

Title: Machine Learning Lecture - 230327

Speakers: Lauren Hayward

Collection: Machine Learning for Many-Body Physics (2022/2023)

Date: March 27, 2023 - 9:00 AM

URL: <https://pirsa.org/23030041>



Exploring Quantum Ethics

Presented by Joan Arrow & Sara Marsh

Instructions

Go to
www.menti.com

Enter the code
8607 4563



Or use QR code

Press **Esc** to exit full screen

Go to www.menti.com and use the code 8607 4563

What is the first thing that comes to mind when you hear the term "quantum ethics"?  Mentimeter

Results are hidden

Press **H** to show results



Go to www.menti.com and use the code 8607 4563

What is the first thing that comes to mind when you hear the term "quantum ethics"?  Mentimeter



Go to www.menti.com and use the code 8607 4563

What is the first thing that comes to mind when you hear the term "quantum ethics"?  Mentimeter



What is Quantum Ethics?

What is Quantum Ethics?

Definition: Quantum Ethics is the field of study concerned with the social, economic, and political implications of quantum technology - where we focus on ensuring quantum tech is used for the **greatest and most equitable public good**.

In order to understand the impact of quantum tech on the public good, it is necessary to understand the **credible applications of quantum technology**.

What is Quantum Ethics?

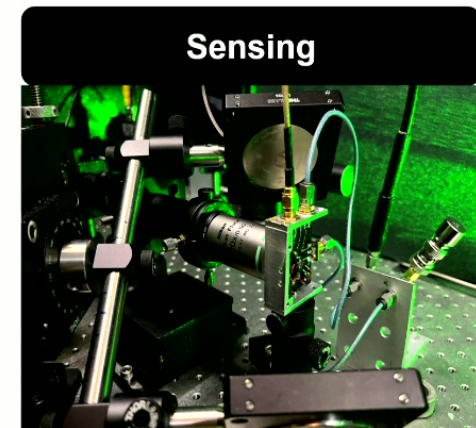
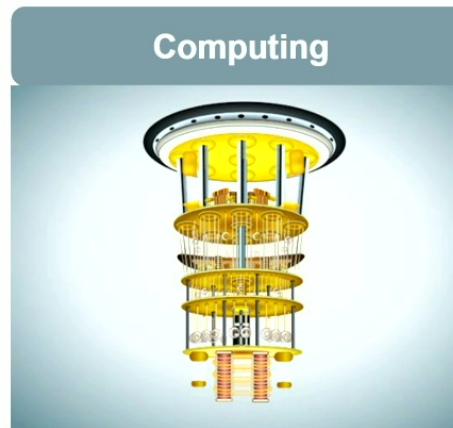
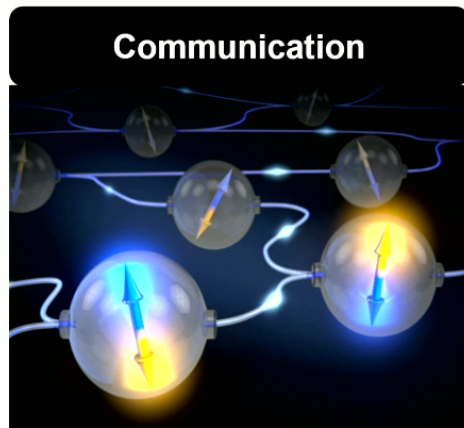
Definition: Quantum Ethics is the field of study concerned with the social, economic, and political implications of quantum technology - where we focus on ensuring quantum tech is used for the **greatest and most equitable public good**.

In order to understand the impact of quantum tech on the public good, it is necessary to understand the **credible applications of quantum technology**.

