HAOYU HU

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EDUCATION

Zhejiang University *(Ranked 45^{th} in QS Ranking worldwide, 4^{th} in mainland China)* Hangzhou, China
BS in Psychology (Qiushi Honor Program) *Sept 2019 - Present (expected graduation in 2023)*
Minor in Artificial Intelligence
CHU Kochen Honors College

- GPA:3.92/4 (rank $1/57$ in the junior year in the psychology major)
- Core Courses: Artificial Intelligence and Machine Learning (A^+); Signal and Cognitive System (A^+); Experimental Psychology (A); Probability and Statistics (A); Psychology Statistics (A); Bayesian Statistics (A); Fundamental Data Structure (A); Cognitive Psychology (A); Developmental Psychology (A); Psychometric (A) and etc.

RESEARCH INTERESTS

Cognitive Modeling, Data Mining, AI for Healthcare, NeuroImaging, Brain Asymmetry, Memory

SKILLS

Basic Skills:	Behavioral Experiment Design (proficient)
Programming:	Python (proficient), Matlab (proficient), SQL(proficient), C/C++, R, Linux Shell(Bash)
Software & Tools:	**NeuroImaging:** Nibabel (proficient), Nilearn, SPM, freesurfer, FSL, AFNI, EEGLAB **Psychology:** Psychtoolbox (proficient), E-prime, Psychopy **Statistics (proficient):** SPSS, Scipy, Numpy, Pandas, JASP **AI:** Pytorch (proficient), Scikit-Learn, Tensorflow(Keras), MindSpore **CV/NLP:** OpenCV, SimpleITK, VTK, NLTK, Gensim

PUBLICATIONS AND WORKING PAPERS

Machine Learning Reveals Hemispheric Differences in the Human Brain Zhejiang University, China
Project Leader Supervised by Assistant Professor Xiangzhen Kong *Jan 2020 - Nov 2021*

- **Accepted by 2022 OHBM (Organization for Human Brain Mapping) Annual Meeting See My Poster**
- Use machine learning and HCP dataset to explore brain structure asymmetry
- Support vector machine (SVM) has shown an extremely high accuracy in recognize the right/left hemisphere (using 34 brain regions of Area/Thickness), indicating that a multilevel method can well tell the phenomenon of brain asymmetry
- By extracting and comparing the most important components to build the model, I found four brain regions contributed most: Pars orbitalis; Frontal pole; Rostral anterior cingulate; Transverse temporal

Mapping Benefits of Midodrine Injection: an Analysis Based on MIMIC IV database
Massachusetts Institute of Technology (MIT), USA
Project Co-Leader Supervised by Principle Research Scientist Leo Anthony Celi *May 2022 - Present*

- Descriptive and prescriptive analysis of the effects of Vasoconstrictive medication via MIMIC IV database using Targeted Maximum Likelihood Estimation for Causal Inference and ML techniques

Mapping Brain Asymmetry from Age and Diseases: a Machine Learning-Based Analysis on 43,913 People from UK Biobank Zhejiang University, China
Project Leader Supervised by Assistant Professor Xiangzhen Kong *Mar 2022 - Present*

- I ran the embedding model trained on HCP database to explore the mystery of the development of human brain asymmetry by testing on UK Biobank database.
- I also explored the develop of the left and the right hemisphere separately by applying traditional statistics methods.
- I explored the difference of brain asymmetry of the disease group and normal group to help clinical diagnosis.

U-Net Pre-Trained by Human-Brain Dataset Transfers Extremely Quickly and Performs Greatly on Rodent Dataset Zhejiang University, China

Project Leader Supervised by Assistant Professor Yuzheng Hu & Senior Engineer Cindy Wang *Feb 2022 - Present*

- I found that the performance of U-Net (a deep learning algorithm used for brain segmentation) becomes much better when pre-trained on human-brain dataset than U-Net that doesn't be pre-trained
- Moreover, the model I developed can be used to segment all rodent brains (include adult mice, juvenile mice and rats) quite well (mean DICE $> 95\%$)
- It's also noticeable that the pre-trained model can transfer very quickly on other datasets (for example, only trained with 2 images, the model can reach over 95% DICE on the testing dataset)

OTHER RESEARCH EXPERIENCES

Detached or Deleted: What Is the Strategy Working Memory Most Likely to Take to Outdated Items that Are Paid Attention to? Zhejiang University, China

Project Co-Initiator Supervised by Associate Dean and Professor Hui Chen *Mar 2022 - May 2022*

- The idea comes from a Science Advance paper. In the paper, it's said that information focused on and used for task may not enter the working memory, but it remains another possibility: it enters the working memory and is deleted quickly after the task. What I want to do is to prove that the stimulus doesn't enter the working memory at all time
- I use a combination of change awareness paradigm and visual search paradigm to explore the problem

A TMS System for Automatic Precise Localization of Stimulating Brain Areas Zhejiang University, China

Participant (Responsible for Deep Learning Part) Supervised by Assistant Professor Yuzheng Hu *Feb 2022 - May 2022*

- Now it's not always easy to use transcranial magnetic stimulation (TMS) to locate the areas of the brain that need to be stimulated, requiring the use of a robotic hand or even a human hand. In addition, the instrument does not have the function of automatic adjustment if the subject has a large head movement during the experiment. Therefore, it is of great significance to develop a system that can be automatically adjusted and accurately positioned.
- In this system, the automatic positioning and adjustment of the relevant brain regions of the subjects were realized through the PointNet algorithm. I'm responsible for embedding this model into the system designed before, so that the system could be completed.

ACADEMIC ACTIVITIES

- Co-founder of **Univeron** – an multi-universities journal club, focusing on all aspects of brain science, like neurobiology, computational neuroscience, neural technology, psychology, psychiatry and so on.
- One of the participants in the **Neurodynamics Reading Group** – mainly focus on exchanging knowledge about neurodynamics and advance science
- One of the participants in the **ZJU NLP Rookies**, a club built to promote the exchange of scientific research on technologies related to natural language processing
- Observer of the first **Neuromatch Academy** in 2020 summer

SELECTED AWARDS AND HONORS

Scholarship for top Students: Pilot Scholarship *2020 - 2021*

The first National Quality Public Welfare Award *2019 - 2020*

The first Psychological Research Poster Award *2019 - 2020*

NITORI International Scholarship *2019 - 2020*

ADDITIONAL INFORMATION

Senior Volunteer (More than 500 hours of volunteer service) *Sept 2019 - Dec 2021*

- I volunteered as a teaching assistant for a month in my freshman year in Portland, Ohio.
- I have hosted dozens of different volunteer events.

Member of Red Cross Society of Zhejiang University *Oct 2019 - Jun 2020*

Member of the Student Union, Department of Psychology and Behavior Sciences *Oct 2020 - Jun 2021*