Yanchen(Wilson) Wang

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Research Interests

Computational Neuroscience, Computational Cognitive Science, Neuroimaging, Machine Learning

Education

University of Rochester **August 2019 – May 2023**
B.S. Computer Science, Minor Mathematics *Rochester, NY*

Research Experience

Columbia University **February 2024 – Present**
Research Staff Assistant (Supervisor: Liam Paninski) *Paninski Lab*

- Built towards the first foundation model for neural spiking data that can solve a diverse set of tasks across multiple brain areas; proposed a self-supervised modeling approach for population activity in which the model alternates between masking out and reconstructing neural activity across different time steps, neurons, and brain regions.
- Introduced a multimodal masked modeling approach that masks portions of both behavior and neural activity, using the unmasked data to make predictions across both modalities; the model is able to seamlessly translate between neural activity and behavior, outperforming state-of-the-art models in both neural encoding and decoding.
- Analyzed raw mouse behavior videos using optical flow to capture detailed motion dynamics; developing a foundational model for video analysis to enhance representation learning, evaluated through end-to-end video-to-spike encoding, assessing models in capturing and interpreting complex behavioral patterns.

Stanford University **February 2023 – September 2024**
Research Data Analyst (Supervisor: Feng Vankee Lin, Ehsan Adeli) *CogT Lab*

- Developed a generative model that captures semantic meanings and decoded high quality images from whole-brain human fMRI; the model can extract semantic information beyond the visual cortex and even decode images without these regions; performed scale analysis that highlights the model's potential for future applications in imagination and complex behavior analysis.
- Discerned how facial expressions mirror human fatigue levels—an aspect crucial for assessing a patient's mental state in clinical contexts; incorporated a Recurrent Video Transformer that supersedes traditional methods like statistical analysis or the Visual Analogue Scale, offering precise predictions of fatigue based on visual data we collected during cognitive training sessions; observed a strong correlation between reaction time and facial expression.

Shanghai Jiao Tong University **July 2023 – November 2023**
Research Assistant (Supervisor: Ruyuan Zhang) *CCNN Lab*

- Explored the Forward Forward (FF) algorithm's efficiency in standard regression tasks and enhanced its performance by unsupervised learning
- Worked on prompt learning to multi-modal vision-languege models, and proposed a MultiModal Adapter (MMA) for VLMs to improve the alignment between representations from text and vision branches.

University of Rochester **August 2022 – May 2023**
Undergraduate Researcher (Supervisor: Christopher Kanan) *KLab*

- Implemented modified back propagation on different neural network models for continual learning, mitigating catastrophic forgetting in incremental learning; extended the benefits of initialization to improve network fine-tuning

Publications

- **Decoding Visual Experience and Mapping Semantics through Whole-Brain Analysis Using fMRI Foundation Models**
  Yanchen Wang*, Adam Turnbull*, Tiange Xiang, Yunlong Xu, Sa Zhou, Adnan Masoud, Shekoofeh Azizi, Feng Vankee Lin, Ehsan Adeli. *Submitted to* ***Nature Human Behaviour.***
- **Jointly modeling neural activity and behavior via multimodal masked modeling**
  Yizi Zhang*, **Yanchen Wang***, Zixuan Wang, Hanrui Lyu, Charan Santhirasegaran, Mehdi Azabou, International Brain Laboratory, Liam Paninski, Cole Hurwitz. *Submitted to* ***Cosyne 2025****.*
- **Towards a "universal translator" for neural dynamics at single-cell, single-spike resolution**
  Yizi Zhang, **Yanchen Wang**, , Donato Jimenez-Beneto, Zixuan Wang, Mehdi Azabou, Blake Richards, Olivier Winter, International Brain Laboratory, Eva Dyer, Liam Paninski, Cole Hurwitz. ***NeurIPS 2024.***
- **Vision-based estimation of fatigue and engagement in cognitive training sessions**
  Yanchen Wang*, Adam Turnbull*, Yunlong Xu, Kathi Heffner, Feng Vankee Lin, Ehsan Adeli. ***Artificial Intelligence in Medicine****.*

- **MMA: Multi-Modal Adapter for Vision-Language Models**
  Lingxiao Yang, Ru-Yuan Zhang, **Yanchen Wang**, Xiaohua Xie. ***CVPR 2024.***
- **Fine-Tuning Neural Networks with Online Backpropagation**
  Yanchen Wang, Christopher Kanan. Abstract accepted by IEEE: WNYISPW.

Work Experience

Digital Currency Group - Foundry **December 2021 - December 2022**
Software Engineer *New York, USA*

- Developed REST API using Go and standardized on-chain data via Rosetta implementation for flow protocol.
- Designed staking architecture and built a multi-protocol wallet address verification package; enhanced CI/CD processes using Docker, YAML, and Makefiles, and implemented synthetic tests for API endpoints using Datadog.

Binance **March 2021 – Sep 2021**
Intern at Binance Broker Team *Beijing, China*

- Managed Binance Brokerage API documentation, resolving developer queries and bugs, and facilitated communications with major platforms, banks, and teams, offering specialized crypto exchange solutions to clients like ccxt.
- Developed Telegram Bots for VIP and Broker services, enhancing user engagement and support efficiency at Binance.

Teaching Experience

University of Rochester

Teaching assistant for CSC266 - Frontiers in Deep Learning **Spring 2023**

Technical Skills

- Languages: Python, Golang, Java, C/C++, SQL, LaTeX, Solidity
- Tools: PyTorch, HuggingFace, Git, Scikit-Learn, Pandas, NumPy, fMRIPrep