SHUCHEN WU

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EMPLOYMENT HISTORY

Shanahan Foundation Fellow — *Seattle, WA, USA*
Allen Institute and University of Washington
Advisors: Rajesh Rao, Stefan Mihalas, Carl Schoonover — 2025-

Visiting Researcher — *Munich, Germany*
Institute of Explainable Machine Learning, Helmholtz Munich — 2024-2025
Advisor: Zeynep Akata

EDUCATION

Max Planck Institute for Biological Cybernetics — *Tübingen, DE*
Ph.D. Computational Neuroscience — Magna Cum Laude
Advisors: Eric Schulz, Peter Dayan, Felix Wichmann — 2020-2024

Institute of Neuroinformatics, University of Zürich & ETH Zürich — *Zürich, CH*
M.Sc. Neural Systems and Computation — 2017-2019

University of Rochester — *Rochester, NY, USA*
B.A. Physics, B.S. Applied Mathematics, B.A. Computer Science — 2013-2017
ΦBK, ΣΠΣ, Magna Cum Laude — Highest Distinction

PUBLICATIONS

Wu, S. C., Rao, R. J., and Mihalas, S., *Percept Activation Graph (PAG): Decomposing LLM Computation into Perceptual Entities and Their Interactions*. Submitted.

Tekker, N., Rui, X., Akata, Z. and **Wu, S. C.**, *What is the Color of RED? Vision Language Models Prefer to Read Rather Than See*. Submitted.

Wu, S. C., Alaniz, S., Schulz, E., and Akata, Z. *Concept-guided Interpretability via Neural Chunking*. In *Proceedings of the 39th Conference on Neural Information Processing Systems (NeurIPS)*, 2025.

Wu, S. C., Thalmann, M., Dayan, P., Akata, Z., and Schulz, E. *Building, Reusing, and Generalizing Abstract Representations from Concrete Sequences*. In *Proceedings of the 13th International Conference on Learning Representations (ICLR)*, 2025. `https://openreview.net/forum?id=xIUUnzrUtD`

Wu, S. C. *From Dionysius Emerges Apollo: Learning Patterns and Abstractions from Perceptual Sequences*. Ph.D. Thesis, Max Planck Institute for Biological Cybernetics / University of Tbingen, 2025.

Wu, S. C., Thalmann, M., and Schulz, E. *Two Types of Motifs Enhance Human Recall and Generalization of Long Sequences*. *Communications Psychology*, 3, 3, 2025. `https://www.nature.com/articles/s44271-024-00180-8`

Wu, S. C., Éltető, N., Dasgupta, I., and Schulz, E. *Chunking as a Rational Solution to the Speed-Accuracy Trade-off in a Serial Reaction Time Task*. *Scientific Reports*, Nature Publishing Group, 2023. `https://www.nature.com/articles/s41598-023-31500-3`

Schreiber, A., **Wu, S. C.**, Wu, C. X., Schulz, E., and Indiveri, G. *Biologically-plausible Hierarchical Chunking on Mixed-signal Neuromorphic Hardware*. Workshop on Machine Learning with New Compute Paradigms, NeurIPS 2023. `https://openreview.net/pdf?id=IuN2WXtFSY`

Wu, S. C., Éltető, N., Dasgupta, I., and Schulz, E. *Learning Structure from the Ground-up—Hierarchical Representation Learning by Chunking.* In *Proceedings of the 36th Conference on Neural Information Processing Systems (NeurIPS)*, 2022. https://proceedings.neurips.cc/paper_files/paper/2022/file/ee5bb72130c332c3d4bf8d231e617506-Paper-Conference.pdf

Binz, M., *...many co-authors...*, **Wu, S. C.**, Schulz, E. *Centaur: A Foundation Model of Human Cognition. Nature* 644, 10021009 (2025). https://doi.org/10.1038/s41586-025-09215-4

Wu, S. C., Yoerueten, M., Wichmann, F. A., Schulz, E. *Characterizing the Dynamics of Visual Hierarchical Grouping* (in prep.)

Chattoraj, A., Lange, R., **Wu, S. C.**, Haefner, R. *A neural sampling-based model of early visual processing based on leaky integrate-and-fire neurons* (in prep.)

