Positions for PhD Study or Research Assistants/Postdoctoral Research Fellows

"On the analysis and modeling of complex brain network connectivity and spatiotemporal activity patterns"

Prof. ZHOU Changsong from the Department of Physics and Centre for Nonlinear Studies at Hong Kong Baptist University (HKBU) is looking for qualified candidates to fill positions of PhD program or RA/postdoc to work on the analysis and modeling of brain network structure and dynamics and the relevance in brain functions and disorders based on large-scale multimodal brain imaging data from the perspective of complex dynamics networks and/or machine learning.

Brain is a highly complex dynamical system with hierarchical network structure and complex dynamical/functional interaction to support efficient functional processing. Advanced brain imaging technologies have rapidly generated bigger and bigger multimodal data about the structure, activity and functional performance of normal and abnormal brains. Understanding the organization principle of the network structure and the dynamical mechanism underlying the emergence of spatiotemporal dynamics patterns is a grand challenge for the fields of Systems Neuroscience as well as Complex Systems, thus there are several word-wide initiatives on brain studies in promoting our understanding of brain functions and disorders, as well as developing brain-inspired computing and intelligence.

Our group has been actively working on the analysis of brain networks and activities from the perspective of dynamical complex network and cost-function optimization, in close collaboration with several experimental neuro-cognitive science groups or hospitals, including Imperial College London, Humboldt University at Berlin, Hamburg University, Beijing Normal University, Jinling Hospital at Medical School of Nanjing University, etc. The research topics cover a broad range of scales from network of excitatory-inhibitory neurons to interacting functional brain regions and functional EEG, brain metabolism, and cognitive variability and disorders. Our works can be found at:
http://cns.hkbu.edu.hk/
http://www.researcherid.com/rid/F-4707-2010
https://www.researchgate.net/profile/Changsong_Zhou2
https://scholar.google.com.hk/citations?user=p3V8N-4AAAAJ&hl=en

Research topics:

We are looking for PhD candidates and/or RAs/Postdoc to research on the following topics:

1) ***Analysis and modeling of hierarchical modular organization in brain structural and functional networks***

Hierarchical modular organization is the most prominent feature of brain network organization. However, little is known how to properly quantify network hierarchy in general, and even less is known about its relevance in normal brain functions and disorders as well as the fundamental principles underlying this prominent organization. We hope to develop theory and methods for the analysis of hierarchal brain structural and functional networks from brain imaging data and build model of brain network from cost-function optimization.

2) ***Inter-person reliability and variability in brain networks and functions***

People differ in their brain network structure, dynamics and cognitive performance. We hope to study the reliability and variability of brain networks and its relationship to individual differences in brain functions, using approaches of network link predictability or machine learning based on large-scale data from Human Connectome Project. Research in this line will be highly relevant for developing network-based bio-markers for early detection of neurodegeneration and brain disorders.

3) ***Brain inspired cost-efficient computing and intelligence with brain-like network structure and dynamics***

Brain is developed through long-time evolution to achieve efficient functioning with very high energy efficiency. Current matching learning and AI deep networks have not really considered important brain network features and dynamical properties. Thus, it is highly interesting and important to study whether and how the prominent features of brain architecture and/or activity are facilitating or constraining the computing and learning ability of the deep networks, and whether such architecture and activity could be employed to develop energy-efficient computing.

Requirements and conditions:

- **PhD study:** Undergraduate or Master/MPhil graduates with Physics and/or computer science or other related background and strong interests in big data analysis in brain studies are highly encouraged to apply for the position directly through the Graduate School of HKBU: **http://gs.hkbu.edu.hk/.**

- **Research Assistants/Postdoc Research Fellows:** Candidates with Physics, Computer Science or related education backgrounds, strong interests in brain studies, and rich experience in one or more of the following fields of network science, big data, dynamical systems, optimization and machine learning are encouraged to apply directly to Prof. Zhou. Applicants already having experience on brain network or brain imaging data analysis will be given priority. The position is initially for one year and is renewable depending on performance and financial situation. The start time is flexible.

Studentship for PhD student:

The current PhD studentship at HKBU is about HK16,500/month; tuition fee paid to HKBU: HK$ 42,100/year

Salary for RA/Postdoc:

The salary ranges from HK$ 18,000 to 25,000/month, depending on the experience.

Contact:

Interested applicants please send inquiry, CV and experience description and statement of research interests to Prof. Zhou Changsong (cszhou@hkbu.edu.hk).