University Research Facility in Behavioral and Systems Neuroscience (UBSN)

Programme At-a-Glance

4th May 2024

UBSN Open Day 2024

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UBSN University Research Facility in Behavioral and Systems Neuroscience 神經科學中心實驗室

About UBSN

The University Research Facility in Behavioral and Systems Neuroscience (UBSN) of the Hong Kong Polytechnic University was established in 2018 and is designed to be an interdisciplinary technological platform supporting the research endeavors of researchers not only from the Hong Kong Polytechnic University, but also those from other higher education institutions in Hong Kong. It also serves as a key training hub for all who are pursuing scientific enquiry in neuroscience and related disciplines.

The UBSN is equipped with state-of-the-art equipment that enables researchers to conduct cutting edge and impactful research. The equipment is classified into 4 categories: Behavioral Neuroscience, Brain Stimulation, Neurophysiology and Neuroimaging. Transcranial magnetic stimulation, near-infrared spectroscopy, transcranial doppler ultrasound, electroencephalogram (EEG), and optical topography system are just some examples of equipment housed in UBSN. Of course, the highlight is our 3T Magnetic Resonance Imaging (MRI) facility.

With our seven strategic research areas, namely, Brain Imaging and Artificial Intelligence/Big Data, Healthy Aging, Mental Health, Neurorehabilitation and Neural Repair, Human Development, Neurolinguistics, and Cognitive Neuroscience of Language and Culture, we are fully committed to tackling important research questions for the benefit of mankind, and nurturing talents among our students and young researchers.

UBSN Homepage

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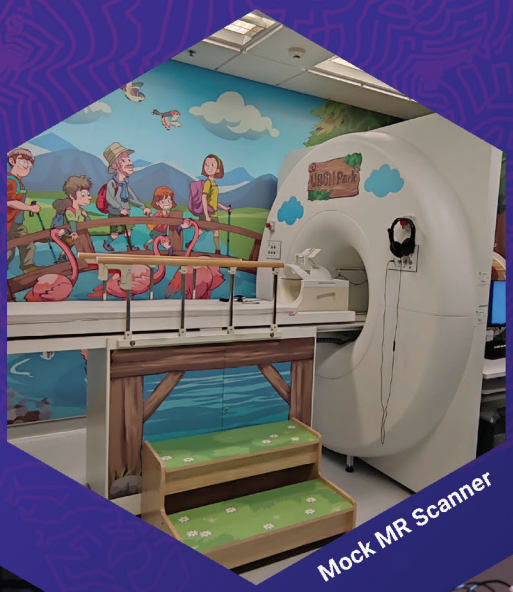
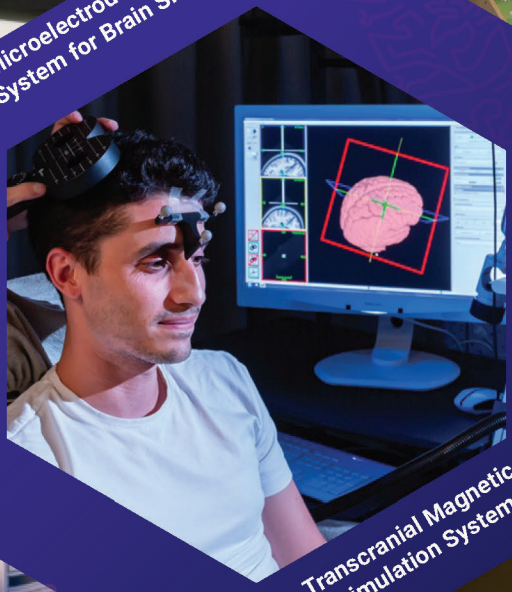
University Research Facility in Behavioral and Systems Neuroscience (UBSN)

