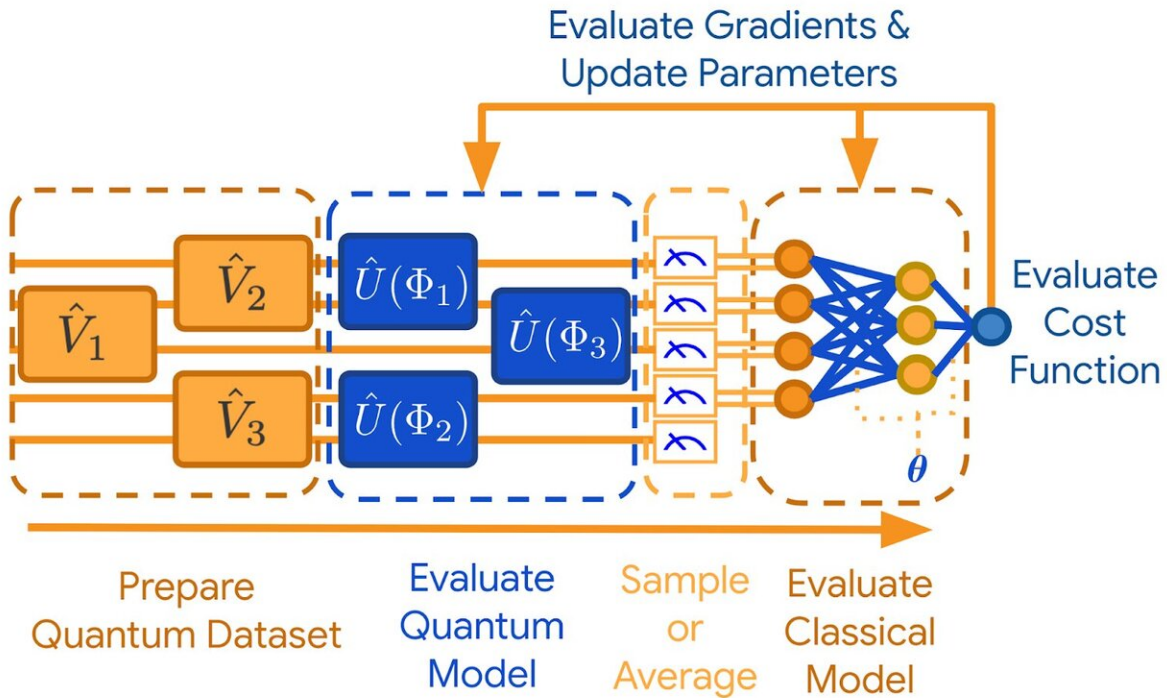# Google releases quantum computing library

March 11 2020, by Peter Grad

A high-level abstract overview of the computational steps involved in the end-to-end pipeline for inference and training of a hybrid quantum-classical discriminative model for quantum data in TFQ. Credit: Google

Google announced Monday that it is making available an open-source library for quantum machine-learning applications.

TensorFlow Quantum, a free library of applications, is an add-on to the widely-used TensorFlow toolkit, which has helped to bring the world of

machine learning to developers across the globe.

"We hope this framework provides the necessary tools for the [quantum computing](#) and machine learning research communities to explore models of both natural and artificial quantum systems, and ultimately discover new quantum algorithms which could potentially yield a quantum advantage," a report posted by members of Google's X unit on the AI Blog states.

They note that advances in recent years in quantum computing "could have a profound impact on the world's biggest problems, leading to breakthroughs in the areas of medicine, materials, sensing and communications."

Improvements derived through quantum research have been seen in cancer detection, earthquake forecasting, extreme weather predictions and discoveries of new exoplanets.

But there has been a lack of analytical tools that can help developers fully utilize the enormous inroads quantum analysis can provide when dealing with massive volumes of data. Google researchers' TensorFlow Quantum is a major step towards broadening the reach of quantum computing to research communities.

The project was undertaken by the Google AI Quantum team in conjunction with students of the University of Waterloo, Alphabet's X and Volkswagen.

Google is not alone in undertaking a major new project in quantum computing. Microsoft recently launched its Azure Quantum project, and Xanadu in Toronto recently introduced a platform similar to TensorFlow called Pennylane. And Honeywell has also recently announced that it is developing a new quantum computing system.

But much attention will be focused on Google's TensorFlow project because of the company's popularity among massive numbers of developer communities and its sound track record in the quantum field.

Quantum computing is increasingly being seen as a critical component for businesses seeking to grab the lead in an ever-increasingly high-tech and competitive business atmosphere. A study by Fujitsu last year found 70 percent of businesses want to apply quantum computing to their business models so they can more rapidly analyze data and develop solutions. Some 89 percent in the study said they believe inferior computing power is making them less competitive.

The TensorFlow Quantum announcement comes the same week as the annual meeting of machine learning enthusiasts at Google's headquarters in Mountain View, California. Instead of a live presentation, a printed report was distributed to members because of concerns over the coronavirus.

  More information: Announcing TensorFlow Quantum: An Open Source Library for Quantum Machine Learning, ai.googleblog.com/2020/03/anno … ow-quantum-open.html

TensorFlow Quantum: A Software Framework for Quantum Machine Learning, arXiv:2003.02989 [quant-ph] arxiv.org/abs/2003.02989

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