Wei Ding

Ph.D. candidate, Tsinghua University | Embodied Cognition | ✉ teresading999@gmail.com

EDUCATION

- **Tsinghua Laboratory of Brain and Intelligence, Tsinghua University** *2021-2026*
  Ph.D. candidate, with concentration on AI of Brain and Cognition.

- **Department of Precision Instrument, Tsinghua University** *2017-2021*
  B.E. in Measurement and Control Technology and Instruments.

- **Department of Computer Science, Tsinghua University** *2018-2021*
  Minor in Computer Application Technology.

PUBLICATIONS

#*denotes co-first author, and * denotes corresponding author.*

[1] **Ding, W.**, Li, F., Ji, Z., Xue, Z.& Liu, J*. (Under review). AToM-Bot: Embodied Fulfillment of Unspoken Human Needs with Affective Theory of Mind. https://arxiv.org/abs/2406.08455

[2] **Ding, W.**, Lin, Y., Zhang, B.*, & Liu, J*. (In submission). Scale-Dependent Coding of the Hippocampus in Relational Memory. https://doi.org/10.1101/2024.01.29.577883

[3] Lin, Y.#, **Ding, W.**#, & Liu, J*. (In submission). Revealing the efficient coding strategy of human in relational memory by reinforcement learning.

[4] Lin, Y., **Ding, W.**, Qiang, S., Deng, L., & Li, G*. (2021). ES-imagenet: A million event-stream classification dataset for spiking neural networks. *Frontiers in Neuroscience*, 1546.

[5] He, W., Wu, Y., Deng, L., Li, G., **Ding, W.**, Wang, W., & Xie, Y*. (2020). Comparing SNNs and RNNs on neuromorphic vision datasets: Similarities and differences. *Neural Networks, 132,* 108–120.

RESEARCH EXPERIENCE

- **Physical Intelligence Lab, Carnegie Mellon University** *May 2024 - Present*
  Supervised by Prof. Jonathan Tsay

  - **Language of Manipulation (Work in Progress):** Through dimensionality reduction of human manipulation gestures and muscle activities, we aim to identify key attractors in human manipulation, facilitating more efficient reinforcement learning for robotic systems.
  - **Generalization Ability of Motor Learning (Work in Progress):** By varying task complexity and time constraints, we aim to uncover distinct learning and execution strategies in human reaching tasks.

- **Tsinghua Laboratory of Brain and Intelligence (THBI), Tsinghua University** *Sep 2021 - Present*
  Supervised by Prof. Jia Liu

  - **Affordance Space Analysis (Work in Progress):** By conducting large-scale online experiments with human participants, we aim to identify the key dimensions of affordance in the human mind and leverage them for rapid symbolic reasoning in robots.
  - **Assistant Embodied Agent Development:** Developed AToM-Bot, a proactive robot-human interaction framework leveraging Vision Language Models (VLMs) and Affective Theory of Mind (AToM) to autonomously detect and fulfill unspoken human needs, achieving high user satisfaction across multiple daily life scenarios.
  - **Computational Neuroscience Modeling:** Utilized RSA and functional connectivity to reveal the functional gradient along the hippocampus long axis through fMRI data. Explored the correlation between the functional gradient and anatomical gradient in the hippocampus by building a Convolutional-LSTM neural network.
  - **Human Behavior Modeling:** Employed reinforcement learning to model human relational memory, integrating strategies like reward focus and temporal information maintenance.

- **Multimodal Large Language Model Group, Zhipu AI** *Jan 2024 - Present*

  - **RLHF for CogVLM (Work in Progress):** Developing both Direct Preference Optimization (DPO) and Proximal Policy Optimization (PPO) framework for cognitive Vision-Language Models (CogVLM). And establishing a systematic benchmark to evaluate and improve the model's ability to follow multi-modal complex instructions.

- **Center for Brain-Inspired Computing Research (CBICR), Tsinghua University** *Sep 2019 - Jul 2021*
  Supervised by Prof. Luping Shi and Prof. Guoqi Li

  - **Spiking Neural Network for Cell Tracking:** Developed an algorithm pipeline for a DVS-based flow cytometer, supporting high throughput cell detection, tracking, and classification.
  - **Large Scale Neuromorphic Dataset:** Proposed a fast and effective algorithm termed Omnidirectional Discrete Gradient (ODG), building a performance benchmark for spiking neural networks.

- **Advanced Computing Group, 2012 Lab** *Jan 2020 - Sep 2021*
  Supervised by Prof. Guoqi Li
  - **Knowledge Distillation:** Developed a framework for distilling large vision models into lightweight networks on mobile devices.
  - **Multimodal Information Integration Network:** Developed a unified framework combining RGB images, lidar data, and low-resolution depth images for depth estimation and semantic segmentation.

Skills

Language: Python, Shell, Matlab, C
ML framwork: Pytorch
fMRI data analysis: FSL

Awards

- Outstanding Graduate(Top 1%), Beijing *2021*
- Honored Graduate(Top 5%), Tsinghua University *2021*
- All-Rounder Scholarships (Top 5%), Department of Precision Instruments *2018,2019,2020*
- Annual Top Community Service Leader, Department of Precision Instruments *2018*
- Academic Excellence Scholarship, Department of Precision Instruments *2017*
- The Silver Medal of National High School Students Biology Competition, China *2016*