

Yiwei Cao

yiwei.cao@mail.mcgill.ca

+1 (438) 223-6074

EDUCATION

McGill University, Montreal, Canada

Sep 2019 - 2023E

Bachelor of Arts and Science

Honors Cognitive Science (Computer Science Stream), Minor Computer Science

CGPA: 3.97/4.00

Thesis: *A Resource-Rational Process Model of Violation of Cumulative Independence*

HONOURS AND AWARDS

- Science Undergraduate Research Awards (SURA) \$7,000 (2021)
- Faculty of Science Scholarship \$300 (2021)

RESEARCH EXPERIENCE

Honors Thesis Student

Sep 2021 – Aug 2022

Laboratory of Natural and Simulated Cognition (LNSC), McGill University, Montreal, Canada

Supervisors: Prof. Thomas Shultz and Dr. Ardavan Salehi Nobandegani

- Used computer-based simulations to test whether and how a psychological process model, sample-based expected utility (SbEU), explains violation of cumulative independence (VoCI), a phenomenon in human decision-making that demonstrates violation of cumulative prospect theory (CPT) and expected utility theory (EU).
- Identified a set of well-replicated empirical demonstrations of VoCI by reviewing past literature.
- Implemented SbEU in MATLAB and used grid search to find the optimal parameters.
- Successfully simulated the empirical phenomenon, with high correlation ($r > 0.8$) between the model simulated results and the empirical data.
- Constructed and ran further simulations to compare the performance of SbEU to CPT and a state-of-the-art model named transfer of attention exchange (TAX); found that SbEU significantly outperforms CPT and is commensurable to TAX.
- Drafted a complete manuscript in preparation for journal submission.

Research Assistant

Sep 2021 – Apr 2022

The Otto Lab, McGill University, Montreal, Canada

Supervisors: Prof. Ross Otto and Dr. Mario Bogdanov

- Performed transcranial direct-current stimulation (tDCS) on more than 30 participants and guided them to complete cognitive tasks in an experiment concerning cognitive effort expenditure and decision-making in the presence of opportunity cost.
- Attended weekly lab meetings and made two 45-minute presentations on research papers.

SURA Undergraduate Researcher

May 2021 – Aug 2021

*The Britt Lab, McGill University, Montreal, Canada**Supervisor: Prof. Jonathan Britt*

- After identifying and examining >20 relevant research papers, drafted a mini review article regarding the effect of optogenetically increasing dopamine signaling in the midbrain on the feeding behavior of mice.

High School Student Researcher

Sep 2018 – May 2019

*Advanced Placement Capstone Research Project, Ottawa, Canada**Supervisor: Prof. John Logan*

- Completed a research course project on the relationship between human voice frequency and adolescents' perception of trustworthiness.
- Responsible for submitting the research proposal, reviewing the literature, designing experimental procedure, recruiting participants, analyzing experimental data, writing the research paper, and completing the oral defense.

WORK & VOLUNTEER EXPERIENCE

Volunteer

Nov 2021 – May 2022

*Cognitive and Social Neuroscience Lab, McGill University, Montreal, Canada**Supervisor: Prof. Bruno Debruille*

- Modified a data processing script in MATLAB to solve a temporal misalignment problem in a set of pre-collected electroencephalography (EEG) data.
- Developed a new function, based on EEGLAB (a MATLAB toolbox for processing EEG data), that merges multiple sets of EEG channels into a single file.
- Processed the data of more than 50 pairs of experimental subjects to test the data processing script.

Intern

Jun 2021 – Aug 2021

*Chinese Academy of Sciences, Institute of Computing Technology, Beijing, China**Supervisor: Dr. Qi Wang*

- Found, read, and wrote short summaries of research papers concerning adversarial attack algorithms that target deep reinforcement learning models.

Academic Executive

Sep 2020 – May 2021

McGill Chinese Students and Scholars Association, remote

- Independently organized an online academic writing workshop in which a guest speaker (Liaison Librarian of McGill) presented tips for writing research papers and engaged participants in writing activities.
- Collaborated with other executives to hold various seminars and events.

PUBLICATION

- **Cao, Y.,** Nobandegani, A. S., & Shultz, T. R. (2022). A Resource-Rational Process Model of Violation of Cumulative Independence (peer reviewed). In *Proc. of the 44th Annual Conference of Cognitive Science Society (CogSci)*.
- **Cao, Y.,** Nobandegani, A. S., & Shultz, T. R. (in preparation). Comparing Models of Violation of Cumulative Independence: Sample-based Expected Utility, Cumulative Prospect Theory, and Transfer of Attention Exchange.

PRESENTATION

- **Cao, Y.,** Nobandegani, A. S., & Shultz, T. R. *A Resource-Rational Process Model of Violation of Cumulative Independence* (5 min). National Integrative Research Conference (NiRC), Montreal, QC. Canada. April 2022.

SKILLS AND CERTIFICATION

Programming & Software: Python, MATLAB, Java, C, Unix, PyTorch, LaTeX

Experimental Neuroscience: transcranial direct current stimulation (tDCS), EEG data analysis

Certification: Neuromatch Academy Computational Neuroscience Course Completion Certificate