

**PERSONAL INFORMATION**

Full name: Yinan Cao  
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**RESEARCH PROFILE**

The central theme of my research is to uncover the neural and computational mechanisms of human information seeking and their role in flexible decision-making.

I received my training at the University of Oxford with Chris Summerfield and Andrew Saxe, and later conducted postdoctoral research with Konstantinos Tsetsos and Tobias Donner in Hamburg. I combine cognitive modeling (low-dimensional algorithmic models and high-dimensional neural networks) with model-based neuroimaging (magnetoencephalography, MEG) to link latent computations to their neural representations. This approach allows me to characterize the computational strategies that govern how the brain samples, filters, and represents information to guide decisions under uncertainty ([Cao et al., 2019, \*Neuron\*](#); [Cao & Tsetsos, 2022, \*eLife\*](#)) and to learn the structure of the world ([Cao et al., 2020, \*NeurIPS\*](#)).

Currently, I am a Marie Curie Fellow in the laboratory of Valentin Wyart at ENS in Paris. My recent work focuses on how strategies of information seeking adapt to context and task structure, including decision framing ([Siems et al., 2026, \*Nature Communications\*](#)), and how they are shaped by the goals (reward seeking vs. epistemic information seeking) ([Cao et al., 2026, \*bioRxiv\*, under review](#)). Using precisely controlled behavioral paradigms combined with MEG and pupillometry, I identify distinct computational motives underlying human information sampling and compare them with the emergence of sampling policies in recurrent neural networks trained on the same tasks as humans.

**ACADEMIC & PROFESSIONAL APPOINTMENTS**

- 01/10/2024–present      **Marie Skłodowska-Curie Fellow**, École Normale Supérieure, Paris, France  
Host laboratory: Laboratoire de Neurosciences Cognitives et Computationnelles  
Advisor: Valentin Wyart  
Secondment advisor: Tobias H. Donner
- 01/08/2020–30/09/2024      **Postdoctoral Researcher**, Institute of Neurophysiology and Pathophysiology, University Medical Center Hamburg-Eppendorf, Hamburg, Germany  
Funded by the **ERC Starting Grant** “Information Sampling in Multiattribute Choice” (PI: K. Tsetsos).  
Advisors: Konstantinos Tsetsos, Tobias H. Donner
- 01/01/2020–30/07/2020      **Research Specialist**, University of Oxford, Oxford, United Kingdom  
Advisors: Christopher Summerfield, Andrew Saxe
- 01/10/2015–29/11/2019      **PhD (Clarendon Scholar)** in Experimental Psychology, University of Oxford, Oxford, United Kingdom  
Supervisors: Christopher Summerfield (primary), Christoph Kayser (co-supervisor)

**EDUCATION**

- 01/10/2015–29/11/2019      PhD, University of Oxford, Oxford, United Kingdom
- 01/09/2011–15/07/2014      MA, McGill University, Montréal, Canada  
Supervisor: Stephen McAdams
- 01/09/2007–15/07/2011      BEng, Tsinghua University, Beijing, China

**RESEARCH TRAINING & VISITING POSITIONS (BEFORE PHD)**

- 2014–2015 NSERC-CREATE Research Intern in Neuroimaging, International Laboratory for Brain, Music and Sound Research (BRAMS), Montréal, Canada
- 2013–2015 Visiting Researcher, Institute of Neuroscience and Psychology, University of Glasgow, Glasgow, United Kingdom

**FELLOWSHIPS & COMPETITIVE FUNDING**

- **Marie Skłodowska-Curie Fellowship** (€195,915), European Commission, 2024–present
- **Clarendon Scholarship & Brasenose-Kwai Cheong Scholarship**, University of Oxford (full doctoral funding awarded to the top 1.8% of all Oxford offer-holders; ~£44,331), 2015–2019
- NSERC-CREATE Auditory Cognitive Neuroscience Research Award (\$3,550) & Graduate Fellowship (\$17,300), Natural Sciences and Engineering Research Council of Canada, 2011–2015
- CIRMMT Research Exchange Award (\$3,000), McGill University, 2013
- GREAT Travel Awards (\$375), McGill University, 2013
- Graduate Excellence Fellowship (\$10,500), McGill University, 2011–2013

**SCIENTIFIC OUTPUTS**

Cao, Y., Summerfield, C., Park, H., Giordano, B. L., & Kayser, C. (2019). Causal inference in the multisensory brain. *Neuron*, 102(5), 1076–1087. doi: <https://doi.org/10.1016/j.neuron.2019.03.043>

Cao, Y. & Tsetsos, K. (2022). Clarifying the role of an unavailable distractor in human multi-attribute choice. *eLife*, 11, e83316. doi: <https://doi.org/10.7554/eLife.83316>

