The Chinese University of Hong Kong
Department of Biomedical Engineering

Motion in Magnetic Resonance Imaging (MRI): From Microscopic to Macroscopic − Measure It, Fight It, and Race It!



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Date: **30 Oct 2026 (Friday)**
Time: **2:00 – 3:00 pm**
Venue: **Room 1122, William M.W. Mong Engineering Building, CUHK**

Abstract

Motion is central to magnetic resonance imaging (MRI) at multiple spatial and temporal scales. At the microscopic scale, the diffusion of water molecules provides information about tissue microstructure and enables quantitative diffusion biomarkers. At the physiological scale, respiratory, cardiac, and subject motion can cause artifacts, geometric distortion, signal loss, and poor repeatability. At the acquisition scale, multi-shot acquisitions and quantitative diffusion MRI require extended scan times, increasing susceptibility to motion and limiting clinical practicality. At the macroscopic scale, MRI-guided interventions and robotics require rapid, accurate motion tracking and feedback. This presentation examines how advanced MRI methods can measure, mitigate, and outpace motion. It will discuss high-fidelity, high-resolution diffusion MRI based on multi-shot echo-planar imaging; motion-robust techniques for free-breathing abdominal and liver imaging; accelerated reconstruction and diffusion-biomarker mapping using model-based and deep-learning approaches; and real-time MRI tracking for image-guided robotic applications. Examples spanning the brain, spinal cord, and liver will illustrate how technical developments can address clinically relevant imaging challenges. The presentation will conclude by outlining an integrated direction combining advanced acquisition, motion correction, efficient reconstruction, artificial intelligence, and multidisciplinary collaboration to improve the resolution, reliability, efficiency, and clinical utility of MRI.

Biography

Dr. Charles Hing-Chiu Chang is an Assistant Professor in Biomedical Engineering at The Chinese University of Hong Kong (CUHK), a biomedical engineer, and an MRI researcher with more than 20 years of experience in MRI technology development, clinical applications, and academic research. During his six-year tenure as a Research and Applications Specialist at GE Healthcare Taiwan, he completed his PhD in Biomedical Electronics while working closely with hospitals and radiologists. He subsequently undertook postdoctoral research at Duke University Medical Center and held an academic appointment at The University of Hong Kong before joining CUHK in 2021. His research focuses on high-fidelity, high-resolution diffusion MRI, MRI acquisition and reconstruction, motion-robust imaging, quantitative diffusion biomarkers, abdominal MRI, and MRI-guided interventions and robotics. He co-developed 2D MUSE, a high-resolution multi-shot diffusion-imaging technique, and has continued to advance diffusion MRI, motion correction, accelerated reconstruction, and artificial intelligence for medical imaging. His work bridges engineering innovation and clinical needs, with applications in the brain, spinal cord, liver, and image-guided intervention. He has published 78 peer-reviewed journal articles and contributed to 140 peer-reviewed conference abstracts. At CUHK, he contributes to multidisciplinary research as a Principal Investigator at the Multi-scale Medical Robotics Center and has co-developed courses in medical robotics and medical imaging. His teaching and supervision integrate engineering principles with clinical needs, hands-on learning, and research training.

**** ALL ARE WELCOME ****

For enquiries, please contact Miss Violet Wong (BME) at 3943-8261.