ZIJIAN NIU

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EDUCATION

Ph.D. in Computational and Systems Biology
September 2024 – Present

Massachusetts Institute of Technology

- **GPA:** 5.00/5.00
- **Relevant Coursework:** Systems Biology, Algorithms for Inference

B.A., *summa cum laude*, in Biochemistry, Biophysics, and Physics
September 2020 – May 2024

University of Pennsylvania

Roy and Diana Vagelos Scholars Program in the Molecular Life Sciences

- **GPA:** 4.00/4.00
- **Relevant Coursework:** Molecular Biology and Genetics, Biochemistry, Biophysics, Organic Chemistry, Statistical Mechanics, Analytical Mechanics, Quantum Mechanics, Electrodynamics, Theoretical and Computational Neuroscience, Physical Networks, Machine Learning, Large-Scale Optimization, Probability Theory, Differential Geometry, Differential Equations, Complex Analysis, Real Analysis

PUBLICATIONS

1. O'Farrell, A., **Niu, Z.**, Li, J., Van Eyndhoven, L., Sarma, K., Shin, S., & Raj, A. (2025). Innate Immune Memory is Stimulus Specific. *Submitted to Cell, under review. bioRxiv*. doi:10.1101/2025.01.22.634275
2. **Niu, Z.**, Bruyère, T., Manthey, D., Li, J., O'Farrell, A., & Raj, A. (2024). NimbusImage: a cloud-computing platform for image analysis. *Submitted to Nature Methods, under revision.*
3. Li, J., Ravindran, P. T., O'Farrell, A., Busch, G. T., Boe, R. H., **Niu, Z.**, Woo, S., Dunagin, M. C., Jain, N., Goyal, Y., Sarma, K., Herlyn, M., & Raj, A. (2024). AP-1 Mediates Cellular Adaptation and Memory Formation during Therapy Resistance. *Submitted to Nature Communications, under revision. bioRxiv*. doi: 10.1101/2024.07.25.604999
4. **Niu, Z.**, O'Farrell, A., Li, J., Reffsin, S., Jain, N., Dardani, I., Goyal, Y., & Raj, A. (2024). Piscis: a novel loss estimator of the F1 score enables accurate spot detection in fluorescence microscopy images via deep learning. *Submitted to Cell Systems, under revision. bioRxiv*. doi:10.1101/2024.01.31.578123
5. Harmange, G., Hueros, R. A., Schaff, D. L., Emert, B., Saint-Antoine, M., Kim, L. C., **Niu, Z.**, Nellore, S., Fane, M. E., Alicea, G. M., Weeraratna, A. T., Simon, M. C., Singh, A., & Shaffer, S. M. (2023). Disrupting cellular memory to overcome drug resistance. *Nature Communications, 14*(1). doi: 10.1038/s41467-023-41811-8

PRESENTATIONS

1. **Niu Z.** and Raj A. Piscis: Novel Loss Estimator of the F1 Score Enables Accurate Spot Detection in Fluorescence Microscopy Images via Deep Learning. Poster presented at: Society of Biomolecular Imaging and Informatics Conference; 2023 October 30-November 1; Boston, MA.
2. O'Farrell A., **Niu Z.**, Li J., and Raj A. Stimulus-Specific and Nonspecific Memories in the Innate Immune System. Talk given at: Annual Meeting of the Biomedical Engineering Society; 2023 October 11-14; Seattle, WA.
3. O'Farrell A., McCook J., **Niu Z.**, and Raj A. Single Cell Analysis of Proinflammatory Gene Expression Reveals Changing Population Dynamics in Trained Immunity. Poster presented at: Annual Meeting of the Biomedical Engineering Society; 2022 October 12-15; San Antonio, TX.

