiv*.

- Hallmark, H. T., **Haltom, J. A.**, & Gu, X. **(2016)**. [Tissue-Driven Hypothesis of Transcriptome Evolution: An Update.](#) *bioRxiv*.

Thesis: [The Use of Bioinformatics and Current Genome Editing Tools in Investigating Zebrafish RB1-deficient Brain Tumors](#)

Dissertation: [Unraveling the Genomic Landscape of Ancestry and Disease With Gene Expression Data](#)

PRESENTATIONS:

ORAL:

International Conference on Infectious Disease – *Tokyo, Japan*   *October 2024*
- SARS-CoV-2 ORF10 Induces Mitochondrial Dysfunction

COVID-19 International Research Team   - *Virtual*   *April 2022*
- Inferring ancestry from COVID-19 RNA-Seq data to uncover ethnic differences in COVID-19 response.

POSTER:

United Mitochondrial Disease Foundation   - *Cleveland, Ohio*   **June 2024**
- SARS-CoV-2 ORF10 Induces Mitochondrial Dysfunction

United Mitochondrial Disease Foundation   - *Charlotte, North Carolina*   **June 2023**
- Mitochondria and reproductive biology

TRiMADX – *Pittsburgh, Pennsylvania* **November 2023**
- SARS-CoV-2 ORF10 Induces Mitochondrial Dysfunction

Targeting mitochondria – *Berlin, Germany* **October 2023**
- SARS-CoV-2 ORF10 Induces Mitochondrial Dysfunction

Realizing the Future: Genome Engineering 2017 - *Minneapolis, Minnesota* *July 2017*
- Targeting transcriptional regulators to examine the mechanism of pRB tumor suppression in Zebrafish neural progenitors.

GRANTS & AWARDS

Teaching Excellence Award **May *2022***
- In recognition of outstanding teaching accomplishments in a graduate program. Given to up to 10% of graduate students annually.

XSEDE Grant - COVID-19 HPC Consortium **September *2021***
- PIs: Eve Wurtele and Jeff Haltom
  Title: Detecting COVID-19 related human orphan gene expression in single cells with comparative genomics and data mining.
- 1-year of HPC resources on the Pittsburgh Supercomputing Center Bridges-2.
- Microsoft Azure technical consultation and compute resources regarding use of AI/ML methods.

Phi Theta Kappa scholarship – *Iowa State University* **2012**
First Generation scholarship – *Iowa State University* **2013**
CALS - Cardinal and Gold scholarship – *Iowa State University* **2013**
Ag - Academic Dean scholarship – *Iowa State University* **2013**

ACADEMIC SERVICE & LEADERSHIP

COVID-19 RNA-Seq data analysis in an HPC environment - *XSEDE workshop* *March 2021*
- Lead the python refresher workshop section that taught advanced python to participants for the subsequent workshop.
- Handled questions and assisted participants for the RNA-Seq section of the workshop.

Graduate Student Facilitator – BIOL 313 - *Iowa State University* *August 2018*
- Judged undergraduate student posters.
- Quizzed undergraduate students on their knowledge of molecular genetics and experiment design.

Genetics and Genomics Lab Boot Camp - *Iowa State University* *August 2018*
- Assisted incoming graduate students with basic wet/dry-lab research techniques.

Essner/McGrail Lab visit from West Waterloo High School - *Iowa State University* *August 2017,2018*
- Introduced high schoolers to computational biology and its applications in cancer research.

GDCB IT Committee Student Representative - *Iowa State University* *August 2016-2017*
Department of Genetics, Development, and Cell Biology,
- Oversaw IT needs for students and faculty in the GDCB department.
- Organized a survey for students and faculty in the GDCB department to gauge their needs.

ACTIVITIES
- NASA GeneLab *October 2022 - Present*
- Member, [COVID-19 International Research Team](#) (COV-IRT). *May 2021 – Present*
- Cyclone Martial Arts Club, Taekwondo/ Judo, Iowa State University *May 2017 – Oct 2022*