Vrishabhadev (Vrishab) Sathish Kumar

Summary

I am an aspiring physician scientist excited by the intersection of computing, genomics, and tumor immunology. By advancing our understanding of cancer pathology, I seek to develop more effective therapies for patients.

Education

University of Washington, Seattle
B.S. Computer Science
(Data Science Specialization)
Graduated June 2023

Skills

Languages	Python, R, SQL, Java, Javascript, C#, C, Matlab
Tools	AWS, GCP, Azure, Docker, WDL, GitHub
Bioinformatics	Single-Cell & Spatial Multi-Omics, Statistics
Domain	Genetics, Molecular Biology, Tumor Immunology

Work Experience

Research Assistant 3 @ Case Western Reserve University Sep. 2024 - current

- Built a cloud-based bioinformatics pipeline for raw scRNA-seq data to perform alignment, quantification, data QC, and cNMF (consensus non-negative matrix factorization) to analyze cell states
- Leading the project: *A Unified Framework for Immunosuppressive Myeloid Programs in Brain Tumors*
  - procured scRNA-seq datasets across brain tumor types (glioma, meningioma, vestibular schwannoma, ependymoma, medulloblastoma, pediatric glioma, pituitary adenoma, brain metastases)
  - analyzed 3+ cohorts per tumor type, totaling 1.5 million cells from over 200 patients
  - assembled a set of consensus gene expression programs shared by myeloid cells across tumors
  - interrogated spatial transcriptomics data to reveal localization of programs
- Analyzed 'omics datasets from murine models of tumor microenvrionments (TME) to support collaborators
  - Rhabdomyosarcoma — identified immune differences in TME due to conditional gene knockout
  - Osteosarcoma — identified immune differences in TME due to treatment by small molecule
- Mentored an undergraduate student to setup a cloud-based bioinformatics pipeline for highly multi-plexed spatial proteomics data that automates cell segmentation and marker positivity prediction
- Advised by Dr.Tyler Miller MD,PhD (Pathology)

Bioinformatics Research Associate 1 @ Kallyope Inc. Aug. 2023 - May 2024

- Processed, clustered, and integrated single cell RNA-sequencing datasets from internal experiments and public databases to generate 40+ curated transcriptomic atlases along gut/brain axis
- Supported strategic decision-making across 4 major drug discovery programs by analyzing atlases and presenting findings to stakeholders (program leads, chief scientific officer, etc.)
  - *Clinical biomarker discovery, 3D-tissue characterization, Cross-species gene expression profiles*
- Implemented AWS pipelines (ec2, s3) and Docker to download large NGS datasets in parallel (20+ terabytes)
- Expanded the internal codebase with automated solutions that replaced manual workflows for differential expression and data processing, saving 1-2 hours per analysis
- Spearheaded frontend & backend updates to internal data visualization software to (1) enable wetlab scientists to generate customizable plots and (2) revamp system design for future features
- Fine-tuned a pre-trained vision transformer model to detect keypoints in behavioral assay videos of mice for novel behavior detection
- Built an end-to-end wrapper for Autogrow4 to enable medicinal chemists to generate new compounds using target receptor structures

Data Science Researcher (Undergraduate) @ University of Washington Sept. 2020 - June 2023

– Built workflows to clean, process, and transform large datasets that quantify counts of genes in microbes collected from 10 years of bulk RNA-sequencing experiments
– Administered unsupervised machine learning algorithms to cluster genes and designed an evaluation regime to select optimal clustering for downstream analysis
– Developed BRACE (Bulk RNA-seq Analysis & Cluster Explorer), a cloud-hosted software tool to present my analyses to domain experts
– Enabled wetlab scientists to explore data trends, investigate hypotheses, and warrant future experimentation
– Presented at 4 conferences, Awarded 2 university scholarships, Wrote honors thesis paper
– Co-advised by Dr. David Beck (eScience, CSE, ChemE), Dr. Mary Lidstrom (ChemE, Microbiology)

Other Research Projects

Applied Deep Learning (Cost-Effective Drug Repurposing) March 2022 - June 2022

– Developed a pipeline that ranks drugs for new indications using (1) an existing deep learning model for drug/target binding score prediction and (2) a novel economic context metric
– Collaborated with 2 PhD/MS students with guidance from Dr. Sheng Wang (CSE)

Applied Deep Learning (Evaluating ncRNA Function Prediction) March 2021 - June 2021

– Developed a feature attribution wrapper using Shapley Additive Explanations (SHAP) for a deep learning model that classifies function of non-coding RNA given sequence
– Built a data visualization pipeline to enable biologists to interpret feature attribution results overlaid on predicted ncRNA structure
– Collaborated with a team of 2 students with guidance from Dr. Larry Ruzzo (CSE)

Kinetic Modeling and Protein Design (Washington iGEM) March 2020 - April 2021

– Designed and applied computational model of gene expression, protein function, and bioreactor kinetics using Ordinary Differential Equations
– Optimized the function of (1) existing lead-binding proteins and (2) designed de novo arsenic-binding proteins using Rosetta (software from the Institute for Protein Design @ UW)
– Led the drylab team (4 students) with guidance from Dr. Frank DiMaio (Institute for Protein Design)

Papers

Piezo1 deletion enhances cross-priming of CD8+ T cells by tumor-infiltrating CD11b+ dendritic cells June 2025

– Journal for ImmunoTherapy of Cancer (https://doi.org/10.1136/jitc-2025-011815)
– *Melissa Bonner*, David Askew, Vrishabhadev Sathish Kumar, Suzanne L Tomchuck, Saada Eid, Muta Abiff, Jay T Myers, Phuong Nguyen, Justin W A Garyu, Tyler E Miller, Alex Yee-Chen Huang#*