Siems, M., Cao, Y., Tohidi-Moghaddam, M., Donner, T. H., & Tsetsos, K. (2026). Rhythmic sampling of multiple decision alternatives in the human brain. *Nature Communications*. doi: <https://doi.org/10.1038/s41467-026-69379-z>

Cao, Y., Summerfield, C., & Saxe, A. (2020). Characterizing emergent representations in a space of candidate learning rules for deep networks. *Advances in Neural Information Processing Systems (NeurIPS)*, 33, 8660–8670. [\[link to paper\]](#)

Cao, Y., Alméras, C., Lee, J. K., Inès Maye, & Wyart, V. (2026, under review at *Nature Human Behaviour*). Humans use a dual policy to improve inferences during epistemic information seeking. *bioRxiv*. doi: <https://doi.org/10.1101/2025.10.08.681186>

Siems, M., Cao, Y., Donner, T. H., Tsetsos, K., & Engel, A. K. (2025, under review at *Nature Communications*). High-amplitude oscillatory events orchestrate cortical activity for efficient cognition. *bioRxiv*. doi: <https://doi.org/10.1101/2025.11.21.689181>

Cao, Y., Giordano, B. L., Avanzini, F., & McAdams, S. (2016). The dominance of haptics over audition in controlling wrist velocity during striking movements. *Experimental Brain Research*, 234(4), 1145–1158. doi: <https://doi.org/10.1007/s00221-015-4529-9>

Tsetsos, K. & Cao, Y. (2025). Perspectives on the mechanistic underpinnings of choice biases. In: Ettinger, U., Heinrichs, B., Murawski, C. (eds) *Decision Making. Studies in Neuroscience, Psychology and Behavioral Economics*. Springer, Cham. [https://doi.org/10.1007/978-3-032-00880-0\\_5](https://doi.org/10.1007/978-3-032-00880-0_5)  
Preprint: doi: <https://doi.org/10.31234/osf.io/2bjae>

Cao, Y. & Tsetsos, K. (2023). Decision bias and sampling asymmetry in reward-guided learning. *bioRxiv*. doi: <https://doi.org/10.1101/2023.09.10.557023>

Cheng, Y., Yuan, X., Jiang, Y., & Cao, Y. (2025). Computational models and neural mechanisms of causal inference in multisensory integration. *SCIENTIA SINICA Vitae*, 55(7), 1395–1408. doi: <https://doi.org/10.1360/SSV-2024-0160>

**INVITED TALKS AND CONFERENCE PRESENTATIONS****Invited Talks (selected):**

- 2025 Workshop on Cognitive Modeling (WoCoMo), Marseille, France  
*Unpacking the black box: Building recurrent neural networks from scratch*
- 2025 Institut de Neurosciences de la Timone (invited by Andrea Brovelli), Marseille, France  
*Flexible human information seeking in decisions under uncertainty*
- 2023 École Normale Supérieure (invited by Valentin Wyart), Paris, France  
*Emergent bias in reward-guided learning*
- 2023 NeuroChat (international public neuroscience forum, online)  
*Flexible information sampling in human decision-making*
- 2021 Max Planck Institute for Human Development, Berlin, Germany  
*Emergent representations in a space of learning rules for deep networks*
- 2020 The FENS Forum 2020—Symposium “The flexible use of multisensory information for behavior – models, neurons and neuroimaging” (Chairs: Uta Noppeney, Christoph Kayser)  
*Unfolding of multisensory inference in mind and behavior*

**Conference Presentations (selected):**

- 2025 Multi-disciplinary Conference on Reinforcement Learning and Decision Making (RLDM), Dublin, Ireland
- 2024 Foraging and Information Seeking Conference, Lyon, France
- 2023 International Symposium on Biology of Decision Making (SBDM), Paris, France
- 2022 Society for Neuroscience Annual Meeting (SfN), San Diego, CA, USA
- 2022 Bernstein Conference on Computational Neuroscience, Berlin, Germany
- 2019 Conference on Cognitive Computational Neuroscience (CCN), Berlin, Germany
- 2019 Organization for Human Brain Mapping (OHBM) Annual Meeting, Rome, Italy

**SUPERVISION & TEACHING**

Instructor, [Workshop on Recurrent Neural Network for Cognitive Modeling](#) (2025).

Supervised 1 MSc student (Inès Maye), École Normale Supérieure (2024–2025).

Supervised 2 BSc students (Fabian Otto, Xavier Roberts-Gaal), University of Oxford (2020).

Co-supervised 1 BSc student (Emily Wilson), McGill University (2013).

Teaching assistant, Cognitive Science (COGS 444, Honors Research, 6 credits), McGill University (2012).

**SERVICE TO THE SCIENTIFIC COMMUNITY**

Ad-hoc reviewer for journals: PNAS, Nature Communications, PLOS Computational Biology, Open Mind: Discoveries in Cognitive Science, Auditory Perception and Cognition, The Journal of the Acoustical Society of America (JASA), eLife etc.