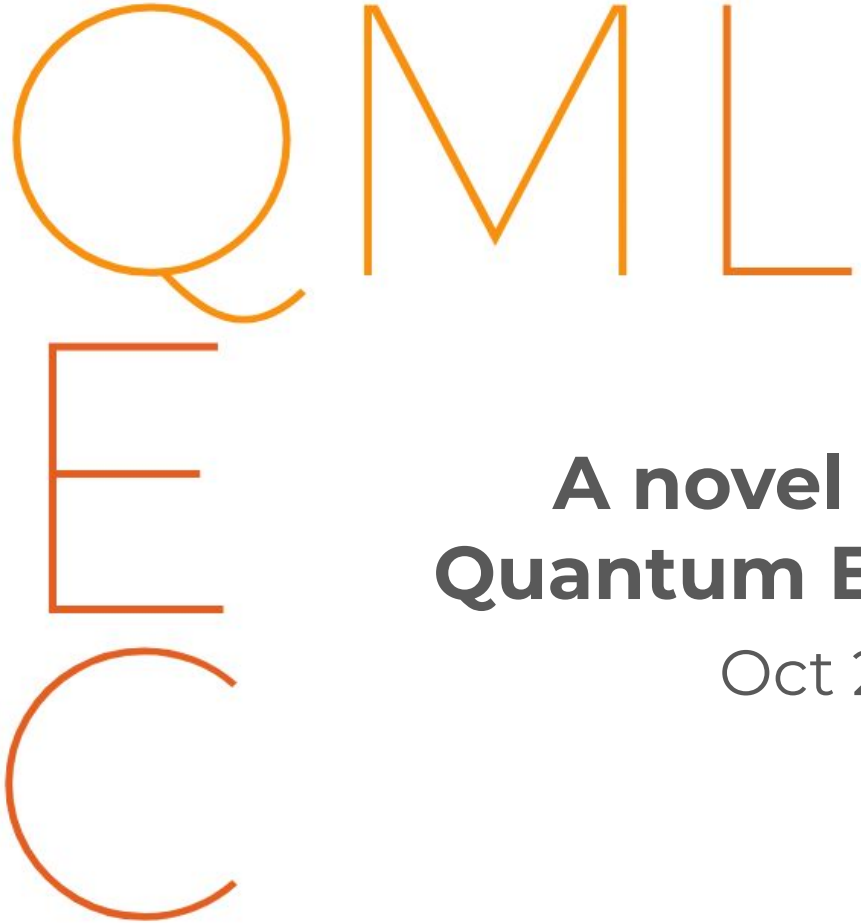

A novel approach to Quantum Error Correction

Oct 20th, 2019

Quantum Futures Hackathon - CERN

The Team

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QML
EC

The Problem: Quantum Error Correction

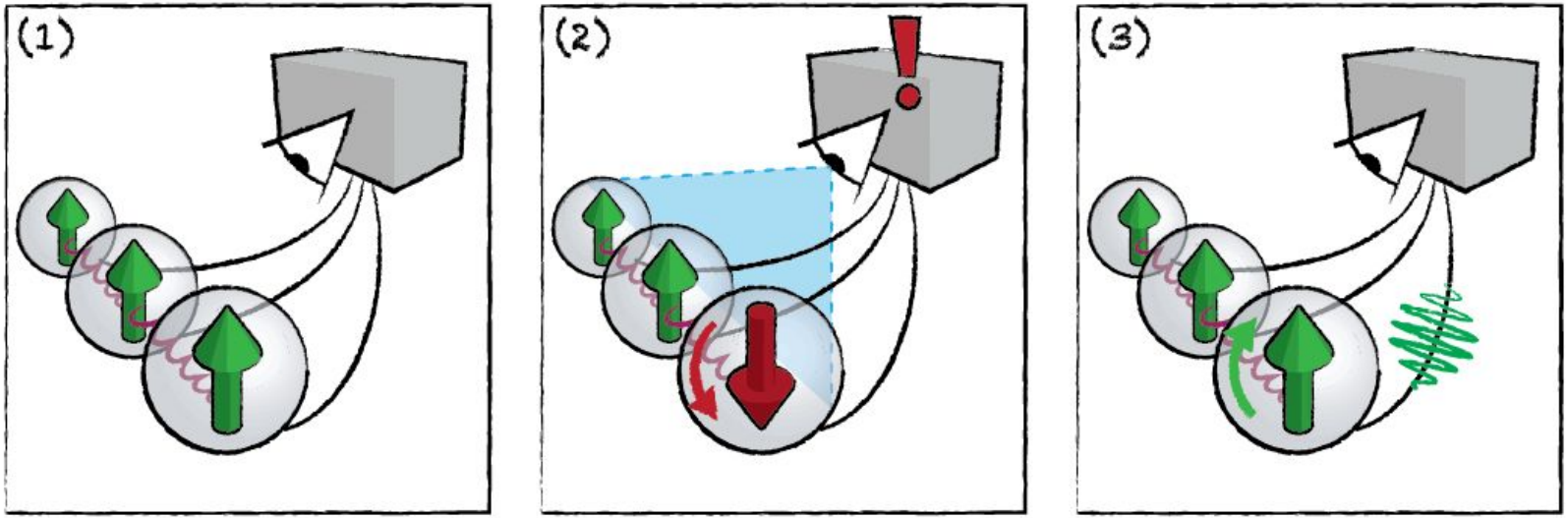

Image from Phys.org

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The Problem: Quantum Error Correction

- Future progress in quantum computing is **impossible**, without error correction

- Current quantum computers are too **unreliable** to use our state of the art error correction methods

