

BOGENG SONG

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SUMMARY

I am a master student in New York University, I am interested in artificial intelligence (machine learning, computer vision, reinforcement learning and NLP), computational neuroscience and computational cognitive science.

EDUCATION BACKGROUND

Master: General Psychology

New York University (NYU), | May 2023

GPA: 3.54/4.0

Bachelor of Science: Psychology

Capital Normal University (CNU), School of Psychology | July 2019

GPA: 3.5/4.0

RESEARCH AND INTERNSHIP EXPERIENCE

Project Research Assistant

New York University (Marisa Carrasco Lab) | Nov 2021-Current

- Using psychophysical methods to measure radial direction bias.
- Analyze eye-tracking data and measure Microsaccades and pupil size.
- Run statistics methods and computational models to examine the impact of cognitive effects on Microsaccades and pupil size.

Research Assistant

New York University (Jonathan Winawer Lab) | Nov 2021-Current

- Use docker and jupyter notebook to draw the outline of visual cortex.
- Train deep neural network model (U-net structure with CNN encoder) to do imaging segment task.

Lab Member (Thesis Project)

New York University (Grace Lindsay Lab) | Aug 2022-Current

- Build Neural Network to mimic human visual and auditory system.
- Test bio-inspired attention affects task performance in visual and auditory models.

Team Member

Algonauts Project 2023 Challenge | Mar 2023-Jul 2023

- Using Machine Learning and Deep Learning method to predict fMRI activation.
- Integrating neuroscience knowledge into model networks to get better prediction score.

Internship Student

Depression and Anxiety Center (Mount Sinai) | Jun 2022-Dec 2022

- Analyze fMRI data with SPM12 and afni, running computational model on neuroimaging and behavior data.
- Design experiment and write psychopy script for fMRI experiment.

Course Project

Bayesian Machine Learning course | Oct 2022-Dec 2022

- Build Semi-Supervised Learning with Variational Bayesian Inference and Maximum Uncertainty Regularization.
- Propose two generic methods to improve the Semi-Supervised learning model. Main idea for this project is to transfer whole model from parameter space into function space (Like Gaussian process).

Group Member (Final Project)

Computational cognitive modeling course | Feb 2022-Jun 2022

- Build different computational models (language models to deal with text) to better understand the cognitive processes that people use while constructing a type of story.
- Extract the main features from the several machine learning models and compare with human data.

Full Time Research Assistant

INSTITUTE OF PSYCHOLOGY, CHINESE ACADEMY OF SCIENCE | Aug 2020-Jun 2021

- Use psychophysical methods to study how human visual cortex perceive gravity information.
- Analyze behavior data and fMRI data.
- Paper review and write scripts for related experiments. (First draft completed, co-first author)

Lab Member (Undergraduate Thesis)

Psychology Department (Ping Wei Lab) | Mar 2018-Jun 2019

- Use EEG and behavioral methods to study the effects of objects associated with reward on attention under different perceptual load conditions.
- Analyze EEG/ERP data with EEGLAB, and behavior data with R and SPSS
- Outstanding Graduate Thesis for undergraduate student.

PUBLICATIONS

Publication:

1. Altered static and temporal dynamic amplitude of low-frequency fluctuations in the background network during working memory states in mild cognitive impairment

Journal: SSCI Journal Frontiers in Psychology (06/2019)

Link: <https://www.frontiersin.org/articles/10.3389/fnagi.2019.00152/full>

Script :

1. Perceived gravity promotes the discrimination of visual motion

Xiqian Lu, Bogeng Song, Ying Wang, Yi Jiang

Topic: This paper uses psychophysical methods to explore human vision's perception of gravitational moving objects

2. The brain's perception area for gravitationally moving objects

Xiqian Lu, Bogeng Song, Ying Wang, Yi Jiang

Topic: Combining psychophysical methods and MRI techniques to explore the perception of gravitational movement in the visual cortex

CONFERENCE

How bio-inspired attention affects task performance in visual and auditory models.

Bogeng Song, Grace Lindsay

Conference: NYU Minds, Brains, and Machine Summer Poster Conference, 2023

Microsaccade rates reflect trial difficulty for perifoveal motion discrimination.

Rania Ezzo, Bogeng Song, Bas Rokers, Marisa Carrasco

Conference: VSS 2023

Automated Delineation of Visual Area Boundaries and Eccentricities by a CNN Using Functional, Anatomical, and Diffusion-weighted MRI Data

Noah C. Benson, Bogeng Song, Toshikazu Miyata, Hiromasa Takemura, Jonathan Winawer

Conference: MODVIS 2023

Automated delineation of V1-V3 boundaries by a CNN using functional, anatomical, and diffusion-weighted MRI data

Noah C. Benson, Bogeng Song, Shaoling Chen, Toshikazu Miyata, Hiromasa Takemura, Jonathan Winawer

Conference: CRCNS PI meeting 2022

Reward motivation affects the cognitive mechanism of attention selection and attention inhibition.

Bogeng Song, Ping Wei

Conference: Annual Meeting of General Psychology and Experimental Psychology of Chinese Psychological Society 2019

SKILLS

- **Statistical tool skills:** Proficiency in Matlab, python, torch, R, SPSS, JASP.
- **Neuroimaging data analysis:** fMRI data: afni, SPM and DPABI and fmriprep; EEG/ERP data: EEGLAB, ERPLAB
- **Computer skills:** Microsoft office, Linux system and JavaScript
- **Computational modeling skills:** Machine learning (SVM, decision tree, etc) and deep learning (Computer vision, large language model), Bayesian modeling (HMM, linear Gaussian Model etc), and Reinforcement learning model.
- **Language:** Mandarin, English

COURSE

Main math and coding course:

1. *Math Tools for cognitive science and neuroscience* (by Mike Landy and Eero Simoncelli, Fall 2021)
2. *Concept and Category* (by Brenden Lake, Fall 2021)
3. *Computational cognitive modeling* (by Brenden Lake and Todd Gureckis, Spring 2022)
4. *Machine learning* (by He He and Tal Linzen, Spring 2022)
5. *Inference and Representation* (by Joan Brunafor, Fall 2022)
6. *Bayesian Machine learning* (by Tim G. J. Rudner, Fall 2022)