YUHAN HELENA LIU

Email: hl7582@princeton.edu
Citizenship: Canada (H1-B **not** required to start)

RESEARCH POSITIONS

Postdoctoral research associate, Princeton University	2024 – present
Graduate research fellow, University of Washington	2020 – 2024
Visiting research collaborator, MIT McGovern Institute	2023
Research intern, Mila – Quebec AI Institute	2021 - 2023
Visiting scientist, Allen Institute for Brain Science	2020 - 2023

EDUCATION

PhD., Applied Mathematics, University of Washington (UW)	2024
MASc., Electrical and Computer Engineering, University of Toronto (U of T)	2019
BASc., Engineering Science (Electrical and Computer Option), U of T	2017

HONORS AND AWARDS

Selected Participant, Rising Stars in Data Science (Stanford University)*	2025
Selected Participant, Rising Stars in Engineering in Health (Columbia University)	2025
Selected Participant, Rising Stars in EECS (MIT)	2024
Boeing Teaching Award: **300 USD**	2024
FRQNT Postdoctoral Research Fellowship: **90000 CAD (ranked 1st)**	2024 - 2026
Selected Participant, Rising Stars in Computational & Data Sciences (UT Austin)	2024
IVADO Postdoctoral Fellowship: **210000 CAD (offered, but declined)**	2024
NSERC Postdoctoral Fellowship: **90000 CAD (offered, but declined)**	2024
Carl E. Pearson Fellowship: **37000 USD****	2023 - 2024
FRQNT Doctoral Research Fellowship: **25000 CAD**	2023 - 2024
FRQNT Doctoral Research Fellowship Supplement: **1500 CAD**	2023 - 2024
Weill Neurohub and NeuroTEC Travel Award: **500 USD**	2023
Mitacs Globalink Research Award: **6000 CAD**	2023
NeurIPS Scholar Award: **1748 USD**	2022
NSF AccelNet IN-BIC Exchange Fellowship: **10000 USD**	2022
Boeing Research Award: **500 USD**	2021
NSF AccelNet IN-BIC Exchange Fellowship: **8400 USD**	2021
NSERC Postgraduate Scholarship (PGS D3): **63000 CAD**	2020 - 2023
Queen Elizabeth II Graduate Scholarship: **15000 CAD**	2018 - 2019
Ontario Graduate Scholarship: **15000 CAD**	2017 - 2018
Engineering Science Capstone Design Winner, U of T: **1500 CAD**	2017
Engineering Society Award, U of T: **4200 CAD**	2015
NSERC Undergraduate Summer Research Award: **5600 CAD**	2014
Club for Biomedical Engineering Competition Winner, U of T: **300 CAD**	2014

Tetra Enable Competition Potential Award, U of T: **200 CAD** 2013

Total amount obtained: about 280,000 CAD

*= Selected to the Rising Stars in Data Science cohort; unable to attend

**= Administered by the UW Applied Mathematics Department and has been awarded to only three individuals in the department's history, including myself, at the NSF GRFP rate (adjusted based on the FRQNT support)

SELECTED PUBLICATIONS

Liu Y.H., Geadah V., Pillow J., "Flexible inference of learning rules from de novo learning data using neural networks". Advances in Neural Information Processing Systems (NeurIPS), 2025 (accepted).

Liu, Y.H., Baratin A., Cornford J., Mihalas S., Shea-Brown E., Lajoie G., "How connectivity structure shapes rich and lazy learning in neural circuits", International Conference on Learning Representations (ICLR), 2024.

Liu Y.H., Ghosh A., Richards B. A., Shea-Brown E., Lajoie G., "Beyond accuracy: generalization properties of bio-plausible temporal credit assignment rules", NeurIPS, 2022.

Liu Y.H., Smith S.J., Mihalas S., Shea-Brown E., Sumbul U., "Cell-type-specific neuromodulation guides synaptic credit assignment in a spiking neural network", Proceedings of the National Academy of Sciences (PNAS), 2021.

FULL PEER-REVIEWED PUBLICATIONS LIST

[P1] **Liu Y.H.**, Geadah V., Pillow J., "Flexible inference of learning rules from de novo learning data using neural networks". NeurIPS, 2025 (accepted).

[P2] **Liu Y.H.**, Yang R.G., Cueva C.J., "Can Biologically Plausible Temporal Credit Assignment Rules Match BPTT for Neural Similarity? E-prop as an Example", International Conference on Machine Learning (ICML), 2025.

– Earlier version appeared as: "Multiple temporal credit assignment rules achieve comparable neural data similarity", NeuroAI at NeurIPS Workshop, 2024.

[P3] Ghosh M., Habashy K.G., De Santis F., Fiers T., …, **Liu, Y.H.**, …, Goodman F., "Spiking neural network models of sound localisation via a massively collaborative process", eNeuro, 2025.

