Speaker: Er-Xuan Jian (National Taiwan University)

Title: Toward Reliable Hybrid Quantum-Classical Biomedical AI: Programming and Verification Challenges from an Engineering Perspective

Abstract: Biomedical AI systems increasingly integrate complex learning models, hardware acceleration, and heterogeneous software components, making computational efficiency and software reliability important concerns in practical deployment. My previous work has focused on FPGA-accelerated medical imaging, edge computing, and multimodal biomedical AI. These experiences have motivated me to explore how emerging quantum-computing paradigms may extend the design space of future biomedical computing systems.

This talk presents a preliminary research direction at the intersection of hybrid quantum-classical computing, quantum programming, and biomedical AI. I will first discuss engineering challenges encountered when translating AI algorithms into deployable systems, particularly computation, abstraction, and reliability. I will then connect these challenges to the quantum software stack and discuss how classical preprocessing, quantum circuits, measurements, and classical decision logic form a heterogeneous computational pipeline.

Building on recent developments in quantum program semantics and verification, I will outline several research questions concerning correctness specifications, abstraction boundaries, and verification of hybrid quantum-classical workflows. Rather than assuming a general quantum advantage for biomedical AI, the aim is to identify where quantum programming techniques may provide meaningful computational models and how such systems could be designed and evaluated reliably. The talk concludes with open problems and possible directions for future interdisciplinary research.