



澳門大學
UNIVERSIDADE DE MACAU
UNIVERSITY OF MACAU



協同創新研究院
Instituto de Inovação Colaborativa
Institute of Collaborative Innovation



認知與腦科學研究中心
Centro de Ciências Cognitivas e Cerebrais
Centre for Cognitive and Brain Sciences

MSCBS
2025

THE 6TH MACAU SYMPOSIUM ON COGNITIVE AND BRAIN SCIENCES

第六屆澳門認知與腦科學研討會



18 OCTOBER 2025



9:00 - 18:30



University of Macau, Macau SAR, China



WEBSITE

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Cover Message of MSCBS 2025

The Centre for Cognitive and Brain Sciences (CCBS) of the University of Macau is excited to extend to you a warm welcome to showcase of progress of rapidly growing and highly promising field of cognitive and brain sciences in The 6th Macau Symposium on Cognitive and Brain Sciences (MSCBS 2025), which will be held onsite at the University of Macau on 18 October 2025, Saturday.

The aims of this symposium are to exchange on the advances and achievements in field of cognitive and brain sciences spanning from cognition, brain health to neuroimaging and brain intervention technique. In particular, we will bring together speakers from diverse backgrounds to discuss the latest, most exciting cognitive neural science on addiction and decision making, language and cognition, emotion, child development and cognitive aging, visual perception, neuroimaging, and psychiatric and neurological disorders. It features plenary sessions with keynote speakers, parallel session and poster session on the following topics:

- Neuroimaging and brain intervention techniques including fMRI/EEG/fNIRS and TMS/tDCS;
- Cognitive neuroscience including behavioral addiction, brain and language cognition, vision and emotion;
- Psychiatric disorders including depression and anxiety, insomnia, bipolar disorders, and obsessive-compulsive disorder;
- Neurological disorders such as AD, PD, epilepsy and pain;
- Child development and developmental disorder;
- Cognitive aging.

We look forward to welcoming you at the symposium!



Prof. Zhen YUAN

Chair of the Symposium Organizing Committee

PROGRAMME

 18 OCT 2025 (SAT)

 UM N1 GUEST HOUSE, GROUND FLOOR

09:00 – 09:15



Welcome Remarks

09:15 – 10:00



Looking at the Big Picture in Neuropsychiatry: Behavioural Evolution, Genetics, Environment, State/Trait, and Measurement/Sensors

Prof. Allan L. REISS
Stanford University



10:00 – 10:45



Precision imaging, neuropeptides and AI: decoding and regulating human emotion

Prof. Benjamin BECKER
The University of Hong Kong



10:45 – 11:25



Refreshment & Poster Session

11:25 – 11:50

Development and Evolution of the Brainnetome Atlas

Prof. Tianzi JIANG
Institute of Automation, Chinese Academy of Sciences

11:50 – 12:15

Symptom-Based Translational Research: KCNQ Opener Improves Anhedonia and Depression

Prof. Minghu HAN
Shenzhen University of Advanced Technology (SUAT)

12:15 – 14:00



Lunch break & Poster Session

14:00 – 14:45



Deciphering the Influence of Fetal Programming on Child Mental Health: Insights from Neuroimaging and Genetics

Prof. Anqi QIU
The Hong Kong Polytechnic University



14:45 – 15:30



Survival in a Complex World

Prof. Dean MOBBS
California Institute of Technology (Caltech)



15:30 – 16:10



Refreshment & Poster Session

16:10 – 16:35

Prefrontal cortex responses and connection to game rewards and losses: Evidences from fNIRS during mobile gameplay

Prof. Haibo YANG
Tianjin Normal University

16:35 – 17:00

CHART: Chinese Brain Health Imaging Consortium

Prof. Xinian ZUO
Beijing Normal University



Parallel Session – 1st Floor, 1005

Functional imaging and modulating neural circuits during development

Prof. Zhihai QIU
Guangdong Institute of Intelligence Science and Technology

High-accuracy neuroimaging: modeling, multimodal, and machine learning

Prof. Jiaming CAO
University of Macau

PROGRAMME

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Main Session – Ground Floor

17:00– 17:25

Perceptual filling-in at the natural blind spot requires visual awareness and involves feedback from higher cortex

Prof. Peng ZHANG
Institute of Biophysics, Chinese Academy of Sciences

17:25 – 17:50

Human escaping decisions: Mechanistic insights from intracranial recordings

Prof. Haiyan WU
University of Macau

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Parallel Session – 1st Floor, 1005

Multiple Mental Representations Guide Human Sequential Behavior

Prof. Guochun YANG
Guangdong Institute of Intelligence Science and Technology

Study on Magneto-acoustic Targeted Modulation of Neural Networks in Prodromal Alzheimer's Disease Based on Cross-scale Multimodal Imaging

