Jacob Shapiro

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Education

Harvard University, Cambridge, MA – *PhD Candidate in Biophysics* *September 2023 - Present*
- Advised by Prof. Fei Chen

Massachusetts Institute of Technology, Cambridge, MA *August 2019 – June 2023*
- Major in *Computer Science and Molecular Biology*, Minor in *Literature*, GPA: 5.0/5.0

Technical Skills

- *Coursework*: Machine Learning*, Inference*, Control Theory*, Algorithms, Software Engineering, Optics. (*: Grad level)
- *Software*: Python, TypeScript, C (learning), Assembly (learning), single-cell RNA-seq analysis, protein design.
- *Laboratory* Skills: Single-cell RNA sequencing, next-generation sequencing, confocal microscopy, cell culture.
- *Engineering*: FPV drone assembly and flight, laser cutting, 3D printing.

Research Experience

Chen Lab, Broad Institute of Harvard and MIT, Cambridge, MA – *PhD Candidate* *September 2023 – Present*

Project: Mapping immune cell clones in tumor tissue with single-cell transcriptomic resolution.
- Used stochastic variational inference to position cells in cancer tissue from spatial transcriptomics data; used Pyro library.
- Adapted spatial transcriptomics technology Slide-Tags to study clonal expansion of T and B cells in melanoma.
- *Publication*: Maurer, K., […] **Shapiro, J.,** *et al.* A clonally expanded nodal T-cell population diagnosed as T-cell lymphoma after CAR-T therapy. *Nat Commun* **16**, 7462 (2025)

Project: Measuring the entire human proteome and transcriptome with single-cell resolution.
- Designing a single-cell proteomics method to study mRNA translation and identify therapeutic opportunities.

Weissman Lab, MIT, Cambridge, MA – *Undergraduate Researcher* *October 2022 – May 2023*

Project: Investigating how viral proteins of unknown function affect human cells.
- Used ESMFold on MIT's computing cluster to predict the structure of putative viral proteins to study their mechanism.

Baker Lab, University of Washington, Seattle, WA – *Undergraduate Summer Research Fellow* *June – August 2022*

Project: Designing an agonist for cell-surface receptors using deep-learning.
- Used protein hallucination to design *de novo* protein sequences that are predicted to bind to cell surface receptors.
- Analyzed designs *in silico* with AlphaFold2 and experimentally characterized binding affinity *in vitro.*

Langer Lab, MIT, Cambridge, MA – *Philips Undergraduate Research and Innovation Scholar* *January 2020 – May 2022*

Project: Modeling nitrogen metabolism in humans to assess feasibility of a treatment for kidney disease.
- Developed a system of differential equations to model urea and ammonia metabolism and implemented the model in Python.
- Ran simulations suggesting proposed disease treatment was not feasible, saving development time in the lab.

Lyndra Therapeutics, Watertown, MA – *Engineering and Product Design Intern* *August – December 2020*
- Used XGBoost and Shapley values to inform optimal design of a long-acting oral drug delivery platform.

Aerospace Controls Laboratory, MIT, Cambridge – *Undergraduate Researcher* *September – December 2019*
- Helped test a drone to collect airflow data behind ship for improved design; gained exposure to ROS and drone components.

Leadership Experience

MIT Glass Lab – *Instructor* *January 2020 - Present*
- Teach beginner glassblowing classes and make pumpkins for the annual MIT Glass Pumpkin Patch.

Amphibious Achievement at MIT – *Director of External Relations* *September 2022 – May 2023*
- Mentored under-privileged Boston youth in STEM and water safety; secured grant funding for the program.

Camp Boston-Sderot, Herzliya, Israel – *Counselor, Volunteer* *August 2021*
- Helped run summer camp for children who live in Sderot, a town on Israel's border with the Gaza Strip that is under frequent rocket fire. Organized and led activities for 70 children, many of whom have PTSD.

Russian School of Mathematics Summer Camp, Sunapee, NH – *Head Counselor* *June – July 2021*
- Managed hiring and training of 36 counselors, led overnight camp activities for over 250 staff members and campers.

Honors and Awards

- **2022 Burchard Scholar** - Selected to participate in dinner seminars with faculty in the Humanities (1 of 30 selected).
- **2022 Bruce Mazlish History Prize** – Awarded for essay on European religious authority from 1500-1800 (1 of 3 awarded).
- **2020 Sinai Scholars Symposium National Finalist** – Awarded for essay on the modern history of Israel (1 of 10 awarded)

Personal

- **Music:** Classical piano (9 yrs.), Jazz piano (5 yrs.), Clarinetist in Klezmer band (8 yrs.)
- **Swimming:** MIT varsity swim team 2019 – 2021, 2019 Illinois Senior State Championships – 1st place in 100 fly
- **Languages:** Russian (fluent), French (proficient)