Redefining the immune microenvironment of gliomas in the era of single-cell genomics April 2025

– Neuro-Oncology Advances (accepted, in press)
– *L. Nicolas Gonzalez Castro*, Vrishabhadev Sathish Kumar*, Mario L. Suva, Tyler E. Miller#*

Theses

A Computational Atlas for Transcriptomic Exploration of M. buryatense Using Unsupervised Machine Learning and Interactive Data Visualization June 2023

– Honors Research Thesis (Unpublished) (Link to Paper)

– Integrates methods, preliminary findings, software tool, and documentation from undergraduate research

Presentations / Posters

A Unified Framework for Immunomodulatory Myeloid Programs in Brain Tumors

Applied cNMF analytical framework to define myeloid cell states across a broad spectrum of brain tumors

– Oral Presentation @ Annual Dept. of Pathology Conference @ CWRU, Oct. 2025 (Slides)

– Poster & Oral Presentation @ Trans. Research Cancer Centers Consortium, Feb. 2025 (Poster) (Slides)

A Computational Atlas for Transcriptomic Exploration of M. buryatense Using Unsupervised Machine Learning and Interactive Data Visualization

Introduced an independently developed software tool (BRACE) that enables wet-lab researchers to visualize and explore large bulk RNA-seq datasets

– Oral Presentation @ Intl. Conf. on Comp. Advances in BioMed Sciences (ICCABS), Dec. 2023 (Slides)

– Oral Presentation @ UW Undergraduate Research Symposium, May 2023 (Slides)

– Poster @ Paul G. Allen School of Computer Science Undergraduate Research Showcase, May 2023 (Poster)

– Poster @ UW Computational Molecular Biology Symposium (CMB), Jan. 2023 (Poster)

Honors / Awards

Best Basic Science Oral Presentation Oct. 2025

– Awarded at 11th Annual Department of Pathology Retreat at Case Western Reserve University

Washington Research Foundation Fellowship (WRFF) Award Oct. 2022

– "*WRFFs are prestigious awards for advanced undergraduates to support promising students who work on creative and sophisticated research projects in biosciences*" (Learn More Here)

Mary Gates Research Scholarship March 2022

– "*Competitive scholarships intended to enhance the educational experiences of undergraduate students at the University of Washington*" (Learn More Here)

Leadership

President @ Impact++ Sept. 2020 - June 2023

– Led 80+ UW students to engage in initiatives at the intersection of computing and social good

– Drive procurement of 6 annual technical projects through collaboration with non-profit leaders and principal engineers @ Microsoft (in diverse areas like open-source software, human rights, internet access, etc)

– Mentored a team of Technical Project Managers who each oversee an annual project (ran weekly Scrums and taught quarterly workshops)

– Organized 2 collegiate hackathons to aid local nonprofits

Research Mentor @ UW Center for Experiential Learning and Diversity Sept. 2022 - June 2023

– Worked with college freshmen and sophomores across STEM disciplines to better articulate their research interests, and find opportunities to get involved

– Mentored college juniors to identify their interests after graduation, succeed in ongoing research efforts, and apply for grants/scholarships (Interviewed for UW News Article)

Journal Club Chair @ Pre-Physician Scientist Club UW Aug. 2021 - June 2023

– Coordinated quarterly journal clubs to explore biomedical research papers and student projects

– Organized fireside chats with MD/PhD students and physician scientists to discuss their journey / research

Volunteering

Emergency Department Volunteer @ University Hospital Sep. 2024 - Current

– Comfort patients in the ER with conversation, snacks, telephone access, etc

– Sanitize rooms, set beds, and stock supplies across the emergency department

Factsheet Writer @ Community Health Literacy Project (CHLP) Sep. 2021 - Current

– Co-authored multilingual "one-pager" factsheets with guidance from MD and MD/PhD students to promote awareness of medical conditions, preventative practices, and healthcare systems.

– Published factsheets include Human Metapneumovirus (HMPV), AI in Healthcare, COVID-19 Vaccine Regulation, COVID-19 vaccines for children, etc.

Technical Project Manager @ Trafficking Interruption Resource Agent (TIRA) Sep. 2021 - Aug. 2022

– Mobilized a 5-member student developer team to implement 2 user stories for TIRA, a full stack application that connects shelters and caregivers in the anti-sex trafficking space [C#, SQL, Azure]

– Headed 30 weekly Scrum meetings attended by the cross-functional team (15+ full-time Microsoft engineers, project managers, non-profit stakeholders, and students)

– Integrated developer perspective in bi-weekly project management syncs to (1) plan upcoming sprints and (2) collaboratively design user stories on Azure DevOps

– Presented to 150+ full-time Microsoft engineers and PMs at Spring Microsoft Hack4Good event

– This was an Impact++ supported project

Developer @ Turn The Bus Dec. 2019 - June 2020

– Developed an optical character recognition (OCR) pipeline using AWS lambda and Polly for:
  – (1) read non-text-searchable PDFs of textbooks
  – (2) translate them into the desired language
  – (3) generate playable audiobooks

– This was an Impact++ supported project

Emergency Department Volunteer @ Evergreen Health Medical Center Oct. 2019 - March 2020

– Greeted patients arriving at the ER and distressed family members visiting ICU patients

– Distributed first aid materials for those bleeding and handed warm blankets to those in shock

– This was halted due to the COVID-19 Pandemic.