Prof. Guolin MA
Peking University

17:50 – 18:00

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Short break

18:00 – 18:20

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Award Announcement

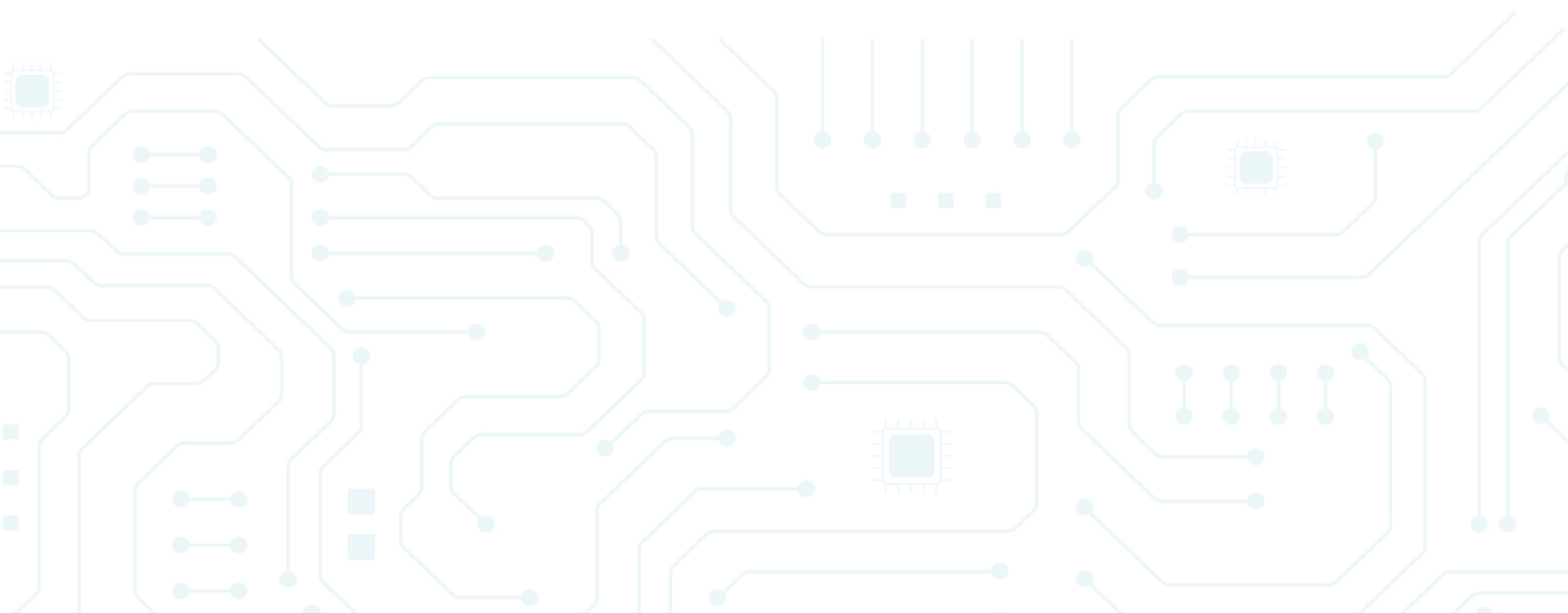
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Closing Remarks & Group Photos

18:30

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Dinner for Speakers at Grand Plaza (N1 Ground Floor)





Prof. Allan L. REISS

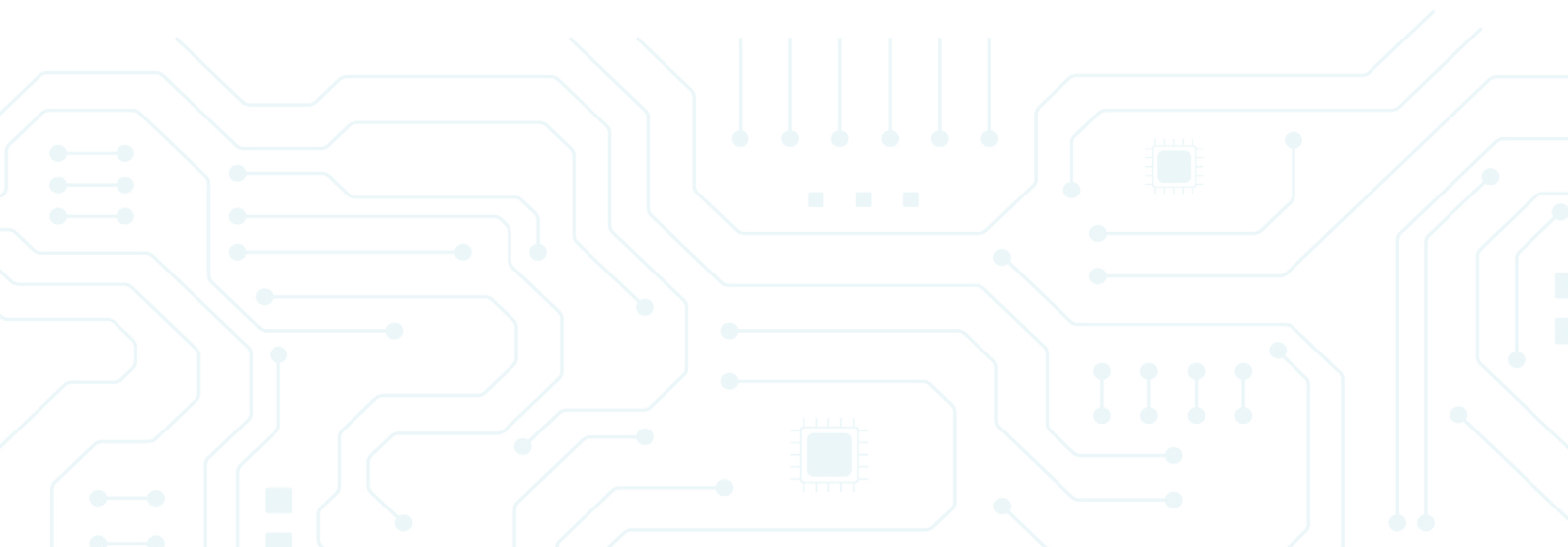
Robbins Professor of Psychiatry
Stanford University

