BOGENG SONG

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Research Interest

Computational cognitive science, Visual perception and attention, Computer Vision, Decision making and learning, Reinforcement learning, NLP and NeuroAI.

Education Background

Master: General Psychology   05/2023
New York University (NYU),
GPA: 3.54/4.0

Bachelor of Science: Psychology   07/2019
Capital Normal University (CNU), School of Psychology
GPA: 3.5/4.0

Research and Interniship Experience

Full Time Research Technician   09/2023 - Current
Ohio State University (Brandon Turner Lab) | Columbus, OH
- Use computational model and eye tracking to study human category learning.
- Write experimental programs and use Python and R to build a computational model for category learning to fit eye movement data.

Research Assistant   11/2021 - Current
New York University (Marisa Carrasco Lab)
- Using computational models and eye tracking to study human category learning.
- Writing experimental programs and employing Python and R to develop a computational model tailored to category learning and eye movement data.

Research Assistant   11/2021 - Current
New York University (Jonathan Winawer Lab)
- Train deep neural network model (U-net structure with CNN encoder) to do imaging segment task.
- Try multiple deep learning methods (including Swin-transformer models, adding attention mechanisms), and find the relatively most efficient model structure. and tested on other dataset.

Lab Member (Thesis Project)   08/2022 - Current
New York Unviersity (Grace Lindasy Lab)
- Using neural networks to study the effects of attention on visual and auditory tasks
- Build Neural Network to mimic human visual and auditory system.
- Test bio-inspired attention affects task performance in visual and auditory models.

Team Member   03/2023 - 07/2023
Algonauts Project 2023 Challenge
- Using Machine Learning and Deep Learning method to predict fMRI activation.
- Build CLIP structure to predict fMRI activation. Try to Sparse-Coding based Masked Brain Modeling (SC-MBM) to find fMRI latent representation.

Course Project   10/2022 - 12/2022

Bayesian Machine Learning course

- 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).

Course Project   02/2022 - 06/2022

Computational cognitive modeling course

- 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 model and compare with human data.

Internship Student   06/2022 - 12/2022

Depression and Anxiety Center (Mount Sinai)

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

Full Time Research Assistant   08/2020 - 06/2021

Institute of psychology,Chinese Academy of Science

- Design psychophysical experiment to study how human visual cortex perceive gravity information.
- Analyze behavior data and fMRI data.

Lab Member (Undergraduate Thesis)   03/2018 - 06/2019

Psychology Department (Ping Wei Lab)

- Use EEG and behavioral methods to study the effects of object 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

Under Review/ Working papers :
1. Implied gravity promotes coherent motion perception
Xiqian Lu*, Bogeng Song*, Ying Wang, Yi Jiang
2. Microsaccade rate and pupil size play a role in motion perception and index task difficulty
Rania Ezzo*, Bogeng Song*, Bas Rokers, Marisa Carrasco
3. Unethical amnesia brain: Memory and metacognitive distortion induced by dishonesty
Xinyi Julia Xu*, Bogeng Song*, Yan Tian, Yizhe Chen, Dean Mobbs, Haiyan Wu
4. Convolutional Neural Networks can Segment the Human Visual Cortex with an Accuracy Similar to Humans
Noah C. Benson, Bogeng Song, Shaoling Chen, Toshikazu Miyata, Hiromasa Takemura, Jonathan Winawer

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

Math and Coding Course

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