CONFERENCE ABSTRACTS AND POSTERS

Wu, S. C., Thalmann, M., Dayan, P., Akata, Z., and Schulz, E. *Building, Reusing, and Generalizing Abstract Representations from Concrete Sequences.* Janelia Grounding Cognition in Mechanistic Insight Workshop, 2025

Wu, S. C., Thalmann, M., Dayan, P., Akata, Z., and Schulz, E. *Building, Reusing, and Generalizing Abstract Representations from Concrete Sequences.* the 13th International Conference on Learning Representations (ICLR), 2025

Wu, S. C., Thalmann, M., and Schulz, E. *Learning, from Concrete to Abstract, Simple to Complex.* The 46th Annual Meeting of the Cognitive Science Society (CogSci) 2024

Wu, S. C., Yoerueten, M., Wichmann, F. A., and Schulz, E. *Normalized Cuts Characterize Visual Recognition Difficulty of Amorphous Image Sub-parts.* Computational and Systems Neuroscience (Cosyne) 2024

Wu, S. C., Thalmann, M., and Schulz, E. *Projectional Motifs Facilitate Sequence Memorization and Transfer.* Computational Cognitive Neuroscience (CCN) 2023

Wu, S. C., Thalmann, M., and Schulz, E. *A Taxonomy of Sequence Motifs Which Facilitate Memorization and Out-of-distribution Transfer.* In *Proceedings of the 2023 Conference on Cognitive Computational Neuroscience (CCN)*, Poster P-3.118, pp. 1294–1296, Oxford, UK.

Yoerueten, M., **Wu, S. C.**, Wichmann, F. A., Schulz, E. *Characterizing the Dynamics of Visual Hierarchical Grouping*, Systems Vision Science Symposium 2023

Schreiber, A., **Wu, S. C.**, Wu, C. X., Schulz, E. and Indiveri, G. *Biologically-plausible Hierarchical Chunk Learning on Mixed-signal Neuromorphic Hardware*, International conference on neuromorphic, natural and physical computing (NNPC) 2023

Wu, S. C., Éltető, N., Dasgupta, I. and Schulz, E. *Learning Structure from the Ground-up—Hierarchical Representation Learning by Chunking*, NeurIPS 2022

Wu, S. C., Éltető, N., Dasgupta, I. and Schulz, E. *Chunking as a Rational Solution to Speed-Accuracy Trade-off in a Serial Reaction Time Task*, Cogsci 2020

Wu, S. C., Geirhos, R. and Wichmann, F. A. *An Early Vision-Inspired Visual Recognition Model Improves Robustness Against Image Distortions Compared to a Standard Convolutional Neural Network*, EPFL Neuro Symposium, BCCN 2019

Chattoraj, A.,**Wu, S. C.**, Lange, D., Haefner, R., *A Probabilistic Population Code Based on Neural Sampling*, Cosyne 2018, BCCN 2019

TALKS

The emergence of entities from perceptual sequences Neural AI Conference, Seattle, 2025

Hierarchical Representations in Cognitive, Artificial, and Biological Intelligence NSF AI Institute for Artificial and Natural Intelligence (ARNI), Online, 2024

Chunks, Abstractions, Motifs - Towards a Generalized Framework of Cognitive Factorization, Allen Institute and University of Washington, Online, 2024

Chunks, Abstractions, Motifs, Human Information Processing Lab, University of Oxford, Oxford, UK, 2023

Chunks, Abstractions, Motifs, Tim Behrens Lab, Sainsbury Wellcome Centre, London, UK, 2023

Hierarchical Representation Learning by Chunking, Memory and Neuromodulation Lab, NYU Lagone, NY, Online, 2023

Man's Search for Patterns, Institute of Biophysics, Chinese Academy of Science, Beijing, 2023

Abstract Motifs Facilitate Learning and Out-of-Distribution Transfer, Institute of Neuroscience (ION), Chinese Academy of Science, Shanghai, China 2023

Man's Search for Patterns, Institute of Neuroscience (ION), Chinese Academy of Science, Shanghai, 2023

Man's Search for Patterns, Eier Eye Hospital, Changsha, China, 2023

Man's Search for Patterns, NeuroSpin UNICOG Lab Meeting, Paris, France, 2022

Learning Representations from the Ground-Up—Hierarchical Representation Learning by Chunking, Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS), 2022

Learning Representations from the Ground-Up—Hierarchical Representation Learning by Chunking, Explainable Machine Learning Lab, Tübingen, 2021

E pluribus unum but how? Chunking as a rational solution to speed-accuracy trade-off in a serial reaction time task, NeuroCode + HIP + CPI Joint Lab Meeting, 2021

