Curriculum Vitae

Personal Information

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Education

- Sep 2017 – Jun 2021: B.E. in Electrical Engineering, ShanghaiTech University (3.45/4.0)
  Best Thesis: AI-based automated seizure detection using EEG signal (Top 5%)
- Sep 2022 – Jun 2025: M.S. in Computer Science, ShanghaiTech University (3.61/4.0)

Research Experience

- **CBCP Chinese Baby Connectome Project (CBCP)**

The Chinese Baby Connectome Project (CBCP), led by the Ministry of Science and Technology and conducted by the ShanghaiTech University, is a significant initiative modeled after HCP, BCP and dHCP. It aims to construct developmental norms for Chinese infants and toddlers by longitudinally collecting multimodal data including MRI, EEG, and behavioral data, with the goal of facilitating early detection and intervention for childhood diseases. I am fortunate to be deeply involved in this project, primarily focusing on data collection and developing data-driven neuroimaging analysis methods.

1) Diffusion-model-based missing infant brain image completion in the longitudinal dataset

Aim: Longitudinal magnetic resonance imaging (MRI) is an effective tool to investigate the developmental trajectories of the brain structures. However, longitudinal MRI acquisition always meets a serious data-missing problem due to participant dropout and failed scans, making longitudinal infant brain atlas construction and developmental trajectory delineation quite challenging. Thanks to the development of an AI-based generative model, we utilized diffusion model for dense and longitudinal 3D infant brain MRI completion and super-resolution.

Output: Cas-DiffCom: Cascaded diffusion model for longitudinal super-resolution 3D medical image completion (IEEE ISBI 2024, accepted)

LoCI-DiffCom: Longitudinal Consistency-Informed Diffusion Model for Infant Longitudinal Medical Image Completion (MICCAI 2024, submitted)

2) Data-driven functional infant brain cortical parcellation

Aim: Infant cortical developmental regionalization is fundamental for illustrating brain microstructures and reflecting functional heterogeneity during early postnatal brain development. However, existing parcellations are solely built based on either local structural properties or single-view functional connectivity (FC) patterns due to limitations in neuroimage analysis tools. These approaches fail to capture the diverse consistency of local and global functional

development. Hence, we aim to construct a multi-view functional brain parcellation atlas, enabling a better understanding of infant brain functional organization during early development.
Output: Regionalized infant brain cortical development based on multi-view, high-level fMRI fingerprint (MICCAI workshop: MLMI 2023, accepted)
Mapping infant brain functional regionalization with multi-view functional brain cortical parcellation (OHBM 2024, accepted)

- **Bachelor thesis: Automated seizure detection based on EEG signal**

Aim: Epilepsy is a neurological disease caused by abnormal neural electrical discharges. Electroencephalography (EEG) is powerful tool to measure the brain electrical activity and has been widely used for seizure detection. Manual EEG analysis is labor-intensive and time-consuming. Automatic seizure detection is urgently demanded for long-time seizure monitoring. However, most of the existing methods are patient-specific with limited generalizability. Few studies investigate inter-patient seizure detection, which remains challenging. The aim of the present study is therefore to develop advanced algorithms for efficient inter-patient seizure detection using EEG. A novel graph neural network referred to as graph isomorphic network is proposed for effective local-global spatiotemporal feature extraction and seizure classification.
Output: Inter-patient seizure detection by brain connectivity analysis using dynamic graph isomorphism network (IEEE EMBC 2022, accepted)

- **Other projects**

Aim: In addition to my involvement in the CBCP project, I collaborate extensively with doctors from various hospitals. For example, I work with doctors from the Shanghai Mental Health Center to explore drug dose prediction for agitation patients, and with Renji Hospital affiliated to Shanghai Jiao Tong University to investigate dynamic PET brain networks. I have a strong interest in transfer learning, graph convolutional networks, and other methodologies, aiming to utilize data-driven approaches from an engineering perspective to assist clinical medicine, bridging the gap between clinical research and practical applications in healthcare.
Output: Predicting antipsychotic drug dose for BPSD: A transfer learning approach using neuroimaging data (OHBM 2024, accepted)

Publications

[1] **Tao T**, Guo L, He Q, et al. Seizure detection by brain-connectivity analysis using dynamic graph isomorphism network[C]//2022 44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC). IEEE, 2022: 2302-2305.
[2] Guo L, **Tao T**, Cai X, et al. Cas-DiffCom: Cascaded diffusion model for infant longitudinal super-resolution 3D medical image completion[J]. arXiv preprint arXiv:2402.13776, 2024.
[3] **Tao T**, Huang J, Liu F, et al. Regionalized Infant Brain Cortical Development Based on Multi-view, High-Level fMRI Fingerprint[C]//International Workshop on Machine Learning in Medical Imaging. Cham: Springer Nature Switzerland, 2023: 467-475.

Patents

[1] Zhang H, Yang Q and **Tao T**. Brain fMRI analysis system, method and terminal for the evaluation of Alzheimer's disease (CN202311330836.3)

Selected abstracts

[1] Gu Z, Guo L, **Tao T**, et al. Effectiveness and Reliability Assessment on Head Motion Capturing and Correction (MoCAP). Annual Meeting of International Society for Magnetic Resonance in Medicine. (ISMRM 2023)

[2] Cai X, Guo L, **Tao T**, et al. Development of Infant Brain Functional Connectome Gradients during Age 0-6 Years (ISMRM 2023, **oral**)

[3] Liu F, Huang J, Guo L, **Tao T**, et al. Harmonizing Multi-Modality Biases in Infant Development Analysis with an Integrated MRI Data Processing Pipeline (ISMRM 2024, **power pitch**)

Other information

- Languages: English (fluent, IELTS: 6.5), Mandarin (native)
- Programming skills: Python, PyTorch, MATLAB
- Reviewer: OHBM 24’