[P4] Liu W., Zhang X., **Liu, Y.H.**, "The Influence of Initial Connectivity on Biologically Plausible Learning", AI to Accelerate Science and Engineering at the Association for the Advancement of Artificial Intelligence (AAAI), 2025.

[P5] **Liu, Y.H.**, Baratin A., Cornford J., Mihalas S., Shea-Brown E., Lajoie G., "How connectivity structure shapes rich and lazy learning in neural circuits", International Conference on Learning Representations (ICLR), 2024.

[P6] Ghosh A., **Liu Y.H.**, Lajoie G., Kording K., Richards B. A., "How gradient estimator variance and bias impact learning in neural networks", ICLR, 2023.

[P7] **Liu Y.H.**, Ghosh A., Richards B. A., Shea-Brown E., Lajoie G., "Beyond accuracy: generalization properties of bio-plausible temporal credit assignment rules", NeurIPS, 2022.

[P8] **Liu Y.H.**, Smith S.J., Mihalas S., Shea-Brown E., Sumbul U., "Biologically-plausible backpropagation through arbitrary timespans via local neuromodulators", NeurIPS, 2022.

[P9] **Liu Y.H.**, Smith S.J., Mihalas S., Shea-Brown E., Sumbul U., "Cell-type-specific neuromodulation guides synaptic credit assignment in a spiking neural network", Proceedings of the National Academy of Sciences (PNAS), 2021.

[P10] **Liu Y.**, Grigorovsky V., Bardakjian B., "Excitation and inhibition balance underlying epileptiform activity," Institute of Electrical and Electronics Engineers (IEEE) Transaction on Biomedical Engineering, 2020.

[P11] Jacobs D., **Liu Y.H.**, Hilton T., del Campo M., Carlen P.L., Bardakjian B.L., "Classification of scalp EEG states prior to clinical seizure onset," IEEE Journal of Translational Engineering in Health and Medicine, 2019.

[P12] **Liu Y.**, Khisti A., Mahajan A., "On privacy in smart metering systems with periodically time-varying input distribution," Proceedings of IEEE Global Conference on Signal and Information Processing, 2017.

[P13] **Liu Y.H.**, Lee S-H., Khisti A., "Information-theoretic privacy in smart metering systems using cascaded rechargeable batteries," IEEE Signal Processing Letters, 2017.

PREPRINTS

[P14] Mastrovito D., **Liu, Y.H.**, Kusmierz L., Shea-Brown E., Koch C., Mihalas S., "Transition to chaos separates learning regimes and relates to measure of consciousness in recurrent neural networks", bioRxiv, 2024.

[P15] Hazelden J., **Liu, Y.H.**, Shlizerman E., Shea-Brown E., "Evolutionary algorithms as an alternative to backpropagation for supervised training of biophysical neural networks and neural ODEs", arXiv, 2023.

TEACHING, MENTORING, AND CURRICULUM DESIGN

Instructor of Record

- Introduction to Neural Coding and Computation, UW (upper-division, ~70 students) — 01/2024 – 03/2024
- Applied Linear Algebra and Numerical Analysis, UW (upper-division, ~50 students) — 06/2022 – 08/2022

Research Mentoring* — 04/2023 – present

Course Design Assistant, Neuromatch Academy — 04/2023 – 07/2023

Guest Lecturer

- Mathematical Biology, Whitworth University (Liberal Arts College) — 01/2024

Teaching Assistant

- COSYNE Tutorial on Spiking Neural Networks (graduate/professional audience) — 03/2022
- Calculus with Analytic Geometry, UW (lower-division, 100+ students) — 09/2019 – 12/2020
- Fundamentals of Computer Programming, U of T (lower-division, 100+ students) — 01/2019 – 04/2019
- Linear Algebra, U of T (lower-division, 100+ students) — 09/2018 – 12/2018
- Calculus III, U of T (lower-division, 100+ students) — 09/2018 – 12/2018
- Introduction to Computer Programming, U of T (lower-division, 100+ students) — 09/2017 – 12/2017

* Each of my three mentees is preparing their first-authored manuscript with my supervision.

** Designed teaching tools based on **large language models (LLMs)** to provide expanded explanations on course material and to guide students through coding exercises

INVITED TALKS

Center for Statistics and Machine Learning at Princeton University	12/2024
Kempner Institute at Harvard University	12/2023
Neural Theory Group at the University of Oregon	11/2023
The Center for the Physics of Biological Function at Princeton University	11/2023
MetaConscious Group at MIT McGovern Institute	10/2023
Grossman Center at the University of Chicago	10/2023
Pillow Lab at Princeton University	10/2023
NeuralAI reading group at Mila – Quebec AI Institute	10/2022
UW Neural Computation and Engineering Connection	05/2022
International Network for Bio-Inspired Computing	04/2022
Lajoie Group at Mila – Quebec AI Institute	09/2021
Summer Workshop on the Dynamic Brain at the Allen Institute	08/2021

ACCEPTED ORAL PRESENTATIONS

Liu, Y.H., Geadah V., Pillow J., "Flexible inference of learning rules from de novo learning data using neural networks", Statistical Analysis of Neural Data (SAND), 2025.