Mental Framing Theory, Studiumfichti, Tuebingen, Germany, 2021

Chunking as a Way of Learning Representations, CPI-Doeller Joint Meeting, Online, 2020

Tyranny of the Majority—Sparsity change in the hidden layer reveals a mechanism of adversarial attack. Machine Learning Summer School (MLSS Tuebingen), 2020

Measurement of the Primary D-T and D-D Ion Temperature Using Neutron Time of Flight Spectra in Inertial Confinement Fusion Experiments., Laboratory for Laser Energetics, Rochester, NY, USA, 2015

SUMMER SCHOOLS

Summer Workshop on the Dynamical Brain, Allen Institute and the University of Washington, 2024

Machine Learning Summer School (MLSS), Max Planck Institute for Intelligent Systems, 2020

Cellular, Cognitive and Computational Neuroscience Summer School, Princeton University, 2018

Computational Neuroscience School, Max Planck Institute for Dynamics and Self-Organization, 2017

Summer School in Computational Sensory-Motor Neuroscience, 2016

SERVICE & TEACHING EXPERIENCE

· Reviewer: ICLR 2025, NeurIPS 2025 (Top Reviewer), *PNAS* 2025, *PLOS ONE* 2024, *Open Mind* 2024, CCN 2023, CogSci 2023, 2024 *Developmental Cognitive Neuroscience* 2022

- Organizer, Reinforcement Learning and Decision Making Seminar Series, 2020, 2021, 2022; Classics in Cognitive Science Journal Club, 2020, 2021; Sutton and Barto Reading Group, 2020, Max Planck Institute for Biological Cybernetics.
- PhD Representative, 2023, Max Planck Institute for Biological Cybernetics.
- CaCTüS Internship Buddy, 2022, Max Planck Institute for Biological Cybernetics.
- Student Representative at the Professional Appointment Committee, Institute of Neuroinformatics, 2019
- Teaching Assistant, Computation & Consciousness, 2017; Electricity & Magnetism (PHY 114), 2015; Engineering Mechanics (PHY 121), 2014

TEACHING AND SUPERVISION

Nurbüke Teker M.Sc. Thesis, Evaluating the representations of VLMs on Stroop Paradigm, Computer Science, Technical University of Munich (2025)

Emre Demirci M.Sc. Thesis (cosupervised with Prof. Emre Akbas at Helmholtz Munich — METU), Curriculum Learning Effect of Vision Models Learning from Tangram Images, Computer Science, Technical University of Munich (2025)

Mehmet Yörüten M.Sc. Thesis, Evaluating Dynamics of Visual Perception by Normalized-Cut, Neural Information Processing, University of Tübingen (2023)

Atilla Schreiber B.Sc. Thesis, Neuromorphic Implementation of Sequence Chunking, University of Zürich (2022)

HONORS & AWARDS

- Top Reviewer, NeurIPS 2025
- Shanahan Foundation Fellowship at the Interface of Data and Neuroscience 2025 - 2028
- SMARTSTART I Computational Neuroscience Fellowship, 2018 - 2019
- Phi Beta Kappa (ΦBK), elected 2017 Oldest academic honor society in the United States, recognizing excellence in the liberal arts and sciences.
- Sigma Pi Sigma (ΣΠΣ), elected 2017 National physics honor society, awarded for outstanding academic achievement in physics.
- Deans Scholarship, University of Rochester, 2013 - 2017
- Continuing Student Scholarship, University of Rochester, 2014 - 2017
- Dean's List, University of Rochester, 2013 - 2017
- Summer Scholar, University of Rochester Medical Center, 2016
- Nominated, Golden Key Scholar, National Society of Collegiate Scholars, 2015 & 2016
- Discover Grant for Undergraduate Research, 2015

OTHER ACTIVITIES

Active member, Johann Gottlieb Fichte-Haus self-organizing community (2020 - 2024): held roles across multiple committees, organized cultural and sustainability initiatives, co-hosted 500-person events, and elected to leadership positions in conflict mediation (2021) and admissions (2023).

Taught coding lessons for kids with age from 5 to 16, TechSpark Academy Coding Camp, 2019

Wrote technical articles to summarize the latest AI conference papers, Synced, AI Technology and Industry Review, 2019

Women's Squash, Ladder: 2013 - 2016, Co-captain: 2016 - 2017, University of Rochester

Flutist, New York Empire State Youth Orchestra, 2013, University of Rochester Chamber Orchestra, 2015;

LANGUAGES

Mandarin (Native), English (Professional), German (Fluent)