

Zitong Lu

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(Update by 08/2020)

Education Background

East China Normal University

Shanghai, China

Master of Science, Cognitive Neuroscience

expected 2021

The Institute of Cognitive Neuroscience, School of Psychology and Cognitive Science

Advised by Yixuan Ku, Yong-di Zhou & Huimin Wang, Overall GPA: 85.3 / 100

Northeastern university

Shenyang, China

Bachelor of Engineering, Software Engineering

2018

Department of Software Engineering, Software College, Overall GPA: 84.6 / 100

Research Interests

Visual working memory, Mental Imagery, Attention, Decision making

Multivariate pattern analysis (MVPA): SVM-based decoding, Representational similarity analysis (RSA)

Machine Learning, Deep Learning.

Research Experience

Independent Projects:

08/2020 – Present

Institute of Cognitive Neuroscience, ECNU

How context influences generation and manipulation of mental imagery

- Designed the experiments and planned to collect EEG data.
- Planned to decode different objects/manipulated variables in order to compare the representational strengths during the imaginary-generation task and the imaginary-manipulation task under different kinds of context (stimulus-relevant context, stimulus-irrelevant context or no context).

07/2020 – Present

Institute of Cognitive Neuroscience, ECNU

Cross-Temporal Representational Similarity Analysis-based E/MEG Decoding on PyCTRSA

- Independently designed and realized a cross-temporal E/MEG decoding method based on traditional RSA.
- Independently implemented a Python toolbox for Cross-Temporal RSA (CTRSA)-based decoding, called PyCTRSA.

- Wrote a document for comparing classification-based decoding and CTRSA-based decoding:
https://nbviewer.jupyter.org/github/ZitongLu1996/PyCTRSA/blob/master/test/Decoding_Classification_VS_CTRSA.ipynb.
- PyCTRSA Website: <https://github.com/ZitongLu1996/PyCTRSA>.

04/2019 – 04/2019

Institute of Cognitive Neuroscience, ECNU

Dynamic Representation between Deep Neural Network and Human Brain in Visual Short-Term Memory

- Obtained features of each layer in a VGG-11 model and calculated representational dissimilarity matrices (RDMs) corresponding to each layer.
- Collected and analyzed EEG data independently, and calculated time series RDMs based on ERP, Theta power and Alpha power of different regions.
- Compared temporal representational similarities between deep convolutional neural network and brain activities in VSTM.

03/2019 – 03/2020

Institute of Cognitive Neuroscience, ECNU

Representation of the unattended feature in Visual Short-Term Memory by EEG Decoding

- Collected and analyzed EEG data independently from a VSTM experiment with three different tasks
- Applied Linear-SVM to conduct time-by-time and cross-temporal decoding for different visual features based on ERP and Alpha power to assess the representation of different features in VSTM
- Decoded for unattended feature based on data from different phase to explore whether the coding of unattended features would weaken as the experiment went on.

03/2019 – Present, continuously updated

Institute of Cognitive Neuroscience, ECNU

NeuroRA: A Python Toolbox of Representational Analysis from Multi-modal Neural Data

- Independently designed and implemented a Python toolbox (NeuroRA) for multimodal (behavioral, EEG, MEG, fNIRS, ECoG, electrophysiology, fMRI) neural data representation analysis.
- Typical features in NeuroRA: calculating neural pattern similarity, calculating spatiotemporal pattern similarity (STPS), calculating inter-subject correlation (ISC), calculating representational similarity analysis (RSA), doing statistical analysis and plotting results.
- NeuroRA Website: <https://neurora.github.io/NeuroRA/>.

11/2017 – 05/2018

Department of Software Engineering, NEU

Image Recognition and Object Detection of Fused Magnesium Furnace Based on Deep Learning

- Completed an object algorithm based on Darknet and an image classification algorithm based on Caffe.

- Independently developed a piece of software for real-time working status recognition of fused magnesium furnace based on Qt, C and C++.

Joint Projects:

04/2019 – 06/2020

Institute of Cognitive Neuroscience, ECNU

Reward and Penalty Expectations Facilitate the Precision of Visual Working Memory through Dissociable Neural Mechanisms

Participating in doing Searchlight RSA and ROI-based RSA among behavioral data, different decision-making coding models and fMRI data.

09/2018 – 03/2019

Department of Computer Science & Institute of Cognitive Neuroscience, ECNU

Decoding Different Visual Features of Visual Short-Term Memory: An EEG Study

Participating in designing and realizing a novel memory decoding model based on deep learning to decoding the attended feature(orientation) and unattended feature(position).

Publications

Lu, Z., & Ku, Y. (submitted). NeuroRA: A Python toolbox of representational analysis from multi-modal neural data. (bioRxiv version: <https://doi.org/10.1101/2020.03.25.008086>)

Sun, Y., **Lu, Z.**, & Ku, Y. (in prepare). Reward and penalty expectations facilitate the precision of visual working memory through dissociable neural mechanisms.

Lu, Z., Ku, Y. (in prepare). Dynamic representation between deep convolutional neural network and EEG in a visual short-term memory task.

Lu, Z., Chen, H., Ku, Y. (in prepare). Decoding unattended features in visual short-term memory.

Lu, Z. (in prepare). PyCTRSA: A Python package for cross-temporal representational similarity analysis-based E/MEG decoding.

Programming & Experiment Skills

Computer Languages: Python, C, C++, MATLAB, Java, Julia

Software & Toolboxes: EEGLAB, MNE, SPM, Nibabel, Nilearn, NeuroRA, Tensorflow, PyTorch

Experimental Experiences: EEG, fMRI, Eye tracker and TMS

Working Experience

05/2017-08/2017 Programmer (as Project Leader) in iSoftStone, Shenyang, China

09/2018-01/2020 Research Assistant in East China Normal University, Shanghai, China

03/2020-Present

Research Assistant in Peng Cheng Laboratory, Shenzhen, China

Honors & Awards

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| 12/2019 | Short-Term Overseas Research Scholarship (about USD 7,000 , by ECNU) |
| 12/2018 | Third prize (30% , China Graduate Student Mathematical Contest in Modeling) |
| 12/2017 | Outstanding Graduate Student (3% , Department of Education of Liaoning Province) |
| 11/2017 | Second-Class Merit Scholarship (13% , by NEU) |
| 04/2017 | Meritorious Winner (13% , Mathematical Contest in Modeling, by the U.S COMAP) |
| 12/2016 | First-Class Liu Dajie & Fang Wenyu's Scholarship (<1% , USD 1500 , by NEU) |
| 11/2016 | Provincial First Prize (3% , China Undergraduate Mathematical Contest in Modeling) |
| 11/2016 | First-Class Merit Scholarship (13% , by NEU) |
| 04/2016 | Honorable Mention (30% , Mathematical Contest in Modeling, by the U.S COMAP) |
| 11/2015 | Second-Class Merit Scholarship (13% , by NEU) |