AWARDS AND HONORS

Fellowships and Scholarships

Hertz Foundation Fellowship 2024
PD Soros Fellowship for New Americans 2024
DOE Computational Science Graduate Fellowship (CSGF) 2024
NSF Graduate Research Fellowship (GRFP) — *declined* 2024
Barry M. Goldwater Scholarship 2023

Academic Honors

Penn Arts and Sciences Dean's Scholar 2024
Penn Physics and Astronomy William E. Stephens Memorial Prize 2024
Phi Beta Kappa 2024
Roy and Diana Vagelos Science Challenge Award 2022
Roy and Diana Vagelos Scholar 2020

RESEARCH EXPERIENCE

Undergraduate Researcher
December 2021 – May 2024

Arjun Raj Lab, Department of Bioengineering and Genetics, University of Pennsylvania

- **Created Piscis**, an automatic deep learning algorithm for spot detection in RNA fluorescence *in situ* hybridization (FISH) images. Significantly outperformed existing computational methods.
- **Mentored a high school researcher** on deep learning and writing Python functions for data preprocessing.
- **Contributed to NimbusImage**, a web platform for biological image analysis that empowers researchers to visualize their data interactively while leveraging state-of-the-art machine learning algorithms.
- **Deployed NimbusImage** via Docker on Linux servers in both the Raj Lab and Shaffer Lab.

Undergraduate Researcher
March 2021 – December 2021

Sydney Shaffer Lab, Department of Pathology and Bioengineering, University of Pennsylvania

- **Investigated the molecular origins of Barrett's esophagus** by analyzing single-cell RNA sequencing data of patient samples in R. Discovered a rare subpopulation of ciliated cells expressing fetal intestinal genes.
- **Created Cellori**, a fast and robust algorithm for nuclei segmentation in fluorescence microscopy images.
- **Created DeepTile**, a Python library that splits large images into smaller tiles, processes each tile, and stitches together the outputs, allowing functions to scale up to arbitrary input image sizes.

TEACHING EXPERIENCE

Teaching Assistant
September 2023 – December 2023

ESE 5300: Elements of Probability Theory

- Graduate-level electrical engineering (ESE) course at Penn on measure-theoretic probability theory.
- Hosted two 1.5-hour office hours each week to guide students through assignments and recitations to review and practice important mathematical concepts.

Workshop Leader
September 2021 – December 2023

Organic Chemistry Workshops

- Program coordinated by Penn's Weingarten Learning Resources Center for organic chemistry students.
- Developed lesson plans and facilitated weekly two-hour workshop sessions to help students reinforce and apply concepts learned from lectures to solve challenging organic chemistry problems.
- **Over 200 students attended my workshops.**

LEADERSHIP AND COMMUNITY SERVICE

Co-founder, Co-president
July 2022 – February 2024

Project Lucid

- Initiative with the mission of spreading awareness and building confidence among Penn undergraduates for effective science communication.
- **Hosted the Lucid Science Challenge**, a research proposal competition based on the National Science Foundation's grant review process, providing a platform for undergraduates to practice adapting their science communication to a new audience.
- Invited seven Penn professors and an industry scientist and executive from Ginkgo Bioworks to serve on our competition judging panels. Raised over $1,000 from sponsorships to fund prizes and merch.
- **Hosted a science communication workshop series**, covering topics such as audience identification and scientific storytelling.

Operations Committee, Event Supervisor, Urban Initiative Fellow
September 2020 – February 2024

Science Olympiad at the University of Pennsylvania (SOUP)

- One of the most competitive Science Olympiad Invitational Tournaments with over 750 high schoolers participating annually.
- Organized virtual social and Penn student panel events for the 2021 and 2022 tournaments.
- Wrote and proctored exams for the Chemistry Lab (2021) and Codebusters (2022, 2023, 2024) events.
- **Mentored high schoolers** from underserved Philadelphia high schools on their Science Olympiad events.

Vice President of Community Outreach
January 2022 – December 2023

Penn Undergraduate Chemistry Society (PUCS)

- Organization to promote the appreciation of chemistry within Penn and the Philadelphia community.
- Hosted a mixer event combining liquid nitrogen ice cream-making with a student research poster session.
- **Launched a community outreach initiative** to share the fun of chemistry and its everyday relevance with students from underserved schools. Conducted a successful pilot at Parkway West High School.

PROFESSIONAL DEVELOPMENT

Summer School Student
June 19-30, 2023

Physics of Life Summer School at Princeton University

- Summer school offered by Princeton University's Center for the Physics of Biological Function, targeting advanced undergraduates interested in biological physics.
- One of 24 students chosen by application to attend two weeks of lectures, problem sessions, and hands-on experiments to build an understanding of how physical principles give rise to biological phenomena.