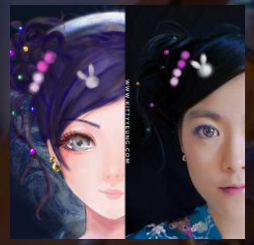
Introduction to Quantum Computing



Kitty Yeung, Ph.D. in Applied Physics

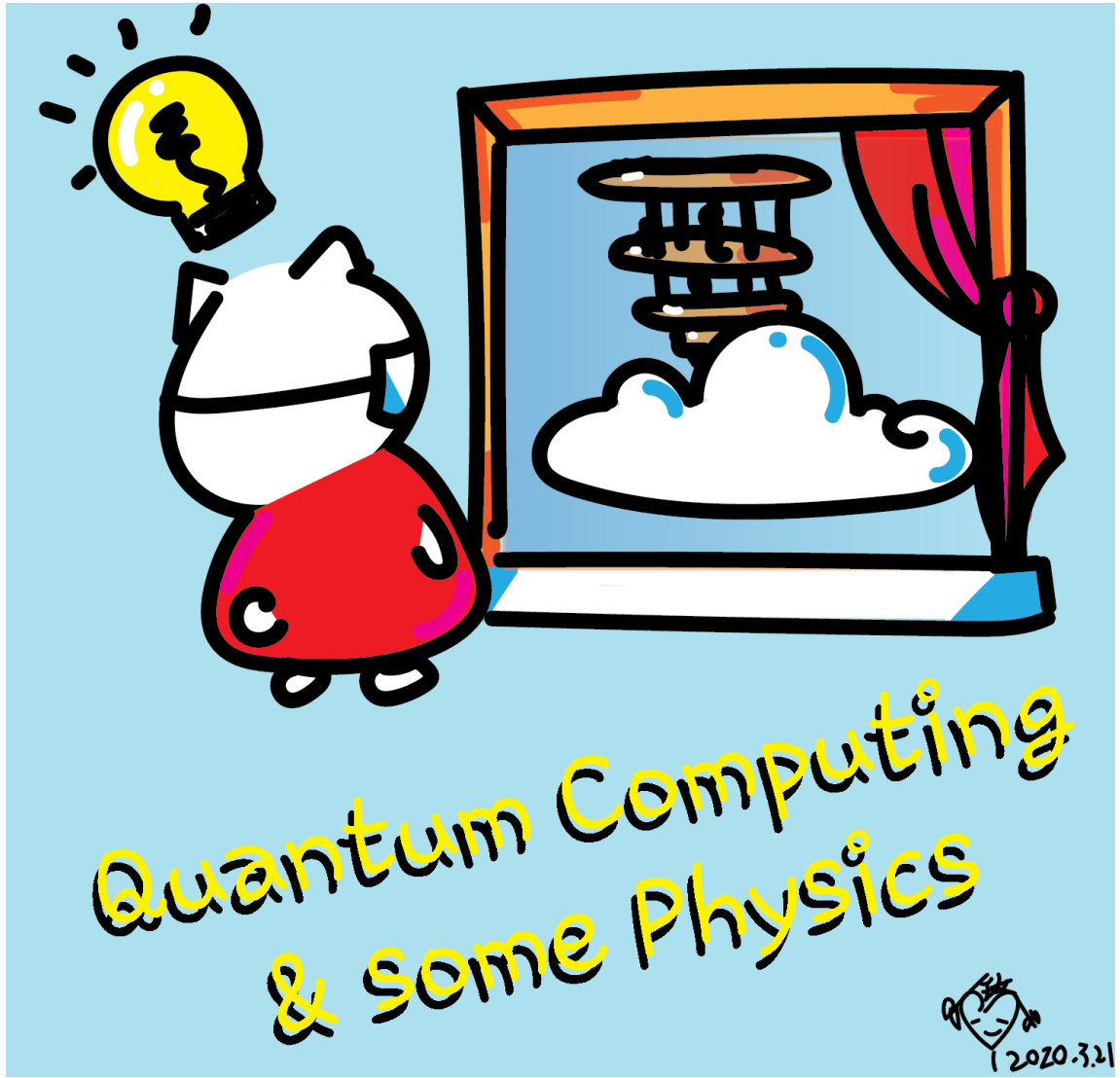
Creative Technologist + Sr. PM
Microsoft

www.artbyphysicistkittyyeung.com
@KittyArtPhysics
@artbyphysicistkittyyeung

Oct 11, 2020
Hackaday, session 23
Guest lecture 3

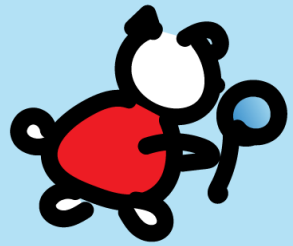
Class structure

- Comics on Hackaday – Quantum Computing through Comics every Sun
- 30 mins – 1 hour every Sun, one concept (theory, hardware, programming), Q&A
- Contribute to Q# documentation http://docs.microsoft.com/quantum
- Coding through Quantum Katas https://github.com/Microsoft/QuantumKatas/
- Discuss in Hackaday project comments throughout the week
- Take notes