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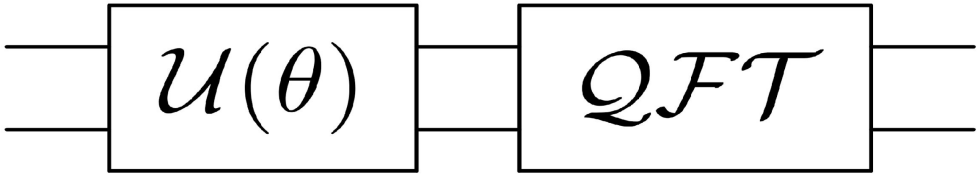
The Solution: VQEC

Variational Quantum Error Correction

We are looking for **optimal** parameters for a Unitary which reduces error of the following system.

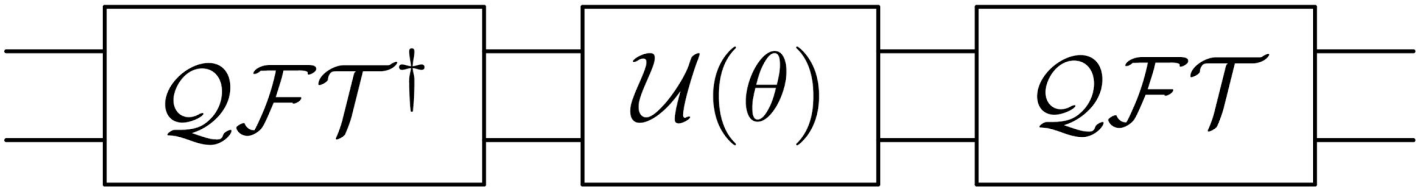


Denoising Unitary Quantum Subcircuit

$$\theta = [\theta_x, \theta_y, \theta_z]^T$$

By taking the **inverse** of the Quantum Subcircuit and applying a **noise model** from the hardware, we may find theta using stochastic optimization.