Prof. Reiss obtained a BA in Psychobiology from Swarthmore College, and MD from George Washington University. Postgraduate training was at University of Colorado, Children's National Medical Center and Stanford University. He was Professor of Psychiatry, Neurology and Pediatrics at Johns Hopkins University before coming to Stanford in 1997. His work uses multimodal methods to determine how biological and environmental factors affect brain structure and function, and to determine how these factors ultimately impact cognitive-behavioral and psycho-social outcome in persons with typical and atypical development. Another focus of his work is on the neuroscience of cognition and behavior in typically developing persons.



Looking at the Big Picture in Neuropsychiatry: Behavioural Evolution, Genetics, Environment, State/Trait, and Measurement/Sensors

This talk will introduce complex concepts and outstanding questions relevant to neuropsychiatry and clinical neuroscience today. I will attempt to address these concepts and questions from an evolutionary as well as current research perspective with the goal of inspiring new and creative ideas from the next generation of investigators to implement in their own future research agendas.





Prof. Benjamin BECKER

Professor
The University of Hong Kong

Prof. Benjamin Becker is Full Professor at The University of Hong Kong and Adjunct Professor at the University of Electronic Science and Technology of China, directing labs focused on cognition, affect, and motivation (<http://www.beckerlab.org>). His research uses advanced neuroimaging, AI-inspired neural decoding, and

neuromodulation to determine how the human brain constructs and regulates emotions and how these processes can be regulated by neuropeptides, BCI and AI. He published over 300 scientific publications, serves in editorial roles for leading journals (Advanced Science, Psychotherapy and Psychosomatics, Psychopharmacology), and leads task forces at the Global Brain Consortium and the Cognitive Science Program at HKU.



Precision imaging, neuropeptides and AI: decoding and regulating human emotion

Emotional and motivational processes are vital for functioning in everyday life and mental health. Dysregulations in these domains critically impede adaptive functioning and represent a transdiagnostic feature across major mental and neurological disorders. A significant proportion of individuals with pathological dysregulations in these domains do not adequately respond to the currently available interventions and thus integrated translational strategies that precisely determine the underlying brain systems and explore novel strategies to modulate the identified targets in humans are urgently needed. In the present talk I will outline synergistic strategies that aim at determining the brain basis of emotions via machine learning and AI-inspired decoding of advanced fMRI and how these brain circuits can be modulated via neuropeptide systems (Oxytocin, Angiotensin II) and novel technology (e.g. conversational AI).



Prof. Anqi QIU

Professor

The Hong Kong Polytechnic University

Prof. Qiu is currently the Director of Mental Health Research Centre, a Professor and Global STEM Scholar in the Department of Health Technology and Informatics at the Hong Kong Polytechnic University (PolyU). Before joining PolyU, she served as Deputy Head of the Department of Biomedical Engineering at

the National University of Singapore (NUS), where she had been a faculty member after the completion of her PhD studies.

Prof. Qiu is a Fellow of the Organization for Human Brain Mapping (OHBM) and has been recognized as a Highly Cited Researcher and ranked among the World's Top 2% Scientists by Stanford University. Recently, she was elected as the Chair of OHBM, a testament to her leadership in the field.

Specializing in computational analyses, 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 mental health research. Her team has high-impact publications in *Nature*, *Nature Neuroscience*, *Nature Mental Health*, *American Journal of Psychiatry*, *Biological Psychiatry*, *IEEE Transactions in Medical Imaging*, *Medical Image Analysis*, etc.



Deciphering the Influence of Fetal Programming on Child Mental Health: Insights from Neuroimaging and Genetics

Venture into the captivating realm of fetal programming, where in-utero experiences can cast a long shadow over an individual's health. This talk will illuminate how stressful or hostile conditions during pregnancy can set the stage for compromised development and lifelong susceptibility to adverse health outcomes. Drawing from our comprehensive longitudinal cohort study, we will reveal the profound link between maternal mental health and child brain development. We will further delve into how the early life environment can shape brain development and psychopathology during the critical period of adolescence. Furthermore, the intriguing role of genetics will be explored, particularly its part in modulating the influence of the early life environment on child brain development and psychopathology. As we conclude, we will discuss promising intervention programs, shining a light of hope on the potential for improving child mental health.



