Scalable Quantum Control Electronics Platform with ML capability

Abstract:

This talk will introduce SQCARS—a scalable and modular quantum control electronics platform designed for superconducting qubits. SQCARS offers a user-agnostic interface, with an intelligent compiler that autonomously sequences quantum operations and maps them efficiently to the underlying hardware. The platform enables real-time closed-loop feedback, making it ideal for advanced applications such as active error correction—a capability not achievable with conventional off-the-shelf measurement units. We have also integrated machine learning-based IPs to enhance qubit readout and optimize control pulses. These innovations have resulted in a significant reduction in cost and a significantly reduced hardware footprint, marking a major step forward toward practical, scalable quantum computing.