Noise Off Noise On Noise On



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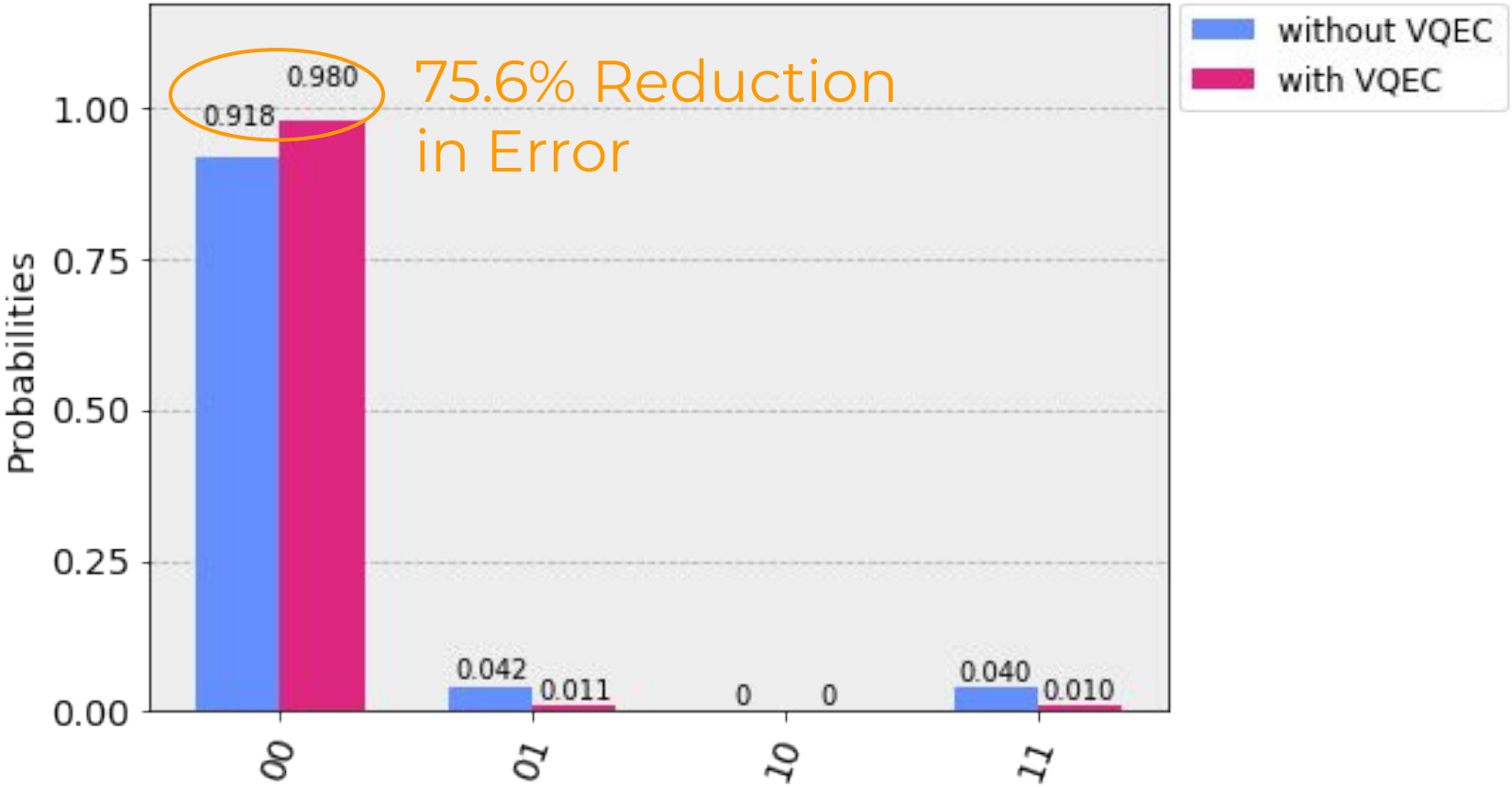
Working Prototype

Initialized with state |00> with random noise



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For more details check out our github,
https://github.com/bobovnii/QML-QEC

Feel free to ask questions after the presentations.

Thank you Hackathon organizers, CERN staff, speakers and participants!