Prof. Dean MOBBS

Professor

California Institute of Technology (Caltech)

Prof. Dean Mobbs is interested in the intersection of behavioral ecology, economics, emotion, and social psychology. Prior to Caltech, Mobbs was an Assistant Professor of psychology at Columbia University and a research assistant at Stanford University. He conducted his PhD at University College, London under the auspices of Professors Chris Frith FRS and Ray Dolan FRS. His awards include the APS Janet Spence Award for Transformative Early Career Contributions (2015) and the NARSAD Young Investigator Award (2015). He is a life fellow of Clare Hall at the University of Cambridge. In 2019, he was named a Chen Scholar at the Tianqiao and Chrissy Chen Institute for Neuroscience at Caltech.



Survival in a Complex World

How did our nomadic ancestors continually adapt to the seemingly limitless and unpredictable number of dangers in the natural world? I argue that human defensive behaviors are dynamically constructed to facilitate survival in capricious and itinerant environments. I first hypothesize that internal and external states result in state constructions that combine to form a meta-representation. When a threat is detected, it triggers the action construction. Action constructions are formed through two contiguous survival strategies: generalization strategies, which are used when encountering new threats and ecologies. Generalization strategies are associated with cognitive representations that have high dimensionality and which furnish flexible psychological constructs, including relations between threats, and imagination, and which converge through the construction of defensive states. I posit that generalization strategies drive 'explorative' behaviors including information seeking, where the goal is to increase knowledge that can be used to mitigate current and future threats. Conversely, specialization strategies entail lower dimensional representations, which underpin specialized, sometimes reflexive, or habitual survival behaviors that are 'exploitative'. Together, these strategies capture a central adaptive feature of human survival systems: self-preservation in response to a myriad of threats.



Prof. Tianzi JIANG

- Professor
- Institute of Automation, Chinese Academy of Sciences

Prof. Tianzi Jiang is Professor and Director of Key Laboratory of Brainnetome and Brain-Computer Interface at the Institute of Automation, Chinese Academy of Sciences, and Director of Xiaoxiang Institute of Brain Health. He obtained PhD degree at Zhejiang University and BSc degree at Lanzhou University. He was Chair of Organization of Human Brain Mapping (2024–2025). He was elected a member of the Academy of Europe, a fellow of IEEE, IAPR and AIMBE. He has published over 400 peer-review journal papers and they obtained 45000

citations. He is the recipient of Hermann von Helmholtz Award, Turan Itil Career Contribution Award, and Natural Science Award of China.



Development and Evolution of the Brainnetome Atlas

Brain atlas is an indispensable tool for studying the relationship between brain structure and cognitive function. We proposed to create a new brain atlas – the Brainnetome atlas, using brain connectivity profiles. The Brainnetome atlas lays the foundation for research in brain science and brain-inspired intelligence, and opens a new avenue not only for the study of brain science and brain diseases, but also for brain-inspired intelligence. In this lecture, we first introduce the research background and content of the Brainnetome, including the definition and the main research directions of the Brainnetome, the idea of creating the Brainnetome atlas, and the essential differences from existing brain atlas. Then, we will introduce the applications of the Brainnetome atlas in elucidating brain cognitive mechanisms and precise diagnosis and therapy of brain diseases. Then, we will present the studies on development and evolution of the Brainnetome Atlas. Finally, a summary and perspective on future research directions are provided.



Prof. Minghu HAN

- Chair Professor
- Shenzhen University of Advanced Technology (SUAT)

Prof. Ming-Hu Han is Chair Professor in SUAT, Adjunct Professor in ISMMS, and an elected fellow in American College of Neuropsychopharmacology (ACNP). His research focuses on the neural circuit mechanisms of susceptibility and resilience to chronic stress in rodent models. His work revealed the neural mechanism that underlies stress resilience and identified KCNQ channels as a new drug target for depression treatment. His collaborative investigations showed that KCNQ opener ezogabine has significant antidepressant effects in

patients with major depressive disorder. His work is published in high profile journals, including Cell, Nature, and Science, and cited over 16,900 times.



Symptom-Based Translational Research: KCNQ Opener Improves Anhedonia and Depression

Stress has been associated with neuropsychiatric conditions and is commonly used in animal models of modelling human neuropsychiatric disorders. However, animal models have various limitations, especially their poor predictive power for drug efficacy in human diseases. We explored whether anhedonia, one of the core symptoms of major depressive disorder (MDD), holds predictive power for treatment efficacy in human depression. Here, we report a novel symptom-driven therapeutic approach for depression, which has emerged from our preclinical work targeting anhedonia and aberrant activity of ventral tegmental area (VTA) dopamine neurons via modulation of KCNQ channels. In preclinical study, we showed that KCNQ opener retigabine (ezogabine) inhibits pathological hyperactivity of VTA dopamine neurons in stress-susceptible mice, accompanied with improvement in deficits of social interaction and sucrose preference, behaviours relevant to anhedonia. Our clinical investigations demonstrated significant improvements in both anhedonia and depression, measured by clinical scores of SHAPS (Snaith–Hamilton Pleasure Scale), MADRS (Montgomery–Asberg Depression Rating Scale), and QIDS (Quick Inventory of Depressive Symptomatology–Self Report). Together, our symptom-driven treatment from a preclinical model to clinical patients indicates that a repeatedly measurable symptom in rodents may possess adequate predictive power, which is potentially useful in research of other psychiatric conditions.



