HAOYU HU

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EDUCATION

Zhejiang University *(Ranked 42^{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**
- First research exploration during my undergraduate study. Learned basic machine learning methods & knowledge and approaches to process neuroimaging data.
- Use machine learning and HCP dataset to explore brain structure 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*

- Used Targeted Maximum Likelihood Estimation for Causal Inference and ML techniques to do descriptive and prescriptive analysis of the effects of Vasoconstrictive medication via MIMIC IV database.

A Robust U-Net Model with Low Computational Cost for Skull-Stripping of the Rodent Magnetic Resonance Images Zhejiang University, China
Project Leader Supervised by Assistant Professor Yuzheng Hu & Senior Engineer Cindy Wang *Feb 2022 - Present*

- Trained the model, wrote the codes, and 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.
- Developed the model that can be used to segment all rodent brains (include adult mice, juvenile mice and rats) quite well (mean DICE $> 95\%$).
- Found 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).

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*

- 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.
- Explored the develop of the left and the right hemisphere separately by applying traditional statistics methods.
- Explored the difference of brain asymmetry of the disease group and normal group to help clinical diagnosis.

A Robust Framework for Neuroimaging Visual Question Answering Zhejiang University, China

Project Proposer and Leader *June 2022 - Present*

- Proposed the project based on the deficiency in VQA application in the neuroimaging data, aiming to build a robust bridge between them.
- Used advanced machine learning technology like BERT and attention U-Net to deal with the problem.

OTHER RESEARCH EXPERIENCES

Detached or Deleted: What Is the Strategy Visual 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*

- Came with the idea 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
- Used 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*

- Participated in the design: 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 can't deal with the large head movement during the experiment. Therefore, it is of great significance to develop a system that can be automatically adjusted and accurately positioned.
- Responsible for embedding the deep learning 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 voluntary service) *Sept 2019 - Present*

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*