Microelectrode Array System for Brain Slice

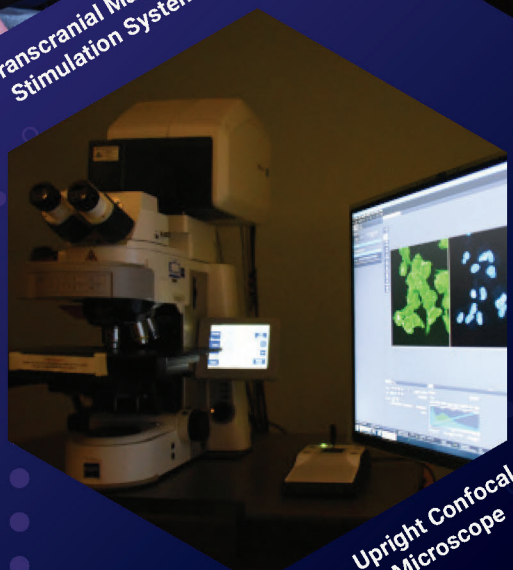

Mock MR Scanner

3 Tesla MRI Scanner


Transcranial Magnetic Stimulation System


Electroencephalography


Eye Tracker


Upright Confocal Microscope

UBSN 4th May 2024 Open Day 2024

Time	Description	Venue
10:00 - 10:30	Registration	Outside Z211
10:30 - 10:45	Opening ceremony	Z211
10:45 - 11:45	Keynote Seminar: Prof. GAO Jia-Hong (Peking University)	Z211
11:45 - 12:00	Group photo	Z211
12:00 - 12:30	Break: Refreshment	Outside Z211
12:30 - 13:00 12:30 - 13:00	1. Plenary Seminar: Dr. Bolton CHAU (PolyU) 2. Lab tour	1. Z211 2. ZB216-218
13:00 - 14:00	**Lunch**	
14:00 - 15:00	Keynote Seminar: Prof. Anqi QIU (PolyU)	Z211
15:00 - 15:30 15:00 - 15:30	1. Plenary Seminar: Prof. SUN Lei (PolyU) 2. Lab tour	1. Z211 2. ZB216-218
15:30 - 16:00	Break: Refreshment	Outside Z211
16:00 - 16:30 16:00 - 16:30	1. Plenary Senimar: Dr. Yvonne HAN (PolyU) 2. Lab tour	1. Z211 2. ZB216-218
16:30 - 16:45	Best Paper Award ceremony	Z211
16:45 - 17:00	Closing ceremony	Z211

Keynote Speaker

Prof. GAO Jia-Hong
Professor and Director
Center for MRI Research, Peking University

Biography: Professor Gao graduated from the University of Science and Technology of China. He pursued his doctoral degree at Yale University and subsequently spent two years as a postdoctoral fellow at the Massachusetts Institute of Technology (MIT). He then worked at the University of Texas Health Science Center at San Antonio before serving as a professor and the Co-director of the Brain Research Imaging Center at The University of Chicago until 2013. Currently, Professor Gao holds positions at Peking University as the Distinguished Professor and Director of the Center for MRI Research, as well as being a principal investigator at the McGovern Institute for Brain Research. With 30 years of experience in the field, Professor Gao has published over 230 papers of great importance.

Seminar title: Brain Imaging Technologies and Their Applications in Human Intelligence Research

Abstract: The development of brain imaging technologies is rapidly advancing and has been widely applied in the study of human higher cognitive mechanisms. This lecture will highlight cutting-edge technologies such as Magnetic Resonance Imaging (MRI), Superconducting Quantum Interference Devices (SQUID) magnetoencephalography (MEG), and others, introducing the features of traditional non-invasive brain imaging techniques and their applications in areas such as Healthy Aging, Neurolinguistics, and Cognitive Neuroscience of Language and Culture. Functional Magnetic Resonance Imaging (fMRI) is a technique that relies on the blood-oxygen-level-dependent contrast for imaging. Utilizing fMRI, brain network maps for auditory language processing have been created for different populations, including young and older adults, revealing the similarities and differences in multi-modal language processing for listening, speaking, reading, and writing. We also explored the variations in processing across different languages. Additionally, our team have built a large-scale multimodal neuroimaging, behavioral, and genetic dataset, CHCP, for the Chinese population, paralleling the United States' Human Connectome Project (HCP). These research efforts provide vital evidence for a deeper understanding of the functions of the human brain and cross-cultural differences in language.

