

Ruiqi Chen

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EDUCATION

B.S., School of Electronic Engineering and Computer Science, Peking University 2017.9 – 2021.7

- **Major:** Intelligence Science and Technology (Overall GPA: 3.59/4.0)
- **Minor:** Psychology (Minor GPA: 3.79/4.0)
- **Selected Coursework:** Neuropsychology, Physiological Psychology, Computational Modeling for Psychology and Neuroscience, Probability Theory and Statistics, Signals and Systems, Introduction to Pattern Recognition

Summer Program for Neural and Cognitive Science, Tsinghua University 2019.8

- Learnt about the principles, methodology and frontiers of neuroscience ([Link](#))

RESEARCH EXPERIENCE

Institute of Neurology, University College London 2020.7 - Present

Summer Research Assistant (Remote)

Advisor: Prof. [Sven Bestmann](#)

Project (Independent): Simulation & Detection of Cortical Traveling Waves ([Link](#))

- Simulated mesoscopic cortical traveling waves of different speeds, in different frequency bands under different levels of Signal-to-Noise-Ratio (SNR), with more than 300,000 trials in total
 - Quantified the precision of linear-regression-based estimation of wave orientation and speed
 - Illustrated that the estimation of orientation improved as SNR and spatial frequency increased, but there might be an optimal spatial frequency interval for the estimation of speed
 - Found that performing a single regression at each time point would be generally better than over the whole trial, and estimating by the median of speed distribution would be more accurate than the mean
- Simulated macroscopic spherical traveling wave with rapidly changing sources, and evaluated the performance of different traveling wave detection algorithms on the dataset ([Link](#))
 - Revealed that neither the clustering method in ([Alexander et. al., 2016](#)) nor the PCA method in ([Alexander et. al., 2019](#)) could reliably classify the spatial structure of the traveling wave
 - Demonstrated that directly clustering the data samples at each time point provided satisfactory results and common phase offset removal might increase the sensitivity of the clustering algorithm

IDG/McGovern Institute for Brain Research, Tsinghua University 2019.7 – 2020.2

Summer Research Assistant

Advisor: Prof. [Bo Hong](#)

Project (Leader): EEG Functional Connectivity Microstates ([Link](#))

- Analyzed a large resting-state EEG [dataset](#) with functional connectivity microstates
 - Discovered the spatially hierarchical, temporally self-similar structure of functional connectivity microstates using different number of clusters and different sliding window length
 - Illustrated the consistency between functional-connectivity-based and voltage-distribution-based EEG microstates by their similarity in spatial topology and temporal dynamics

- Established the link between the proportion/stability/connectivity profile of a specific microstate and activity of the Default Mode Network (DMN) in different mental states
- Explored the interaction between alpha oscillation and microstate dynamics
- Recorded EEG signals from subjects resting/listening to a story/listening to music, with eyes open or closed, and compared the microstate dynamics across different conditions ([Link](#))
 - Identified the microstates by voltage distributions or functional connectivity patterns
 - Analyzed results with mathematic tools including dynamic Generalized Linear Model (dynamic GLM), Multidimensional Scaling (MDS), and unsupervised machine learning ([Codes](#))

IDG/McGovern Institute for Brain Research, Peking University

2019.3 - Present

Undergraduate Research Assistant

Advisor: Prof. [Huan Luo](#)

Funding: Peking University Undergraduate Research Grant (4000 RMB)

Project (Independent): Sequential Working Memory ([Link](#))

2019.4 - Present

- Designed an EEG experiment to explore the neural mechanism underlying the manipulation of contents in auditory working memory and collected data from 16 subjects ([Codes](#))
- Pre-processed the data with EEGLAB and performed ERP & time-frequency analysis with Fieldtrip ([Codes](#)); results being consistent with ([Albouy et al., 2017](#))
- Decoded the memory content with an LSTM network and found that the neural representation is relatively consistent during the delay period
- Wrote an intensive review about the temporal organization in working memory, and another for the computational models and functions of neural oscillation in attention and working memory ([Link](#))

Working Memory Decoding Analysis ([Link](#))

2019.3

- Implemented an Inverted Encoding Model (IEM) based on an EEG visual working memory experiment
- Reconstructed the tuning curve for the orientation of two Gabor stimuli

COURSE PROJECTS

Word Embedding Strategies & RNN Decoders for Sentiment Classification ([Link](#))

2020.4

- Compared the performance of three word embedding strategies (Skip-gram, CBOW & Task-oriented) and three decoding networks (LSTM, GRU, simple RNN) on the IMDB dataset after controlling the number of parameters
- Found that LSTM generalized best while simple RNN was highly unstable; Task-oriented encoding is optimal

Visualization of NSFC Funding 2018 ([Link](#))

2019.10

- Revealed the disparity in funding received among different academic institutions and regions in China vividly
- Acquired visualization skill to facilitate high-dimensional big data analysis

SKILLS

- **Programming:** (*Proficient*) MATLAB (EEGLAB, Fieldtrip, Psychtoolbox), Python (TensorFlow, OpenCV); (*Intermediate*) C/C++, HTML, CSS, JavaScript (d3.js), SVG; (*Basic*) R, SPSS
- **Signal Analysis:** EEG recording & preprocessing, ERP & time frequency analysis, MVPA, dynamic GLM, clustering & classification, decoding, connectivity, microstates, traveling wave
- **Modeling:** Bayesian modeling & MCMC, Inverted Encoding Model, Convolutional & Recurrent Neural Network
- **English:** GRE Verbal 168 (98%), Quantitative 170 (96%), Analytic Writing 4 (57%); TOEFL 112 (Speaking 23)