Prof. Haibo YANG

Professor
Tianjin Normal University

Prof. Haibo Yang, professor and the dean of the Department of Psychology at Tianjin Normal University. The research field is to explore the relationship between cognitive processing and mental health in adolescents using problematic smartphones. The papers were published in journals such as *Computer in Human behavior*, *Journal of Affective Disorders*, et al. He has been granted 8 invention patents and participated in the formulation of 1 national standard. He won the first prize of Tianjin Humanities and Social Sciences

Outstanding Achievements and the Zhixian Zhu Psychology Award. The textbook "Experimental Psychology" won the first National Excellent Textbook Award.



Prefrontal cortex responses and connection to game rewards and losses: Evidences from fNIRS during mobile gameplay

The prefrontal cortex (PFC) plays a critical role in cognitive control and reward/loss processing, making it a key brain region in the study of addiction. This study aimed to explore differences in PFC functional connectivity between individuals with internet gaming disorder (IGD) and recreational game users (RGU) during mobile gameplay. A total of 27 IGD-classified individuals and 28 RGU were recruited to complete both single-competitive and cooperative-competitive gaming tasks, while monitored using functional near-infrared spectroscopy. The results showed that in single-competitive mode, during both positive and negative game events, IGD individuals exhibited lower clustering coefficients, shorter characteristic path length, and higher global efficiency, indicating a shift towards a more random network pattern, and suggesting impaired cognitive control. However, no group differences were observed during cooperative-competitive gameplay. Additionally, Network-Based Statistic analyses revealed that during negative events in single-competitive mode, IGD individuals showed enhanced functional connectivity between the dorsolateral PFC and frontopolar areas, possibly reflecting compensatory hyperconnectivity. This study highlights PFC network topology changes in IGD individuals during gameplay and offering novel insights for developing targeted interventions and game-based mental health strategies.



Prof. Zhihai QIU

Principal Investigator
Guangdong Institute of Intelligence Science and Technology

Prof. Qiu obtained his BSc in Physics and M Phil in Optical Engineering from Fujian Normal University in 2012 and 2015, and his doctoral degree in Biomedical Engineering from The Hong Kong Polytechnic University in 2019. He worked as a postdoc at Stanford with Kim Butts Pauly. Prof. Qiu is currently Principal Investigator at Guangdong institute of Intelligence Science and Technology. Prof. Qiu's current research is focusing on functional ultrasound imaging and ultrasound neuromodulation. His research has been published in high profile journals, including *Cell Reports*, *PNAS*, *Brain stimulation*.



Functional imaging and modulating neural circuits during development

The developmental trajectory of the brain, once thought to be rigidly programmed, is increasingly understood as a dynamic process that is open to influence. The ultimate challenge, however, is to find a means to interact with the developing brain in a precise, non-invasive, and restorative manner. In this talk, I will present a new paradigm that leverages the unique dual capabilities of ultrasound to both observe and guide brain development. We have demonstrated that this technology can be used to functionally assess the developing brain and, crucially, to deliver targeted neuromodulation during critical early-life windows. The power of this approach is crystallized in our recent findings where this ultrasound-based intervention successfully reversed debilitating autism-like symptoms in a model of Rett syndrome. This breakthrough provides a foundational proof-of-concept, suggesting that we may one day be able to correct the course of neurodevelopmental disorders. I will discuss the profound implications of this work and the future horizons it opens for creating a new class of non-invasive therapeutics for challenging developmental brain disorders.



Prof. Xinian ZUO

- Professor
- Beijing Normal University

Prof. Xi-Nian Zuo is the Fellow of the Organization of Human Brain Mapping, associate editors of Chinese Science Bulletin and Science Bulletin for the field of Life Science, and currently serves as the Chief Scientist of the Chinese Color Nest Data Community at Science Data Bank (<https://ccndc.scidb.cn>).



CHART: Chinese Brain Health Imaging Consortium

Quantifying individual deviations of brain morphology from normative references is essential for understanding neurodiversity and facilitating personalized brain health management. We established Chinese brain normative references using morphological imaging scans of 24,061 healthy volunteers from 105 sites, revealing later peak ages of lifespan neurodevelopmental milestones (1.2–8.9 years) than the European/North American references. We then modeled individual brain deviation scores in 3,932 patients with different neurological disorders from the population references to evaluate three key missions of charting brain health using machine learning approach. The norm-deviation scores outperformed raw structural measures in these evaluations, and their utilities and potentials were confirmed by longitudinal and sensitivity analyses. As part of the Global Research Data Ark Initiative, Chinese Color Nest Data Community at Science Data manages data sharing of the large-scale neuroimaging resource and presents how the Chinese-specific normative brain references may foster personalized diagnosis and prognosis in neurological diseases, enabling clinically applicable assessments of brain health.