In contrast to MRI, MEG captures the electromagnetic signals directly from neural activity in the brain. MEG signals are becoming an important tool in uncovering the mysteries of the human brain and can assist neuroscientists in revealing previously inaccessible phenomena related to higher cognition and brain disorders, along with their neural mechanisms. By using SQUID-based MEG in conjunction with frequency-based paradigms, we have uncovered the processing maps for different linguistic levels (words, phrases, sentences) and identified key brain mechanisms for verbal imagination (digits, poetry). The development and maturation of the next generation of MEG based on atomic magnetometer technologies will allow for wearable and miniaturized brain sensing technologies to play a significant role in brain-computer interfaces, aiding scientists in decoding more about human cognition and benefiting everyday life for the general public.

Keynote Speaker

Prof. QIU Anqi
Professor and Global STEM Scholar

Department of Health Technology and Informatics, The Hong Kong Polytechnic University

Biography: Prof. Qiu is a global STEM scholar and Professor at the Department of Health Technology and Informatics at the Hong Kong Polytechnic University. She is also an Adjunct Professor at the Department of Biomedical Engineering at Johns Hopkins University. Her past roles include Deputy Head for Research & Enterprises at the Department of Biomedical Engineering and Director for the BME Innovation Center at the NUS Suzhou Research Institute, a part of the National University of Singapore.

After the PhD study, Prof. Qiu joined the National University of Singapore as an Assistant Professor, where she founded the Laboratory for Medical Image Data Sciences. Her remarkable contributions to the field of Neuroimage have earned her multiple accolades, including the Faculty Young Research Award and the 2016 Young Researcher Award of NUS. In a recent recognition of her outstanding research achievements, she was bestowed with the prestigious "Dean's Chair" Associate Professorship and Hong Kong Global STEM Professorship.

Specializing in computational analyses of neuroimage and genetics, Prof. Qiu is deeply committed to understanding the origin of individual health differences throughout a lifespan. She leverages complex and informative datasets that include disease phenotypes, neuroimaging, and genetics to further her research. Her team has high-impact publications in Nature, Nature Neuroscience, Nature Mental Health, PNAS, American Journal of Psychiatry, Biological Psychiatry, IEEE Transactions in Medical Imaging, Medical Image Analysis, etc.

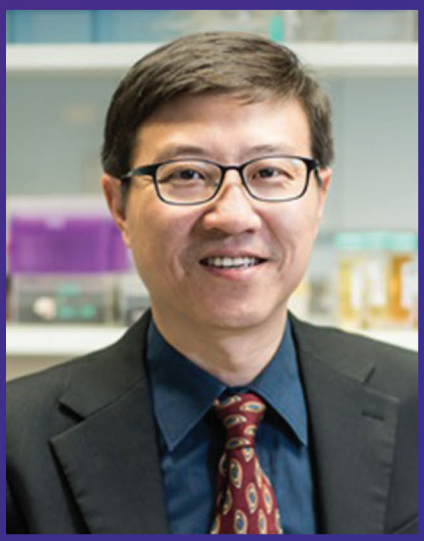
Seminar title: Nature and Nurture: Evidence from Pediatric Neuroimaging and Genetics

Abstract: According to the fetal-programming model, exposure to stressful or hostile conditions in utero is associated with compromised development and a lifelong risk of adverse health outcomes. In this talk, I will review the findings on maternal mental health and child brain development from our longitudinal cohort study, Growth Up in Singapore Towards healthy Outcomes (GUSTO). I will then share our findings on early life environment in relation to brain and psychopathology development in early adolescence. We will discuss what roles genetics play in modulating the influence of early life environment on child brain and psychopathology. Finally, we will discuss potential intervention programs for improving child mental health.