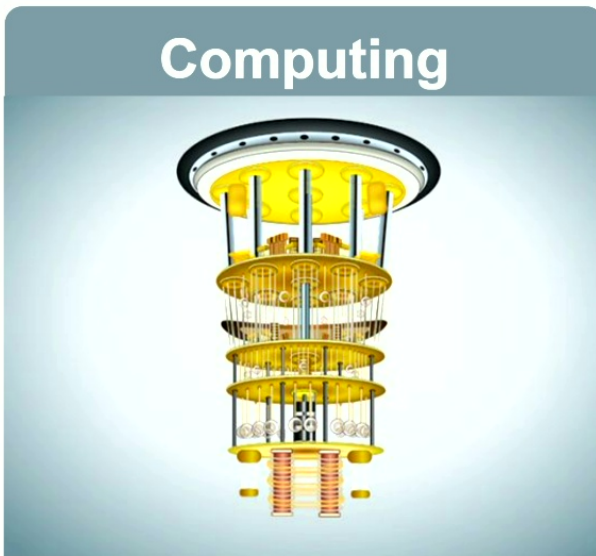
"This is the moment when hype gives way to clarity." - Matthias Troyer

The 3 Pillars of Quantum Technology

The quantum technology industry can be broken down into three primary categories:



Impact Spotlight



Machine Learning & AI

Breaking Encryption

Drug Discovery

Finance

Chemistry

Logistics

Quantum Computing: Where are we now?

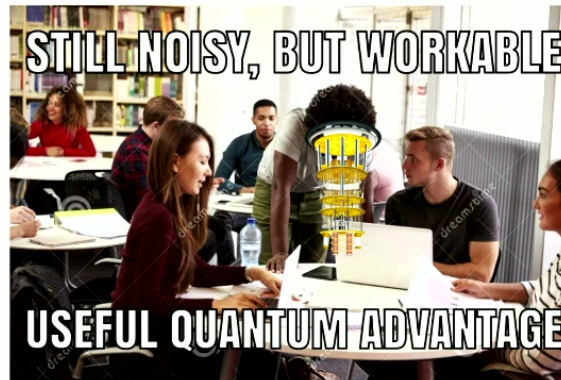
Today

Small devices simulatable
on classical hardware



Soon (5-15 yrs)

Noisy, Intermediate Scale
Quantum (NISQ) Devices

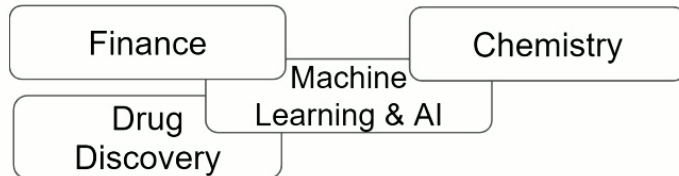


Someday (≥ 30 yrs)

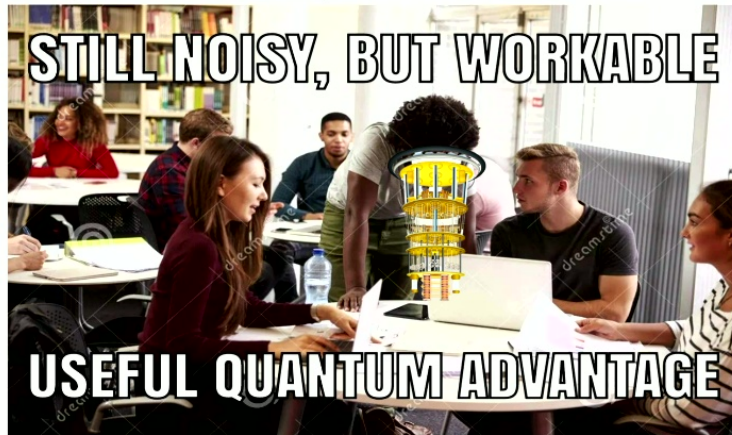
Fault tolerant Devices



Soon



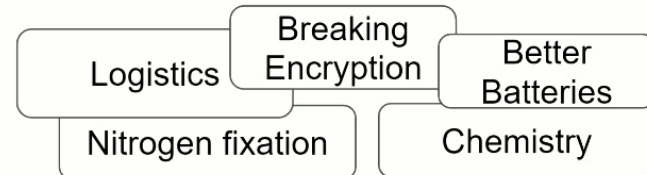
STILL NOISY, BUT WORKABLE



USEFUL QUANTUM ADVANTAGE

Noisy, Intermediate Scale
Quantum (NISQ) Devices

Someday



ERROR CORRECTED AT LAST

Fault-tolerant Devices



Center for
Quantum Networks
NSF Engineering Research Center



Assessing the Societal Impact of Variational Quantum Algorithms



Joan Arrow (she/her)

