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, Perception, Attention, Decision making
Multivariate pattern analysis (MVPA): SVM-based decoding, Representational similarity analysis (RSA)
Machine Learning, Deep Learning.

Research Experience

Independent Projects:

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 base 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 multimode (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

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)