Prof. Jiaming CAO

- Assistant Professor
- University of Macau

Prof. Cao is an Assistant Professor at the Centre for Cognitive and Brain Sciences at the University of Macau. He received his PhD and MS degree in Biomedical Engineering from Carnegie Mellon University, and Bachelor's degree in Electronic Engineering from Tsinghua University. Prof. Cao's work is mainly concerned with developing new data processing algorithms and modeling techniques applied to non-invasive neuroimaging and neurostimulation, specifically focusing on diffuse optics and electroencephalography.



High-accuracy neuroimaging: modeling, multimodal, and machine learning

Neuroimaging using diffuse optics and electroencephalography are playing an increasingly important role in both neuroscientific and clinical applications due to their non-invasive and portable nature. It is, however, still challenging to achieve high accuracy using these technologies, and a lot of advancements remain to be made in both hardware and algorithm development.

The talk will start with presenting a new Python package, NIRFASTERFF, for fast, FEM-based light modeling. Supporting a variety of modeling problems common to tissue optics, the package can accelerate workflows in fields such as functional near-infrared spectroscopy (fNIRS) and diffuse optical tomography (DOT). Moving to a more applicational topic, the talk will subsequently discuss an algorithm for multimodal imaging, where DOT and EEG are recorded simultaneously, and the spatially accurate DOT is used to spatially confine the source localization of the fast EEG signals. This multimodal imaging algorithm enables high spatio-temporal accuracy neuronal source reconstruction, which can benefit applications such as, e.g., localizing epileptic foci. Finally, going beyond model-based methods, the talk will present some preliminary results on further improving DOT reconstruction accuracy using machine learning techniques, which can, we hope, enable consistently accurate neuroimaging results even when the noise is high or the data is undersampled.



Prof. Peng ZHANG

Professor
Institute of Biophysics, Chinese Academy of Sciences

Prof. Peng Zhang is an investigator and processor of State Key Lab of Brain and Cognitive Science, Institute of Biophysics, Chinese Academy of Sciences. He studies human visual perception, attention and plasticity by combining behavioural and high-resolution neuroimaging techniques (e.g. 7T fMRI and MEG/EEG). His lab recently developed novel experimental paradigms and high-resolution fMRI approaches that enabled non-invasive imaging of mesoscopic functional units in the human brain, such as cortical columns and layers, and functional subdivisions of small subcortical nuclei.



Perceptual filling-in at the natural blind spot requires visual awareness and involves feedback from higher cortex

Perceptual filling-in at the natural blind-spot (BS) exemplifies how the brain constructs conscious perception from incomplete sensory inputs. Here we combined psychophysics and laminar fMRI at 7 Tesla to study the role of visual awareness and top-down feedbacks in perceptual filling-in at the blindspot. In behavioural experiments, the contrast detection threshold of a small probe presented to the fellow eye within the BS location was significantly elevated by a large grating disc (inducing filling-in) presented to the BS eye, compared to a grating annulus presented to the fellow eye (no filling-in). However, this effect occurred only when the grating was rendered visible (counterphase flickering at 4 Hz) but not invisible (30 Hz flickers), suggest that filling-in at the BS requires visual awareness. We further investigated layer-dependent fMRI signals inside and near the blind-spot area in V1 and V2. Compared to control conditions, stimulus presented to the BS eye produced stronger responses in the superficial and deep layers within the BS area of V1, consistent with the laminar pattern of cortico-cortical feedbacks. Our findings demonstrate that perceptual filling-in at the natural blind-spot requires visual awareness and involves feedbacks from higher cortex.



Prof. Guochun YANG

Principal Investigator
Guangdong Institute of Intelligence Science and Technology

Prof. Guochun Yang is a researcher and the PI of the Laboratory of Cognitive Neural Representation and Regulation. He obtained his Bachelor of Medicine degree from Wuhan University in 2012 and his Ph.D. in Cognitive Neuroscience from the University of Chinese Academy of Sciences in 2018. From July 2018 to February 2025, he conducted postdoctoral research at the Institute of Psychology, Chinese Academy of Sciences, and the Department of Psychological and Brain Sciences at the University of Iowa, USA. His research

findings have been published in journals such as PLOS Biology, eLife, Journal of Neuroscience, and Neuroscience & Biobehavioral Reviews etc.



Multiple Mental Representations Guide Human Sequential Behavior

The ability to perform a series of tasks in a specific order is a hallmark of intellectual behaviors. While previous research has investigated different forms of sequence representations in the human brain, particularly debating between associative chaining and positional coding, it remains unclear whether and how different representations contribute simultaneously to sequential behavior, especially at the abstract task level. This study addresses this gap by utilizing working memory tasks embedded in multiple sequences, where consecutive task associations and position-task associations can be dissociated. The design also teases apart two additional representations: holistic representation and suppression of past tasks. Our findings provide evidence for all four representations, supported by both model-free and computational model-based behavioral analysis. Model-guided EEG results further highlight the neural contributions of each representation to task prediction during sequential performance. These findings demonstrate that multiple representations collaborate to support effective execution of task sequences.