September 13
Prof. Terrill Frantz
Quantum Cryptography

THE SUNDAY SPECIALS



~~September 20~~ October 18
Prof. Chris Ferrie
Quantum Tomography

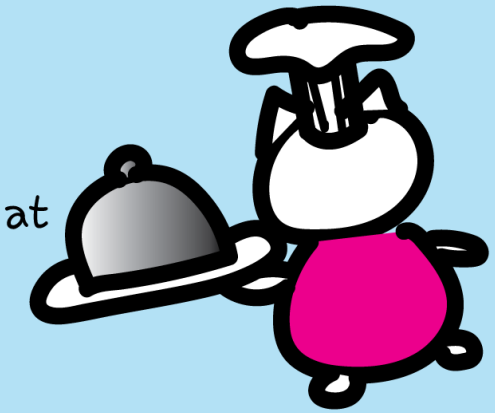
September 27
Rolf Huisman
Introducing the open source
Q# Community project qTRIL

November 2
~~October 18~~

Dr. Michael Beverland
Quantum Error Correction

October 11
Dr. Maria Schuld
Quantum Machine Learning

October 3
Kitty speaking at
Zen4Makers



Quantum Machine Learning

- Maria Schuld works as a senior researcher for the Toronto-based quantum computing start-up Xanadu, as well as for the Big Data and Informatics Flagship of the University of KwaZulu-Natal in Durban, South Africa, from which she received her PhD in theoretical physics in 2017. She co-authored the book "Supervised Learning with Quantum Computers" (Springer 2018) and is a lead developer of the PennyLane software framework for quantum differentiable programming. Besides her research on the intersection of quantum computing and machine learning, Maria has a postgraduate degree in political science, and a keen interest in the interplay between emerging technologies and society.
- This talk is a guided tour through the emerging research discipline of quantum machine learning, which investigates how quantum computers could be used for "intelligent" data analysis. A focus will be the strategy of optimizing the physical parameters of a quantum circuit in order to train it like a neural network. We will try to understand what the resulting models look like, how they can be integrated into modern machine learning pipelines, and what the most pressing open questions are.

Dr. Maria Schuld

Microsoft Quantum Documentation

Learn how to use the Microsoft Quantum Development Kit and Q#, a language for quantum programming. Learn key concepts and write your first quantum program. Explore the rich tools and libraries of the QDK.

Quantum computing

LEARN

Understanding quantum computing

Quantum computers and quantum simulators

What are Q# and the QDK?

Linear algebra for quantum computing

Microsoft Learn modules for quantum computing

CONCEPT

Quantum computing concepts

Start with the Quantum Development Kit

GET STARTED

The Quantum Development Kit

DOWNLOAD

Install the QDK

Update the QDK

Q# programming language

HOW-TO GUIDE

Q# user guide

Quantum simulators and host applications

TUTORIAL

Build a quantum random number generator

Explore entanglement with Q#

Quantum speedup: Grover's search algorithm

LEARN

Learn with the Quantum Katas

Browse Q# code samples

Community & contribution

HOW-TO GUIDE

Contribute to the QDK

Read the Microsoft Quantum blog

Q# libraries

REFERENCE

Standard libraries

Chemistry library

Machine learning library

Numerics library

aka.ms/learnqc

Microsoft | Docs Documentation Learn Q&A Code Samples

Search

Learn Products Roles Learn TV Certifications FAQ & Help

LEVEL 3 1500/3699 XP

Docs / Learn / Browse / Quantum computing foundations

3800 XP

Quantum computing foundations

4 hr 50 min • Learning Path • 4 Modules

Beginner Developer Quantum Development Kit Quantum

Intrigued by quantum computing but don't know where to start? This learning path helps prepare you for this exciting next generation of computing.

After completing this learning path, you'll be able to:

- Explain the fundamental concepts of quantum computing.
- Build basic quantum programs by using the Quantum Development Kit and Q#.
- Identify the kinds of problems quantum algorithms can solve more efficiently than classical algorithms.

Prerequisites

None

Bookmark Add to collection

Modules in this learning path

Questions

- Post in chat or on Hackaday project https://hackaday.io/project/168554-quantum-computing-through-comics
- FAQ: Past Recordings on Hackaday project or my YouTube https://www.youtube.com/c/DrKittyYeung

Guest lectures

- Oct 18, **Prof. Chris Ferrie**, University of Technology Sydney, **Quantum Tomography**
  Time change! 2pm PT

- No class on Oct 25