Plenary Speaker

Prof. SUN Lei
Professor

Department of Biomedical Engineering, The Hong Kong Polytechnic University



Biography: Prof. Lei SUN, Professor in the Department of Biomedical Engineering, The Hong Kong Polytechnic University, received his bachelor's degree from the University of Science and Technology of China and his Ph.D. from Pennsylvania State University. He then conducted postdoctoral research at the University of Southern California. And joined the Hong Kong Polytechnic University in 2008. His research interests include understanding the underlying mechanisms and possible translational strategies of using ultrasound for neuro-modulation and brain stimulation, investigating the potentials of ultrasound bio-effects for cancer therapy and diabetes, and multimodality molecular imaging and theranostics.

Prof. Lei SUN has 20 years of research and development experience in medical ultrasound technology, including system development, signal/image processing and biomedical applications. As a PI, he has managed numerous research projects such as Research Grants Council General Research Fund (GRF), Health and Medical Research Fund (HMRF), Innovation Technology Fund (ITF), and National Natural Science Foundation (NSFC), with a total funding of over 38 million Hong Kong Dollars. He also participated in the 973 project of the Ministry of Science and Technology. He has published more than 200 peer-reviewed journal articles and international conference proceedings, including Advanced Science, Biomaterials, Cell Reports, npj Regenerative Medicine, Acta Biomaterialia, iScience, Ultrasound in Medicine and Biology, IEEE Transactions on Biomedical Engineering, IEEE Transactions on Ultrasonics Ferroelectrics Frequency Control, etc. Dr. Sun is a member of the Institute of Medical Ultrasound Engineering of the Chinese Society of Biomedical Engineering and a member of the Instrument and Equipment Development Committee of the Chinese Society of Ultrasound and Engineering. He has chaired/co-chaired many international conferences and won several best papers/poster awards, e.g. the research achievement awards from the Faculty of Engineering, The Hong Kong Polytechnic University.

Seminar title: Ultrasound Neuromodulation and Sonogenetics

Abstract: Noninvasive and accurate control of neuronal activity in deep brain is critical for probing brain function and treating brain dysfunctions. Transcranial low-intensity ultrasound is a promising neuromodulation modality, with the advantages of non-invasiveness, deep penetration and high spatiotemporal accuracy. However, the underlying mechanism of ultrasound neuromodulation remains largely unclear and controversial, hindering the development of efficacious treatments.

In this talk, the current understanding of the mechanism of transcranial ultrasound, especially the role of mechanosensitive proteins, will be discussed, as well as the common research methodologies and possible complications. However, conventional ultrasound's spatial resolution is diffraction-limited and low-precision. Here, I will present our latest strategy to achieve precise ultrasound neuromodulation by sonogenetics with cell-type selectivity and spatial accuracy.

Plenary Speaker

Dr. Bolton CHAU
ADoMHRC & Associate Professor

Department of Rehabilitation Sciences, The Hong Kong Polytechnic University

Biography: Dr Chau obtained his DPhil degree from University of Oxford and his MPhil and BSc degrees from The University of Hong Kong. His key research interests are in the neuroscience of reward-guided decision making and learning. In our modern lives, it is very common that we make decisions between a large number of options. However, our knowledge about neural mechanisms of decision making is mainly based on experiments that involve a few options. Hence, recently his research focuses on investigating whether these mechanisms are generalizable to decisions with many options. Key research questions involve how do people sample information from large sets of options? How do people make use of information to guide their decision making?