Prof. Haiyan WU

Assistant Professor
University of Macau

Prof. Haiyan Wu's research primarily focuses on the neural mechanisms of social cognition. Her publications have been cited over 1850 times. As a first or corresponding author, Professor Wu has published more than 60 papers in neuroscience and psychology journals, such as Nature Communications, eLife, Neuroscience & Biobehavioral Reviews, Scientific Data, Neuroimage, Annals of the New York Academy of Sciences, and Human Brain Mapping. She has also obtained 3 neuroscience-related patents. Her research achievements have been

cited by numerous domestic and international experts in journals like Nature Communications, Advanced Science, and Social Cognitive and Affective Neuroscience. She is selected as one of the "Top 30 Young Innovators in Brain Science and Artificial Intelligence Research" in 2023.



Human escaping decisions: Mechanistic insights from intracranial recordings

Predators attack at different spatiotemporal scales, which may cause the prey animals to respond with reactions that range from simple motor reactions and strategic planning that involve more complex cognitive processes. Recent work in humans suggests that escape relies on two distinct circuits: the reactive and cognitive fear circuits. However, the specific roles of these two circuits in different stages of human escaping remains poorly characterized. In this study, we recorded Stereotactic electroencephalography (SEEG) from epilepsy patients while they performed a modified flight initiation distance (FID) task. We identified brain regions in the cognitive fear circuit, including the ventromedial prefrontal cortex and hippocampus, are involved in encoding the perceived level of threat during the information processing stage. The actual escaping stage, especially under rapid attack, the reactive fear circuit, including the midcingulate cortex and amygdala, is prominently activated. Furthermore, we observed a significant theta band information flow from the amygdala to the vmPFC and HPC under rapid attacks. This suggests the existence of communication between the reactive and cognitive fear circuits, enabling the organism to react quickly to ensure survival under the imminent threat. Collectively, these findings provide insight into the distinct roles of the reactive and cognitive fear circuits in facilitating successful human escaping behavior.



Prof. Guolin MA

Professor
Peking University

Appointed Chairman of the Branch of Medical Imaging Engineering and Technology, Chinese Society of Biomedical Engineering; Standing Committee Member of the Imaging Branch of the China Medical Rescue Association; Vice President of the Radiological Imaging Equipment Branch of the China Association of Medical Equipment; Vice President of the Imaging Branch of the China Medical Rescue Association; Standing Committee Member of the Radiology Professional Committee of the Chinese Research Hospital Association; Member of the expert

group for the key projects "Research and Development of Digital Diagnosis and Treatment Equipment" and "Brain Science and Brain-Like Research" under the National Key R&D Program of the Ministry of Science and Technology. Reviewer for the National Natural Science Foundation of China (NSFC) and for national and Beijing science and technology awards.



Study on Magneto-acoustic Targeted Modulation of Neural Networks in Prodromal Alzheimer's Disease Based on Cross-scale Multimodal Imaging

Alzheimer's disease (AD) is a neurodegenerative disorder primarily characterized by cognitive impairment in the elderly, which is difficult to diagnose in its early stages. Prodromal Alzheimer's disease (pAD) requires effective intervention to delay its pathological progression. Research has found that the default mode network (DMN) is the earliest affected brain network in pAD, but substantial evidence is still lacking on whether DMN abnormalities can serve as intervention targets. We propose that "using focused magneto-acoustic stimulation technology to individually and precisely target and modulate abnormal brain regions within the DMN circuit can enhance neural network plasticity and delay the pathological progression of pAD." We will study pAD patients and humanized gene-edited rat models, employing multimodal brain imaging techniques and integrating neurodynamic models to perform cross-scale individualized modeling at both the macroscopic brain network and microscopic cortical column levels. We aim to identify and anchor specific biomarkers within the DMN circuit and explore precise intervention targets. Subsequently, advanced focused magneto-acoustic coupling stimulation technology will be used to precisely target and stimulate key areas, studying the effects of DMN neural circuit modulation. By comprehensively correlating multimodal brain imaging with spatiotemporal transcriptomics and other multidimensional information, the project seeks to uncover the neural modulation mechanisms of key pathogenic brain regions in pAD, providing a scientific basis for individualized intervention and effective assessment of pAD.

ORGANIZING COMMITTEE MSCBS 2025

CHAIR



Prof. Zhen YUAN

MEMBER



Prof. Christian MONTAG



Prof. Andriy MYACHYKOV



Prof. Juha SILVANTO



Prof. Michiel SPAPÉ



Prof. Kuzma STRELNIKOV



Prof. Cheng-Teng IP



Prof. Rihui LI



Prof. Haoyun ZHANG

Poster Committee

CHAIR



Prof. Kuzma STRELNIKOV

MEMBER



Prof. Cheng-Teng IP



Prof. Rihui LI



Prof. Haoyun ZHANG

ABOUT CCBS



認知與腦科學研究中心

Centro de Ciências Cognitivas e Cerebrais
Centre for Cognitive and Brain Sciences



CCBS

In 2019, Centre for Cognitive and Brain Sciences (CCBS) was established as a unique campus-wide centre to harness and enhance the multidisciplinary research and educational skills of the university in cognition and brain sciences. CCBS consists of four platforms: neuroimaging, brain intervention, cognition and behavioral data collection and high performance computing. The four platforms complement each other and realize the integration of multi-dimensional and large-scale data acquired from brain imaging, eye movement, behavior, physiology, clinical, etc., which can help reveal the neural mechanisms of cognition, guide the brain intervention, and achieve the treatment of brain disorders. CCBS is a scientific and scholarly community striving to make cognition and neuroscience greater than the sum of its parts by integrating various faculties and disciplines to accelerate breakthroughs. CCBS is dedicated to enhancing interdisciplinary cognitive and brain sciences and translating discoveries into solutions for health and society.