Liu, Y.H., Baratin A., Cornford J., Mihalas S., Shea-Brown E., Lajoie G., "How connectivity structure shapes rich and lazy learning in neural circuits", NeuroAI Montreal, 2023.

Liu, Y.H., Smith S.J., Mihalas S., Shea-Brown E., Sumbul U., "Biologically-plausible backpropagation through arbitrary timespans via local neuromodulators," Computational and Systems Neuroscience (COSYNE), 2023.

Liu, Y.H., Ghosh A., Shea-Brown E., Lajoie G., "Beyond accuracy: robustness and generalization properties of biologically plausible learning rules," From Neuroscience to Artificially Intelligent Systems (NAISys), 2022.

Liu, Y.H., "A Large-Scale Neuro-Glial Network Model of Seizure Termination," U of T Annual Research Conference, 2019.

ACCEPTED POSTER PRESENTATIONS

Mo H. H., **Liu Y.H.**, Shea-Brown E., Mihalas S., "How spiking vs rate dynamics in neural networks impact rich vs lazy learning regimes", 10th Annual BRAIN Initiative Meeting, 2024.

Liu, Y.H., Baratin A., Cornford J., Mihalas S., Shea-Brown E., Lajoie G., "How connectivity structure shapes rich and lazy learning in neural circuits", COSYNE, 2024.

Liu, Y.H., Baratin A., Cornford J., Mihalas S., Shea-Brown E., Lajoie G., "How recurrent network connectivity shapes learning: implications for effective rich and lazy regimes in neuroscience", Lake Conference – Neural Coding and Dynamics, 2023.

Liu Y.H., Ghosh A., Richards B. A., Shea-Brown E., Lajoie G., "Beyond accuracy: generalization properties of bio-plausible temporal credit assignment rules", 9th Annual BRAIN Initiative Meeting, 2023.

Liu, Y.H., Smith S.J., Mihalas S., Shea-Brown E., Sumbul U., "Biologically-plausible backpropagation through arbitrary timespans via local neuromodulators," NeuroAI in Seattle, 2022.

Liu, Y.H., Lajoie G., "Beyond accuracy: robustness and generalization properties of biologically plausible learning rules," COSYNE, 2022.

Liu, Y.H., Smith S.J., Mihalas S., Shea-Brown E., Sumbul U., "A solution to temporal credit assignment using cell-type-specific modulatory signals," COSYNE, 2021.

SERVICE AND OUTREACH

Reviewer, NeurIPS 2025 (reviewed 3 submissions)	06/2025 – 08/2025
Reviewer, ICML 2025 (reviewed 6 submissions)	02/2025 – 04/2025
Reviewer, COSYNE 2025 (reviewed 10 submissions)	11/2024
Reviewer, ICLR 2024 (reviewed 3 submissions)	10/2024 – 12/2024
Co-organizer, COSYNE 2024 Workshop	01/2024 – 03/2024
Reviewer, COSYNE 2024 (reviewed 10 submissions)	12/2023
Secretary, UW Association for Women in Mathematics	09/2023 – 05/2024
Reviewer, NeurIPS 2023 (reviewed 6 submissions)	06/2023 – 08/2023
Session Chair, UW Neural Computation and Engineering Connection	05/2023
Outreach Volunteer, SIAM Math Fair at Lockwood Elementary School	05/2023
Reviewer, COSYNE 2023 (reviewed 12 submissions)	12/2022
Panelist, UW SIAM Student Chapter	10/2020 – 12/2023
Student Organizer, Fairhall and Shea-Brown Joint Lab Meetings	01/2022 – 06/2022
Student Organizer, UW Theoretical Neuroscience Journal Club	09/2020 – 06/2021
Mentor, UW Amath Student Mentorship Program	07/2020 – 06/2022
Event Director, U of T IEEE Student Chapter	09/2016 – 04/2017
Co-Chair, U of T Engineering Science Education Conference	03/2015 – 02/2016
Executive, U of T Undergrad Engineering Research Day	05/2014 – 08/2014

NEWS COVERAGE

"Complex Wiring in Neural Networks," College of Arts and Sciences, University of Washington, December 2021. Available at: https://tinyurl.com/mr36cvjz

BLOG WRITING

"*Generalization properties of bio-plausible temporal credit assignment rules*." The Mila Blog (June 2023), URL: https://tinyurl.com/4hz6uvs9

ADDITIONAL TRAINING

Mentoring Best Practices, Princeton Neuroscience Institute	01/2025 – 04/2025
Summer Workshop on the Dynamic Brain, Allen Institute for Brain Science	08/2021
Scientific Writing, Faculty of Applied Science and Engineering, U of T	01/2019 – 04/2019

TECHNICAL SKILLS

Proficiency in Python (NumPy, Matplotlib, TensorFlow, PyTorch), MATLAB, C/C++, shell scripting and working with supercomputers.