

# Ruiqi Chen

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## EDUCATION

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- Bachelor of Science | Peking University** 2017.9 - Present
- Major: Intelligence Science and Technology (degree expected in 2021.7)
  - Overall GPA: 3.59/4.0 Last term's GPA: 3.70/4.0
  - English skills: GRE 338 (AW 4), TOEFL 106 (Speaking 24)

## RESEARCH EXPERIENCE

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- IDG/McGovern Institute for Brain Research | Tsinghua University** 2019.7 - Present
- **Advisor:** Prof. [Hong Bo](#) (PI)
  - **Project (Leader): EEG Functional Connectivity Microstates ([Link](#))** 2019.9 – Present
    - 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 long-time EEG signal from 5 subjects while they were 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 general linear model, multidimensional scaling, 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. [Luo Huan](#) (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 analyzed the results with Fieldtrip
    - Learned the rationale of cluster-level permutation test and applied it to ERP analysis, result being consistent with ([Albouy et al., 2017](#)); helped fix a [bug](#) in Fieldtrip during the process
    - Working on the time-frequency analysis currently ([Codes](#))
    - 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 based on an EEG visual working memory experiment
  - Reconstructed the tuning curve for the orientation of two Gabor stimuli
  - Practiced MATLAB programming and multivariate pattern analysis (MVPA) through self-learning

## PROGRAMMING PROJECTS

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### **Training a Deep Neural Network on CIFAR-10 ([Link](#))** 2019.12

- Trained a ResNet-20 model from scratch on CIFAR-10 dataset and achieved high accuracy
- Practiced DNN implementation with Keras and TensorFlow (self-taught within one week)

### **Visualization of NSFC Funding 2018 ([Link](#))** 2019.10

- Visualized the National Natural Science Foundation of China (NSFC) funding allocation and revealed the hidden disparity among different academic institutions and regions in China
- Practiced front-end programming (HTML/CSS/JavaScript/SVG/D3.js, self-taught within one week)
- Acquired visualization skill to facilitate high-dimensional big data analysis

## ACTIVITIES

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### **Summer Program for Neural and Cognitive Science | Tsinghua University** 2019.8

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

## RELEVANT COURSES

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### **Neuropsychology (96/100)**

- Anatomy, function and diseases of the cortex and the thalamus

### **The Brain and Cognitive Science (92/100)**

- Sensation and perception, language, problem solving and deduction, etc.

### **Probability Theory and Statistics (90/100)**

- Bayes theorem, central limit theorem, parameter estimation, hypothesis testing, ANOVA, regression, etc.

### **Experimental Psychology (90/100)**

- Experiment design, psychophysical methods, memory, social cognition, etc.

### **Computational Neuroscience (89/100)**

- Hodgkin-Huxley equations, E-I balanced network, continuous attractor network, etc.

### **Computational Perception and Scene Analysis (86/100)**

- Physiological, psychological and computational models for vision and audition

### **Signals and Systems (84/100)**

- Continuous and discrete Fourier Transform, Laplace and z Transform, filtering, etc.

### **Introduction to Pattern Recognition (83/100)**

- Bayes decision theory, SVM, logistic regression, artificial neural network, decision tree, clustering, PCA, etc.

## SKILLS

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- **Programming:** C/C++, Python (NumPy, TensorFlow, OpenCV), MATLAB (EEGLAB, Fieldtrip, Psychtoolbox), HTML, CSS, JavaScript, SVG, R & SPSS (expected this semester)
- **Electrophysiology:** EEG recording, ERP & time frequency analysis, multivariate pattern analysis, dynamic general linear model, cluster analysis, phase coupling analysis