

Rafael Jacobsen

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EDUCATION

Harvard University Cambridge, MA

A.B. Honors Physics and Computational Neuroscience, Current GPA: 3.97/4.0

June 2027

Cambridge Rindge and Latin High School

Cambridge, MA

GPA: 98.3/100, ACT: 36

June 2023

Relevant Coursework:

Physics 220: *Fluid Dynamics* (Grad), Physics 230: *Active Matter* (Grad) Physics 262: *Statistical Mechanics* (Grad), Physics 153: *Electrodynamics*, Physics 143a: *Quantum Mechanics I*, Physics 143b: *Quantum Mechanics II*, Physics 151: *Advanced Mechanics*, Physics 19: *Introduction to Theoretical Physics*

Math 55a: *Linear Algebra and Group Theory*, Math 55b: *Complex Analysis and Topology*, Applied Math 226: *Theory of Neural Computation* (Grad), Stat 171: *Stochastic Processes*, Math 243: *Evolutionary Biology*

Genetics 201: *Principles of Genetics* (Grad), Neuro 80: *Introduction to Neuroscience*, Bio 155R: *Biology of Insects* (Grad)

CS 61: *Systems Programming*, CS 124: *Algorithms and Data Structures*

Awards: Detur Book Prize, John Harvard Scholarship

RESEARCH EXPERIENCE

Harvard University Mar 2023 – Present

Dr. Aravinthan Samuel, Professor of Physics

- Performed whole-brain imaging of a freely moving *C. elegans* under a thermotactic stimulus.
- Cultivated *C. elegans* nematodes, designed and executed experiments involving a spinning disc microscope and laser calcium imaging as well as novel behavioral experiments.
- Used Python, neural networks, and boosted decision trees to analyze and process data. Created original pipelines for large-scale image processing.
- Analyzed extracted calcium signals using available connectomics datasets.
- Presented research at multiple conferences and was awarded the PRISE Harvard fellowship during the summer of 2024.
- Acted as project lead and trained 6 undergraduates and high schoolers.

Harvard University/CERN June 2020 – Feb 2023

Dr. Melissa Franklin, Professor of Physics

- Performed analysis of triple vector boson events detected by the ATLAS detector at the large hadron collider in CERN.
- Optimized control regions and filters and created neural networks and boosted decision trees. Worked with Python, Julia, and C++ as well as the ROOT framework. Author on an unpublished ATLAS/CERN paper.

TEACHING EXPERIENCE

Harvard University Sept 2025 – Dec 2025

One of two teaching staff for Physics 141: Physics of Sensory Systems. Wrote original problem sets and exams, taught section, and held office hours. Graded problem sets and exams.

Harvard University Jan 2024 – Apr 2024

Course assistant for Physics 143a: Quantum Mechanics. Held office hours and graded problem sets and exams.

PUBLICATIONS

- [1] Jacobsen, R. and Samuel, A. (2025). Thermoregulation: Tactics for navigating thermal gradients. *Current Biology*, 35(22), R1093–R1096.

INTERNAL NOTES

[1] ATLAS Collaboration. Search for $W^\pm W^\mp Z$, $W^\pm ZZ$ and ZZZ production in pp collisions at $\sqrt{s} = 13$ TeV. ATLAS Note ANA-STDM-2020-08-INT1, CERN

PRESENTATIONS

Whole Brain Imaging of Freely Moving C. elegans under a Thermal Stimulus

iPoLS conference Georgia Tech, Atlanta Poster presentation	August 2023
iPoLS olfaction workshop ICTP, Trieste 15-minute talk and poster presentation	June 2024
Neurophotonics Symposium Boston University, Boston Poster presentation	December 2024
CBS Symposium Harvard University, Cambridge Poster presentation	June 2025

SKILLS

Coding

Proficient in Python and C++. Years of experience designing image processing pipelines using convolutional neural networks and old-school algorithms.

Microscopy and calcium imaging

Imaged animals using spinning-disc confocal microscopes, wrote original and modified existing software for image acquisition.

Wet lab

Performed multi-step genetic crosses of *C. elegans* involving PCR. Maintained frozen and healthy stocks. Designed and implemented larger-scale behavioral experiments.

OTHER ACTIVITIES

Harvard-Radcliffe Collegium Baritone in mixed choir	Sept 2023 – present
River Charles Ensemble, Baroque Orchestra, Bach Society Orchestra Cello	Sept 2023 – June 2024
St. Paul's Schola and Adult Choir Mass quartet and adult choir	Oct 2022 – Feb 2024
Margaret Fuller Food Bank, St. Paul's Food Bank Volunteered multiple weekly shifts	Feb 2022 – Oct 2023
Harvard Square Homeless Shelter Volunteered at a student-run homeless shelter.	June 2023 – Dec 2024
Sunrise Movement <i>Leader of the WSAYO team</i>	Oct 2020 – June 2021

Lead the Which Side Are You On team of ~80 people in support of a proposed bill for renewable energy in Massachusetts. Work involved coordinating and participating in dozens of meetings with Massachusetts State House representatives and their constituents. Participated in organizing the Boston climate strikes.