Proposals to Solve Industrial Machine Learning Problems by Near-Term Quantum Devices

October 9, 10:10am-12:00am

ED 824

主講人

Min-Hsiu Hsieh

ARC Future Fellow and
Associate Professor,
School of Software
Faculty of Engineering and Information Technology
University of Technology Sydney

Abstract:

The rapid progress in fabricating noisy intermediate scale quantum

(NISQ) devices motivates a fundamental question: Could such quantum devices be employed to solve practical problems with quantum supremacy?

In this paper, we answered this question in the affirmative. We propose two benchmark quantum learning schemes: Quantum divide-and-conquer generative adversarial learning (Q-DCA-GAN) and Quantum ensemble learning (QEL). Q-DCA-GAN and QEL aim to tackle industrial generative learning and discriminative learning tasks with quantum advantages, where both of them are easily implemented on NISQ devices. A common feature of the proposed schemes is employing the multiple layer parameterized quantum circuits (MPQCs) as the learning model. We first prove that the expressive power of MPQCs outperforms classical neural networks, characterized by the entanglement entropy and the computational complexity. Via introducing Bayesian learning into MPQCs, we further propose the Bayesian quantum circuit (BQC) learning model that can either be employed as a generative model or a class prior estimator.

主辦單位

MOST 科技部 Ministry of Science and Technology

國立交通大學電信工程研究所