Ruiqi Chen

E-mail: crq@pku.edu.cn **Website:** rq-chen.github.io **Phone:** (+86) 13432001762
Address: 5 Yiheyuan Road, Peking University, Beijing, China, 100871

EDUCATION

Bachelor of Science | School of EECS | Peking University 2017.9 - Present

- Major: Intelligence Science and Technology (degree expected in 2021.7)
- Overall GPA: 3.59/4.0 Psychology & Neuroscience GPA: 3.78/4.0
- English skills: GRE Verbal 168 (98%), Quantitative 170 (96%), AW 4 (57%); TOEFL 112 (Speaking 23)

RESEARCH EXPERIENCE

Institute of Neurology | University College London (Remote) 2020.7 - Present

- **Advisor:** Prof. Sven Bestmann
- **Project (Independent): Simulation & Detection of Cortical Traveling Waves (Link)**
  - Simulated an EEG dataset with spherical traveling wave and close-to-real voltage distribution and power spectrum; now working on the simulation of intracranial signals with planar waves
  - Demonstrated that the PCA method in (Alexander et. al., 2019) could not reliably estimate the spatial frequency and source of the traveling wave through experimental and theoretical analysis
  - Revealed that the clustering method in (Alexander et. al., 2016) might suffer from pattern misclassification and "blurring" during averaging, and consequently imprecise estimation of the spatiotemporal structure
  - Proved that directly clustering the data samples provided satisfactory results and common phase removal might increase the sensitivity of the clustering algorithm
  - Now implementing more methods from the literature and evaluating their performance under noise

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

- **Advisor:** Prof. Bo Hong (PI)
- **Project (Leader): EEG Functional Connectivity Microstates (Link)** 2019.9 – 2020.2
  - Discovered the hierarchical, self-similar structure of EEG functional connectivity microstates by analyzing the results with different sliding window length and different number of clusters
  - 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) under different task conditions
  - Explored the interaction between alpha oscillation and microstate dynamics
- **Pilot Study on EEG Microstates (Link)** 2019.8
  - Recorded EEG signal from subjects resting/listening to a story/listening to music, with eyes open or closed
  - Conducted k-means clustering based on voltage distribution or functional connectivity pattern
  - Analyzed results with mathematic tools including dynamic Generalized Linear Model (dynamic GLM), Multidimensional Scaling (MDS), unsupervised learning, and silhouette evaluation (Codes)
- **EEG Oddball Experiment (Link)** 2019.7
  - Designed and performed an EEG oddball experiment with Psychtoolbox
  - Conducted Event-related Potential (ERP) analysis with EEGLAB
  - Successfully replicated the MMN/P300 effect

IDG/McGovern Institute for Brain Research | Peking University 2019.3 - Present

- **Advisor:** Prof. Huan Luo (PI)
- **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

PROGRAMMING 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

Training a Deep Convolutional Neural Network on CIFAR-10 (Link) 2019.12

- Implemented a ResNet-20 model with Keras and TensorFlow and practiced parameter tuning

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

ACTIVITIES

Summer Program for Neural and Cognitive Science | Tsinghua University 2019.8

- Learnt about the principles, methodology and frontiers of neuroscience (Details)

SELECTED COURSES

- **Cognitive Neuroscience:** Neuropsychology (96/100), The Brain and Cognitive Science (92), Experimental Psychology (90), Physiological Psychology (90), Psychological Statistics II (90)
- **Computational Modeling:** Computational Modeling for Psychology and Neuroscience (92), Computational Neuroscience (89), Computational Perception and Scene Analysis (86)
- **Mathematics:** Probability Theory and Statistics (90), Introduction to Stochastic Processes (84), Signals and Systems (84), Introduction to Pattern Recognition (83), Set Theory and Graph Theory (81.5)

SKILLS

- **Programming**: (Proficient) MATLAB (EEGLAB, Fieldtrip, Psychtoolbox), Python (TensorFlow, OpenCV); (Intermediate) C/C++, HTML, CSS, JavaScript (d3), SVG; (Basic) R, SPSS
- **Signal Analysis**: EEG recording & preprocessing, ERP & time frequency analysis, MVPA, dynamic GLM, clustering & classification, connectivity, microstates, traveling wave
- **Modeling**: Bayesian modeling & MCMC, Inverted Encoding Model, Convolutional & Recurrent Neural Network