Jiayi Zhang

jiayi.zhang@princeton.edu — +1 (412) 773-3143
South Drive, Carl Icahn Laboratory — Princeton, New Jersey

Ph.D. candidate in Computational Biology with expertise in dynamical system (e.g. recurrent neural network) modeling, model validation and distillation. Experienced in multi-modal data analysis and data visualization in various programming languages. Passionate about leveraging computational thinking and interdisciplinary approaches to solve complex problems across diverse domains.

EDUCATION

2022 - Present **Ph.D. candidate in Quantitative & Computational Biology**
Princeton University, Lewis-Sigler Institute for Integrative Genomics
Advisor: Tatiana Engel, Ph.D.

2018 - 2022 **B.S. in Computational Biology** (minor in Linguistics)
Carnegie Mellon University, School of Computer Science
Graduated with University Honors & SCS College Honors (GPA: 3.97)

2020 Spring **The Maritime Studies Program of Williams College and Mystic Seaport**
Williams College

CURRENT RESEARCH

2023 - Present **Inferring and validating circuit mechanisms in RNNs and neural recordings**
Princeton University — Mentor: Tatiana Engel, Ph.D.
- Devise model selection strategy for inferring latent circuit mechanisms from Recurrent Neural Network (RNN) dynamics and biological neural recordings
- Develop targeted perturbation strategies to confirm mechanisms underlying task-performing networks and cognitive behavior

2024 - Present **Multi-modal data analysis mouse social behavior**
Princeton University — Collaborators: Bartul Mimica, Ph.D., Dexter Tsin
- Apply dimensionality reduction (VAE, UMAP) to analyze co-variations in mouse behavior and vocalizations during paired social interactions

PAST RESEARCH

2021 - 2022 (Thesis) **Detection of Amyotrophic Lateral Sclerosis through bioacoustic features**
Carnegie Mellon University — Mentor: Rita Singh, Ph.D.
- Extracted bioacoustic features from algorithmically estimated vocal fold oscillations for diagnosis of Amyotrophic Lateral Sclerosis (ALS) with machine learning methods

2021 Summer **Hyper-resolution spectrogram for vocalization analysis**
Memorial Sloan Kettering Cancer Center, Computational Biology Summer Program
Rockefeller University — Mentor: Marcelo Magnasco, Ph.D.
- Maintained and vectorized hyper-resolution spectrogram analysis pipeline in Python; Implemented spectrogram analyses for dolphin vocalizations and ALS patient speech

2020 Summer **Semantic segmentation of pillow-basalt in field images**
Williams College — Mentor: Lisa Gilbert. Ph.D.
- Created a semantic segmentation pipeline for identifying pillow-basalt from field images for estimating rock porosity; Utilized Dynamic Programming to trace fluorescent signal for biomass estimation

PUBLICATIONS

2024 **J. Zhang** and R. Singh, "Vocal fold dynamics for automatic detection of amyotrophic lateral sclerosis from voice," en, in *ICASSP 2024 - 2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, IEEE, Apr. 2024, pp. 311–315

CONFERENCE PRESENTATIONS

2025	(Poster) **J. Zhang** and T. A. Engel. *Grounding Cognition in Mechanistic Insight; HHMI/Janelia Research Campus*
2025	(Poster) **J. Zhang** and T. A. Engel. Enhancing the causal predictive power in recurrent network models of neural dynamics. *Cosyne Abstracts 2025*
2024	(Talk) Targeted Perturbations for Circuit Mechanism Validation *INCF Neuroinformatics Assembly 2024*, Session: Closing the discovery loop and digital twins; Austin, TX
2024	(Poster) **J. Zhang** and T. A. Engel. Identifying behaviorally-relevant dimensions for causal validation of circuit mechanisms. *Program No. PSTR488.08. 2024 Neuroscience Meeting Planner. Chicago, IL. : Society for Neuroscience, 2024* (Poster)

AWARDS AND HONORS

2025	COSYNE Presenter Travel Grant (500 USD)
2024	Cassidy Yang Award for academic excellence, mentorship and outreach Lewis-Sigler Institute for Integrative Genomics
2024	Conference travel funding (1,000 USD) Princeton University, Keller Center for Innovation in Engineering Education
2022	SCS Alumni Award for Undergraduate Excellence Awarded for thesis: "Vocal Fold Dynamics for the Automatic Detection of ALS from Voice."
2021	Early Election to the Phi Beta Kappa Society
2018 - 2022	Dean's List (High Honors from Fall 2019)
2017	First Prize, Chinese National Olympiad in Linguistics

EMPLOYMENT

2018 - 2022	**CMU CS Academy** Content Lead, Outreach Team Member – Created graphics-based exercises for high school Python programming courses; Reached high schools in all 50 US states and abroad (more than 500K students) – Led curriculum development for professional training modules for high school teachers

OPEN-SOURCE REPOSITORY

2021	**Hyper-resolution spectrogram** Generate hyper-resolution spectrograms from audio signals (Github)
2020	**Fluorescence Tracer** Find optimal paths that trace fluorescently highlighted rock crevices on images (Github)

TEACHING & MENTORING

2024 - 2025	Mentor for Simons Foundation's Shenoy Undergraduate Research Fellowship in Neuroscience
2024 Summer	Advanced Python workshops, Princeton University, instructor
2022 Spring	Fundamentals of Bioinformatics (02-604), Carnegie Mellon University, teaching assistant
2022 Spring	Nature of Language (80-180), Carnegie Mellon University, teaching assistant
2020 Summer	Pre-College Computational Biology Program, teaching assistant
2019 Fall	Principles of Imperative Computation (15122), teaching assistant

SKILLS

Programming	Python (PyTorch, Pandas, etc.), MATLAB, R, C, GO
Languages	Bilingual in English and Mandarin
Other	Photography, Illustration