

# Shaoyang Cui(Joey)

Department of Psychological and Cognitive Sciences

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## EDUCATION

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### • Bachelor of Engineering in Artificial Intelligence

Sep 2021 - Jul 2025

*Yuanpei College, Peking University*

**Overall Grade:** 86/100 | **GPA:** 3.52/4.0

*Member of the **Tong Class**, an honorary pilot program specializing in AI at Peking University.*

## RESEARCH INTERESTS

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My core interest lies in deconstructing the concept of "**Intelligence**" through the lens of **Cognitive Science** and **Neuroscience** to architect next-generation AI and step towards AGI. Currently, I am focused on bridging these disciplines to investigate the functional mechanisms of Theory-of-Mind (ToM) within Large Language Models, seeking to discern whether their emergent behaviors stem from genuine cognitive reasoning or sophisticated statistical mimicry.

## RESEARCH EXPERIENCE

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### – Research Assistant, Brain-Inspired Algorithmic Modeling Lab

Jul 2025 – Present

*Department of Psychological and Cognitive Sciences, Tsinghua University*

### – Research Intern, Computational Neuroscience Team (PI: Dr. Kai Du)

Jul 2023 – Jul 2025

*Institute for Artificial Intelligence, Peking University*

## PUBLICATION

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### – Task Ability Decomposition and Difficulty Quantification for AGI Evaluation

Mar 2024 - Jul 2025

Cui, S. Y., He, X. Y., Han, J. H., Zhang, Z. L., & Peng, Y. J.

- \* **Science China Technological Sciences (JCR Q1)**. Full title available upon request.
- \* First to explore the structure of task-ability space and its link to task difficulty.
- \* Proposed TADDL-V: a framework for quantifying difficulty of visual tasks to support AGI evaluation.
- \* Released AGI-V70: a curated benchmark set for testing diverse visual abilities. See GitHub.

## PROJECTS

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### TradeCraft: Exploring Theory of Mind in LLM Agents' Strategic Decision-Making and Communication Jul 2025 – Present

*Collaborative Research Project, supervised by Dr. Junqi Wang and Dr. Lifeng Fan*

- Designed and developed **TradeCraft**, a large-scale multi-agent benchmark integrating planning and social reasoning modules to assess the functional utility of Theory-of-Mind in strategic decision-making.
- Manuscript **under review at ICML 2026**.

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### Possible Models of Self-Awareness in Conscious Turing Machines

Sep 2022 - Dec 2022

*Supervised by Prof. Lenore Blum(CMU) and Prof. Manuel Blum(CMU)*

- Based on the previous works of Conscious Turing machine(CTM), discussed the consciousness and self-consciousness of a CTM, gave a clear definition.
- **Invited to present at the IJTCS2023 workshop.**

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### HelioX: A GPU-Native Framework for Biophysically Detailed Networks

2025 - Present

*Supervised by Dr. Kai Du(THU) and Prof. Tiejun Huang(PKU)*

- We developed a GPU-native framework that unifies high-performance simulation with scalable differentiable training for biophysically detailed networks (BDNs).
- Architected an analytical-gradient learning module that avoids the overhead of generic automatic differentiation, enabling precise backpropagation across complex dendritic structures.
- Manuscript **under review at ICML 2026**.

## ON-CAMPUS

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- \* **Champion, 2nd AI Cup Badminton Tournament, Institute for AI, Peking University** *Jun 2025*
- \* **Team Manager and Coach: Women's Football Team, Yuanpei College** *Oct 2022 - Jun 2024*
- \* **Member of the Tennis Team, Yuanpei College** *Oct 2022 - Jul 2025*

## AWARDS

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- \* **IJCAI 2022–2023 Special Track: Chinese Standard Mahjong AI Competition** *Jun 2022 – Jun 2023*  
*Peking University, under the supervision of Prof. Wenxin Li*
  - Achieved **10th place** in **IJCAI 2022** and **7th place** in **IJCAI 2023**, invited to present at the **IJCAI 2023 Special Track**.
  - Competition details available at official game page.

## PERSONAL QUALITIES

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**IELTS:** 7.5

**Technical Skills:** Proficient in PyTorch, NEURON as well as development tools like Git and GitHub.