Dr Chau generally conducts his research using a combination of brain imaging, brain stimulation, eye tracking and computational modelling techniques. His research findings mainly show that (1) in two-option decisions, the lateral orbitofrontal cortex is important for reinforcement learning and guiding optimal decisions and; (2) in three-option decisions, people make suboptimal decisions and the decision signal in ventromedial prefrontal cortex is attenuated; (3) when there are plenty options, the dorsolateral prefrontal cortex is involved in filtering out choice-irrelevant information. These findings were published in journals such as Nature Neuroscience and Neuron.

Seminar title: The human frontopolar cortex is causally involved in digesting choice information during decision making

Abstract: The human brain contains a very unique frontopolar cortex (FPC), as it is greatly expanded when it is compared to other animals' brain. Despite its anatomical uniqueness, we know very little about the precise functions of the FPC. Intriguingly, although brain imaging data suggest that the FPC is correlated with a wide range of cognitive processes, most of these links receive little support from causal data such as brain stimulation or lesion studies. In this talk, I will present our recent studies that investigate FPC's function using a combination of brain imaging, brain stimulation and computational modelling. We show that the lateral part of the FPC is causally involved in digesting choice information during decision making.

Plenary Speaker

Dr. Yvonne HAN
Associate Professor & Programme Leader of BSc (Hons) in Occupational Therapy

Department of Rehabilitation Sciences, The Hong Kong Polytechnic University

Biography: Dr. Han received her undergraduate training in occupational therapy from the University of Alberta in Edmonton, Canada. She obtained her MPhil degree in Neurophysiology from the Faculty of Medicine, The University of Hong Kong (HKU), and her PhD degree in Neuropsychology from The Chinese University of Hong Kong. Dr. Han is a qualified occupational therapist and has many years of experience in the field of paediatric rehabilitation of various challenges, including Autism Spectrum Disorders, cortical visual impairment, Down syndrome, physical disabilities, cerebral palsy, and sensory integration dysfunction. Before joining The Hong Kong Polytechnic University, Dr. Han worked as an Assistant Professor in the Department of Special Education and Counselling at the Hong Kong Institute of Education. She served for several years as Chairman of the Department's Research and Development Committee, and has been very active in initiating a progressive set of policies and procedures that have significantly increased the research productivity of the department. Dr. Han's research interests focus on enhancing cognitive functions in children with neurological disorders, with special interest in the field of neuropsychology and its application to special educational needs with strong relevance to occupational therapy.

Seminar title: tDCS – a novel treatment for autism?

