

Research Keywords

Computational biology, emergent dynamics, agent-based modeling, machine learning, multimodal frameworks

Research and Work Experience

Graduate Research Assistant — MODYLS Lab at UW Biology

Sep 2023 — present

- Current project: Multiscale spatiotemporal modeling of combinatorial recognition circuits forecasts rational design of CAR T cell-based therapies
- Advisor: Dr. Neda Bagheri
 - Develop open-source spatiotemporal agent-based model framework ([ARCADE](#)) using Java to simulate the tumor microenvironment and engineered cell therapies
 - Dynamical systems modeling of multiscale (environment, cell population, subcellular) modules to recapitulate biological dynamics (diffusion, metabolism, inflammation) using mass action and stoichiometric based ODEs
 - Utilize AWS batch and Slurm HPC protocols to run tumor microenvironment simulations analyzing engineering (activation sensitivity, binding affinity) and treatment (dosage, delivery) parameters to inform therapeutic designs
- Outcomes: Poster presentation at [SEED 2026](#), [EBRC 2024](#), publication in progress

Graduate Research Assistant — AIMS Lab at Paul G. Allen School of CSE

Dec 2023 — present

- Current project: Identifying signals for Alzheimer's disease progression through isolating salient variables in single cell transcriptomics
- Advisor: Dr. Su-In Lee
 - Create variational autoencoder framework ADVISE (Alzheimer's Disease Variational Isolation of Signal Embeddings) to filter disease related signals from biological background signals in large, noisy, single cell datasets (~2M cells)
 - Detect gene and pathway signatures from latent variables using explainable AI techniques (expected gradient, hotspot, GSEAPY pathway analysis) to inform potential targets for disease treatments
 - Use Python, PyTorch, SCVI, and SciPy packages to denoise single cell datasets, construct model, and apply explainable AI algorithms
- Outcomes: Poster presentation at [MLCB 2024](#), publication in progress

Research Assistant — Bedford Lab at Fred Hutch VIDD

Apr 2022 — Sep 2023

- Projects: Phylogenetic modeling of Norovirus evolution reveals genotype adaptive mutation rates, A computational framework for identifying epistatic interactions through MLR fitness modeling
- Advisor: Dr. Trevor Bedford
 - MLR models to assign fitness to different sars-cov-2 variant lineages, assess for epistasis through analyzing fitness differences
 - Norovirus adaptive evolution live tracking with phylogenetic analysis, population and migration statistical analysis
- Develop Python, Snakemake, Augur scripts for data wrangling and used R for data visualization, constructed phylogenetic trees from bulk RNA sequences using NextStrain
- Outcomes: [Publication](#), [Contributed to Nextstrain open source software](#), Built [Nextstrain live Norovirus tracking dashboard](#), Poster presentation at [SURP Poster Session](#)

Programmer — BIOFAB at Institute of Protein Design**Sep 2021 — Apr 2023**

- Advisor: Dr. Eric Klavins
- Projects:
 - Develop software pipeline for cloud based software [Aquarium](#) (application for inventory tracking and standardizing wet lab protocol)
- Test, revise, and design software to improve efficiency of Aquarium software
- Collaborate with lab technicians to standardize lab protocols and user interface of Aquarium software

Global Programs Intern — SightLife**Nov 2020 — Sep 2021**

- Build patient database with medical records with collaborating LVPEI hospitals in India using RStudio and Excel. Identifying statistical trends that point to barriers of access for patients in hopes of improving surgical protocols.
- Design general ophthalmic tech curriculum (activities, wet labs, lesson plans) for international developing countries in collaboration with USFDA and LVPEI
- Identify barriers of access to cornea infection treatments in developing countries

Research Assistant — Behavioral Ecophysics Lab at UW Biology**Jan 2020 — Apr 2023**

- Advisor: Dr. Alejandro Rico-Guevara
- Projects:
 - Investigating thermoregulation of hummingbirds through segmentation of CT scan structure
- Landmark 1,000+ CT scans to build extensive database using SlicerMorph
- Utilize Matlab and Python to run statistical analysis on 3D tracking on hummingbird flight trajectory and movement
- Preprocess CT scans using Slicermorph to learn segmentation and statistical shape analysis for 3D reconstruction
- Develop protocols for Slicermorph program functions (segmentation and measurement) for future student use
- Outcomes: Poster presentation at [2022 Undergraduate Research Symposium](#)

Education**University of Washington, Seattle****Sep 2023 — Jun 2028 (expected)**

- PhD in Computational Biology
- Cumulative GPA: 4.0 / 4.0
- Advisor: Dr. Neda Bagheri

University of Washington, Seattle**Sep 2019 — Jun 2023**

- Double Major: B.S. in Computer Science, Biochemistry
- Cumulative GPA: 3.73 / 4.0

Publications***Peer Reviewed Publications***

*equal contributions

Allison W. Li, Jason Y. Cain, Neda Bagheri (2026).

In silico modeling forecasts parameter optimizations to improve resiliency of SynNotch-AND gate CAR T circuits against immunosuppressive environments

Frontiers in Biotechnology (In preparation)

Allison W. Li, Jason Y. Cain, Neda Bagheri (2026).

Spatially structured contexts limit iCAR selectivity despite improved migration, treatment parameters, and circuit design

Frontiers in Biotechnology (In preparation)

Allison W. Li*, Wei Qiu*, Christopher M. Arian*, Jessica E. Young, Su-In Lee (2026).