3T Siemens MAGNETOM
Prisma MRI Scanner



Magstim Rapid
2 Image-guided rTMS system



Artinis OxyMon 112-channel
whole brain fNIRS



Biosemi EEG machine

INSTITUTE OF COLLABORATIVE INNOVATION INTERNATIONAL TEAM

Interim Director, Chair Professor



Prof. Chengzhong XU

PhD, The University of Hong Kong, China
BSc, Nanjing University, China

*Parallel and Distributed Computing, Cloud and Edge Systems for AI,
Intelligent Transportation and Autonomous Driving, Reinforcement Learning and AI Theory*



ICI

Associate Director, Distinguished Professor



Prof. Christian MONTAG

PhD, University of Bonn, Germany
BSc, University of Giessen, Germany

*Addiction & DM, Cognitive Aging,
Neuroimaging*

Associate Director, Head of CCBS, Professor



Prof. Zhen YUAN

PhD, University of Science and
Technology of China

*Neuroimaging, Cognitive Aging &
Brain Disorders*

Professor



Prof. Andriy MYACHYKOV

PhD, University of Glasgow, UK
BSc, Cherkassy State University, Ukraine

Brain & Language Cognition



Prof. Juha SILVANTO

PhD, University College London, UK
BSc, Cardiff University, UK

Neuroimaging

Associate Professor



Prof. Michiel SPAPÉ

PhD, Leiden University, The Netherlands

Neuroimaging for decision making



Prof. Kuzma STRELNIKOV

PhD, Saint-Petersburg
State University, Russia

Neuroimaging for decision making

Assistant Professor



Prof. Jiaming CAO

PhD, Carnegie Mellon University, USA

Neuroimaging



Prof. Joseph DEXTER

PhD, Harvard University, USA
A.B, Princeton University, USA

*Digital humanities; systems biology and
mathematical modeling for biomedicine*



Prof. Ruey-Song HUANG

PhD, University of California,
San Diego, USA

Neuroimaging



Prof. Cheng-Teng IP

PhD, University of Copenhagen, Denmark

Clinical electroencephalography (EEG)



Prof. Rihui LI

Postdoctoral, Stanford University,
PhD, University of Houston, USA

Neuroimaging



Prof. Haiyan WU

Postdoctoral, Caltech, USA
PhD, Beijing Normal University, China

Human Cognitive Neuroscience



Prof. Haoyun ZHANG

PhD, Pennsylvania State University, USA

*Cognitive aging, brain and
language cognition*

POSTGRADUATE PROGRAMMES OF CCBS

Doctor of Philosophy in Brain and Cognitive Sciences



Aims: To equip students with advanced interdisciplinary knowledge that integrates computational and neural sciences for the study of perception, cognition such as decision making and linguistics, brain health, and brain-like intelligence.



Study Plan (30 credits):

- 4 Compulsory Courses + 1 Required Elective course
- Doctoral Thesis
- Assessments:
 - Qualifying Examination
 - Thesis Proposal Assessment
 - Oral Defense

Applicant background:

Applicant must possess either a bachelor or master's degree in the following disciplines or fields:

Cognitive Neuroscience, Psychology, Biomedical Engineering / Biomedical Sciences, Clinical Medicine / Radiology / Psychiatry

Application Period for AY2026/2027:

01/08/2025 – 31/10/2025 (1st batch)
01/11/2025 – 13/03/2026 (2nd batch)
01/08/2025 – 15/01/2026 (for UM PhD Funding)

Master of Science in Cognitive Neuroscience



Aims: To train students with innovative approaches for inspecting brain functions in terms of neurolinguistics, neuroeducation, neuroeconomics, neuroimaging, brain-inspired intelligence, etc. and promote translating discoveries into solutions for health and society.



Study Plan (30 credits):

- 3 Compulsory Courses + 5 Required Elective courses
- Project Report (with an Oral Presentation)

Applicant background:

We welcome applicants with a bachelor degree in various backgrounds. Priority will be given to applicants with relevant background, including but not limited to **behavioral science, biological science, psychology, cognitive science, educational psychology, neuroeconomics, computer science, biomedical engineering/sciences, neuroscience, and linguistics.**

Application Period for AY2026/2027:

03/10/2025 – 02/01/2026 (1st batch)
03/01/2026 – 13/03/2026 (2nd batch)



Application Channel



澳門大學
UNIVERSIDADE DE MACAU
UNIVERSITY OF MACAU



協同創新研究院
Instituto de Inovação Colaborativa
Institute of Collaborative Innovation



認知與腦科學研究中心
Centro de Ciências Cognitivas e Cerebrais
Centre for Cognitive and Brain Sciences

MSCBS
2025



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