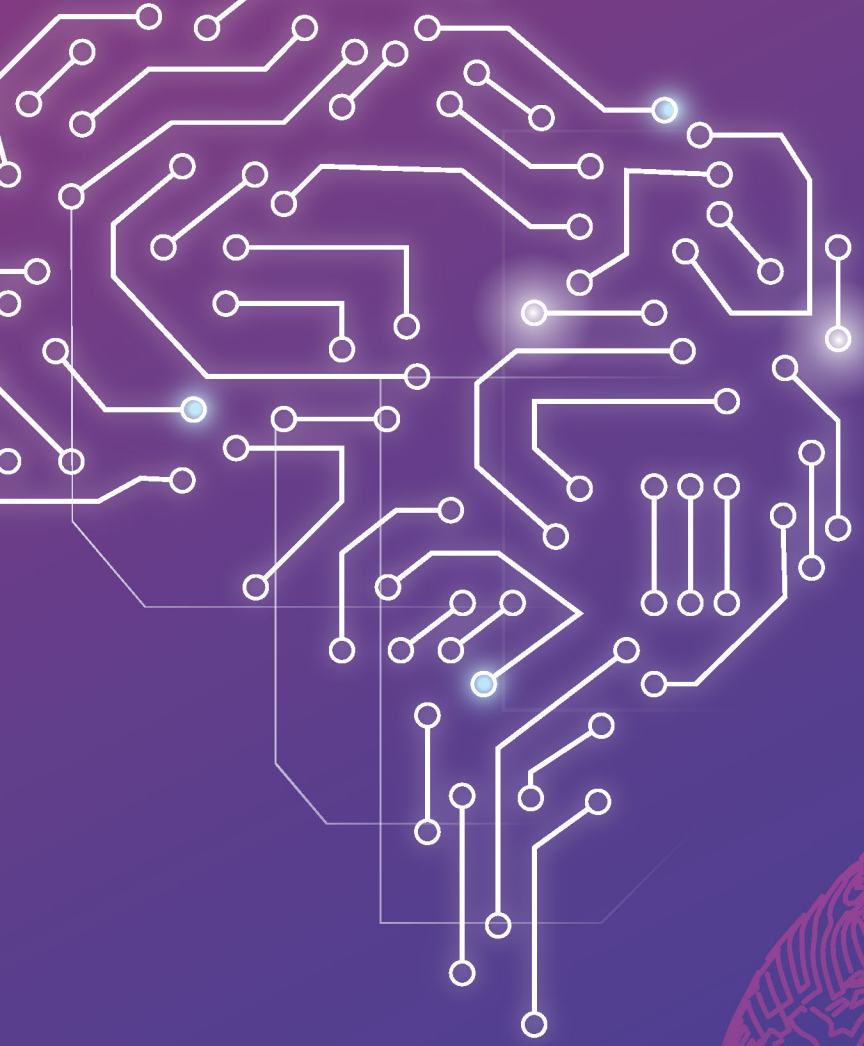
Abstract: To date, there is no known cure for autism spectrum disorder (ASD). Although some behavioral interventions have shown positive therapeutic effects in reducing the outward problem behaviors associated with ASD, the disorder remains a highly disabling condition. Few treatment options are available for targeting the core symptoms of ASD. The development of treatments that target common neural circuit dysfunctions is promising. Recently, a non-invasive brain stimulation technique, Transcranial Direct Current Stimulation (tDCS), has shown great promise as a potentially effective and cost-effective tool for reducing core symptoms such as anxiety, aggression, impulsivity, and inattention in patients with autism. This technique has been shown to modify behavior by inducing changes in cortical excitability and enhancing connectivity between targeted brain areas, yet its clinical and neurobiological effects in individuals with ASD remain elusive. An important next step is to better understand the neurophysiological mechanisms underlying tDCS treatment – in particular, the role that tDCS plays in targeting and effectively changing functional connectivity in individuals with ASD. Our research findings support that the use of multisession tDCS combined with online cognitive remediation results in more adaptive regulation of global brain dynamics, which is associated with enhanced information processing efficiency and social functioning after the intervention.

UBSN Souvenir and Stamp Collection

Stamp Collection		Souvenir (Available while stocks last)	
At Z211	**At Registration**		UBSN Non-woven Bag with Programme Booklet
At Z211	**Following after Keynote Seminar: Prof.GAO Jia-Hong**		UBSN Portable Umbrella
At Z211	**At Keynote Seminar: Prof. QIU Anqi**		UBSN USB Drive
At Z211	**Following after Plenary Seminar: Prof. SUN Lei**		UBSN Cup Coaster (White edition)
At Z211	**At Plenary Seminar: Dr. Bolton CHAU**		UBSN Cup Coaster (Black edition)
At Z211	**At Plenary Seminar: Dr. Yvonne HAN**		Dried Fruit Tea Bag
At UBSN (ZB216-218)	**At Lab Tour**		Substitute for any one of the plenary seminar stamps (Redeem at Z209 after 5pm) Redeemed? ☐
At Z211	**Following after "Best Paper Award" Ceremony + Questionnaire**		UBSN Brain-shaped Stress Ball
At Z209	**After collecting 7 stamps in the above locations!**		UBSN 4-in-1 Travel Adaptor **OR** UBSN Mug Set

Campus Map
校園地圖

THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學



UBSN

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