Disentangling context-specific Alzheimer's Disease progression signatures through an explainable AI framework

Nature Neuroscience (In preparation)

Kimberly R. Andrew*, Jennifer Chang*, Cornelius Roemer, James Hadfield, Victor Lin, Anderson F. Brito, Richard Daodu, Isabel A. Joia, Kathryn Kistler, **Allison W. Li**, Louise H. Moncla, Miguel I. Paredes, Denise Kühnert, Laura Marcela Torres, Laura Urbanska, Ivan Aksamentov, Emma B. Hodcroft, John Huddleston, John T. McCrone, Thomas R. Sibley, John S. J. Anderson, Jover Lee, Richard A. Neher, Trevor Bedford (2026).

Nextstrain automates real-time phylodynamic analysis of open data for endemic and emerging pathogens.

Bioinformatics (In review) [[Preprint](#)]

Posters & Extended Abstracts

In silico modeling forecasts iCAR inefficacy in tumors and evaluates migration constraints on selectivity [[PDF](#)]

A. W. Li, J. Y. Cain, N. Bagheri

Synthetic Biology, Engineering, Evolution & Design (SEED) 2026, Denver, CO

Modeling multi-scale in silico dynamics of combinatorial recognition circuits in T cell therapies [[PDF](#)]

J. Y. Cain, **A. W. Li**, N. Bagheri

EBRC 2024: Engineering Biology Research Consortium, Seattle WA

Capturing Biological Signals in Alzheimer's Single Cell Transcriptomic Data by Isolating Salient Variations [[PDF](#)]

A. W. Li, W. Qiu, E. Weinberger, S. Lee

MLCB 2024: Machine Learning in Computational Biology, Seattle WA

Phylogenetic Modeling Analysis of Norovirus Reveals Varying Genotype and Gene Adaptive Mutation Rates [[PDF](#)]

A. W. Li, J. Huddleston, K. Kistler, T. Bedford

Fred Hutch SURP Conference 2022, Seattle WA

Oral presentations

In silico modeling guides design of combinatorial antigen recognition in engineered CAR T therapies [[PDF](#)]

A. W. Li, J Y. Cain, N. Bagheri

Synthetic Biology Consortium Automation Symposium 2026, Fred Hutch, Seattle WA

Multiscale Modeling Informs Synthetic CAR T Circuit Design for Cell Therapy [[PDF](#)]

A. W. Li, J Y. Cain, N. Bagheri

UW Biology Graduate Seminar 2026, UW Life Sciences Building, Seattle WA

Funding

NIH R01

Sep 2023 - present

- Design-driven engineering of robust mammalian sense-and-respond functions: from parts to programs (5R01EB026510-08)

Teaching Experience

Teaching Assistant - UW Department of Biology Dec 2023 - Mar 2024

- Instructed weekly wet lab sections (**pipetting, gel electrophoresis, PCR, dialysis**), graded assignments and exams, revised exam questions, and held office hours for **introduction to biochemistry** (BIOL 200).

Teaching Assistant — UW Computer Science and Engineering Sep 2021 - Jun 2022

- Instructed weekly sections, graded assignments, wrote exam questions, and held office hours for **data structures and algorithms** (CSE 331), and **introductory java programming** (CSE 142)

Peer Educator — UW Interdisciplinary Honors Program Dec 2019 - Mar 2020

- Wrote **lesson plans** and curriculum for incoming freshman to facilitate the **transition into college**, mentored **13 students** in the classroom, **developed curriculum** to support students both academically and with student health and wellness

Honors and Awards

Washington Space Grant Fellowship — Washington NASA Space Grant Consortium	Jun 2026
Top Scholar Fellowship — University of Washington Department of Biology	Sep 2023
Tapia Conference Scholarship — Paul G. Allen School of Computer Science	Jun 2022
Burkhardt Family Scholarship — Paul G. Allen School of Computer Science	Sep 2021
Phi Beta Kappa Honor Society Member — Phi Beta Kappa Honor Society	Sep 2020

Volunteering and Service

Scholarship Review Panel - UW Biology - Seattle, WA Feb 2026 - Now

- Score and evaluate funding proposals using NIH grant review criteria

Art Director — Grey Matters Neuroscience Journal - Seattle, WA Mar 2021 — Apr 2024

- Oversee artist progress in publication cycle, create timeline/deadlines for artists to meet, run illustration workshops and art critiques, hire new artists for each publication cycle
- Collaborate with local student-run art businesses/organizations to promote art content in science and research
- Create first [neuroscience art gallery](#) at UW to promote interdisciplinary thinking in science, and encourage diversity in research
- Illustrated for multiple [journal articles](#)
- Developed [digital art portfolio](#)

Volunteer Chair - UW Manana Sep 2020 - Jun 2023

- Collaborated with local youth programs (Solid Ground) to host in-person and virtual celebrations (birthday, cultural) for at-risk youth
- Organized fundraising events for hosting youth programs
- Recruited, ran background checks, and trained a team of 10+ volunteers for in-person and virtual proceedings of celebration events

Media

[Speaker at Women in Machine Learning and Data Science](#)

Mar 2026

[Nextstrain blog announcement of Norovirus release](#)

Jan 2026

References

Available upon request

Last updated July 2026