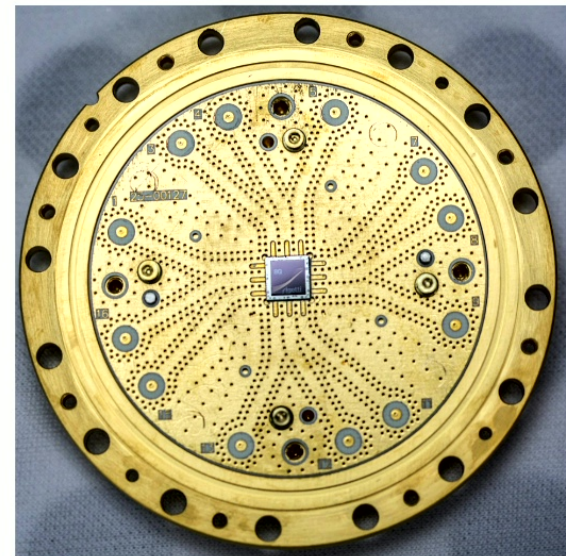
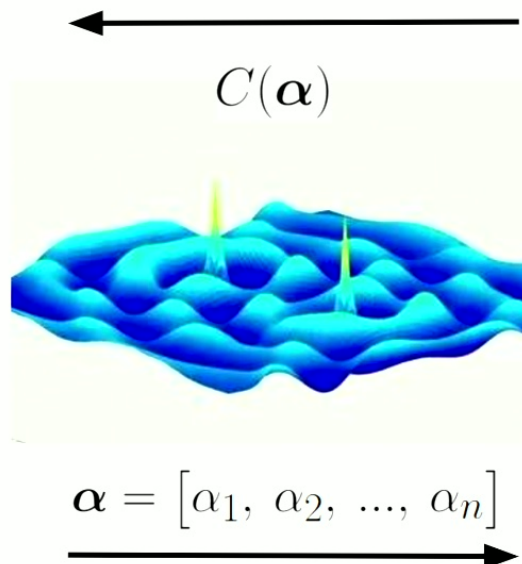
PhD Student, Co-Founder of the Quantum Ethics Project

University of Waterloo — coneelju@uwaterloo.ca

Funded by National Science Foundation Grant #1941583



Variational Quantum Algorithms



Variational Quantum Algorithms

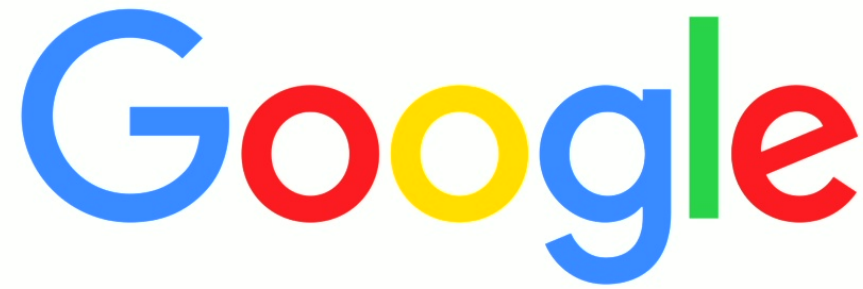
Applications (60+)

- Quantum Chemistry (Variational Quantum Eigensolver)
- Portfolio Optimization (Quantum Approximate Optimization Algorithm)
- Condensed matter physics (Variational Quantum State Diagonalization)
- ⋮

Noisy, Intermediate Scale Quantum (NISQ) Devices



Noisy, Intermediate Scale Quantum (NISQ) Devices





Hedge Fund Industry
\$3.83T

**Corporations have a legally binding, fiduciary responsibility
to maximize investment return for shareholders**



Who are we building quantum
computers for?



Time to discuss some ethical dilemmas with our peers

Quantum Ethics in Action!