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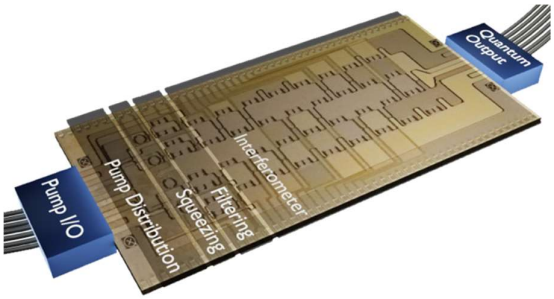
WACQT | Wallenberg Centre for Quantum Technology

Solving problems on a Continuous-Variable quantum computer on the cloud



Photonic Chip realizing a Continuous-Variable quantum computer on the cloud, courtesy of Xanadu

Background
Quantum computing is expected to outperform classical computational capabilities for solving certain problems, such as factoring integer numbers. However, this requires very large quantum processors, that are not available today. Many researchers are devoting effort in understanding whether some advantage could also be found in solving other types of problems, that would require less resources and could be addressed in near-future devices.

Along with the popular approach based on the use of quantum bits, or qubits, where the two basic quantum states |0> and |1> are encoded onto a 2-level system, another promising approach is emerging, where infinite quantum levels are instead used for information encoding. In this scenario, one typically uses quantised electrical radiation. Since the real and imaginary part of the electromagnetic field vary continuously, this approach is referred to as “Continuous-Variable” (CV). Like for qubits, a CV quantum computer on the cloud has just been released.

Problem description
The project consists in solving a problem of interest, that has to be determined within the project itself, on the CV cloud quantum computer. Problems that can be addressed by this architecture include graph analytics, classification, and simulation of molecular vibronic spectra. Since many real-world problems e.g. in logistics are naturally expressed in terms of graphs, several applications are possible. In order to establish the problem to solve, we will interact with collaborators within the Wallenberg Centre for Quantum Technology (WACQT), both academic researchers and WACQT industrial PhD students.

Workflow
We will first focus on understanding the theoretical background on Continuous-Variable quantum computation. Then, we will identify an interesting problem that can be solved on the CV quantum computing cloud. Finally, we will program the cloud quantum computer to solve the problem of interest.

Team size
3-6 students.

Literature
https://www.xanadu.ai
www.wacqt.se

Student background
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