Financial Risk Analysis using Quantum Computing

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Abstract

With the emergence of quantum technology, new paradigms for computation, communication and simulation have been developed in recent years. On the hardware side, new engineering acheivements in producing quantum chips, brought us to a new era of noisy intermediate scale (NISQ) quantum computing. Consequently, industrial and research community have been focused on exploring new applications for NISQ devices. Among those application is machine learning. In particular a variational quantum circuits (VQC), extracts necessary parameters from classical machine learning on the (classical) outputs produced by quantum measurements. In this talk first we review basic concepts of quantum computing, quantum circuits and VQC. Then we report on our latest studies on using quantum machine learning on the problem of risk analysis. In particular we review recent works on financial predictions using VQC. Then we explain our idea of replacing VQC with a GAN style machine learning (quantum GAN) for loading classical data in a quantum state, prior to incorporation of a quantum algorithm for prediction of financial risks. Our technique has some advatages compare to classical means of risk predictions such as Monte Carlo simulation, in terms of speed and scalability.

Biography

Ebrahim Ardeshir-Larijani is a research scientist within Quantum information group of Pasargad Institute for Advanced Innovative Solutions (PIAIS), Bank Passargad. Prior to that, he was a senior postdoc at IPM school of Computer Science. He received a PhD in computer science from University of Warwick. His research area includes Quantum computing, formal methods, Programming semantics.

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