About Me........

1. Python Developer.
2. Working with Index-Data Project.
3. Keen interest in Open Source Contribtions (Specifically Scientific Data Analysis!)

What this Talk is About!

- How to run your **Python code** or **Finance-Model** on Quantum-computer, Without a Phd in Physics!
- What are possible ways to think about Quantum-Computing in terms of **Application-Development.**
- **I am not a Quantum-Computing Advocate but would love to be one some day.....**

About QML(Quantum Machine Learning!)

- Mix Classic Layers with Quantum Layers.
- Run 50% code in Classic Computer and rest either on **Quantum-Computer** Or **Quantum-Simulator.**
- Use the power of **Q-bits!**
- **Think in terms of Physics(May be.... VQE)**

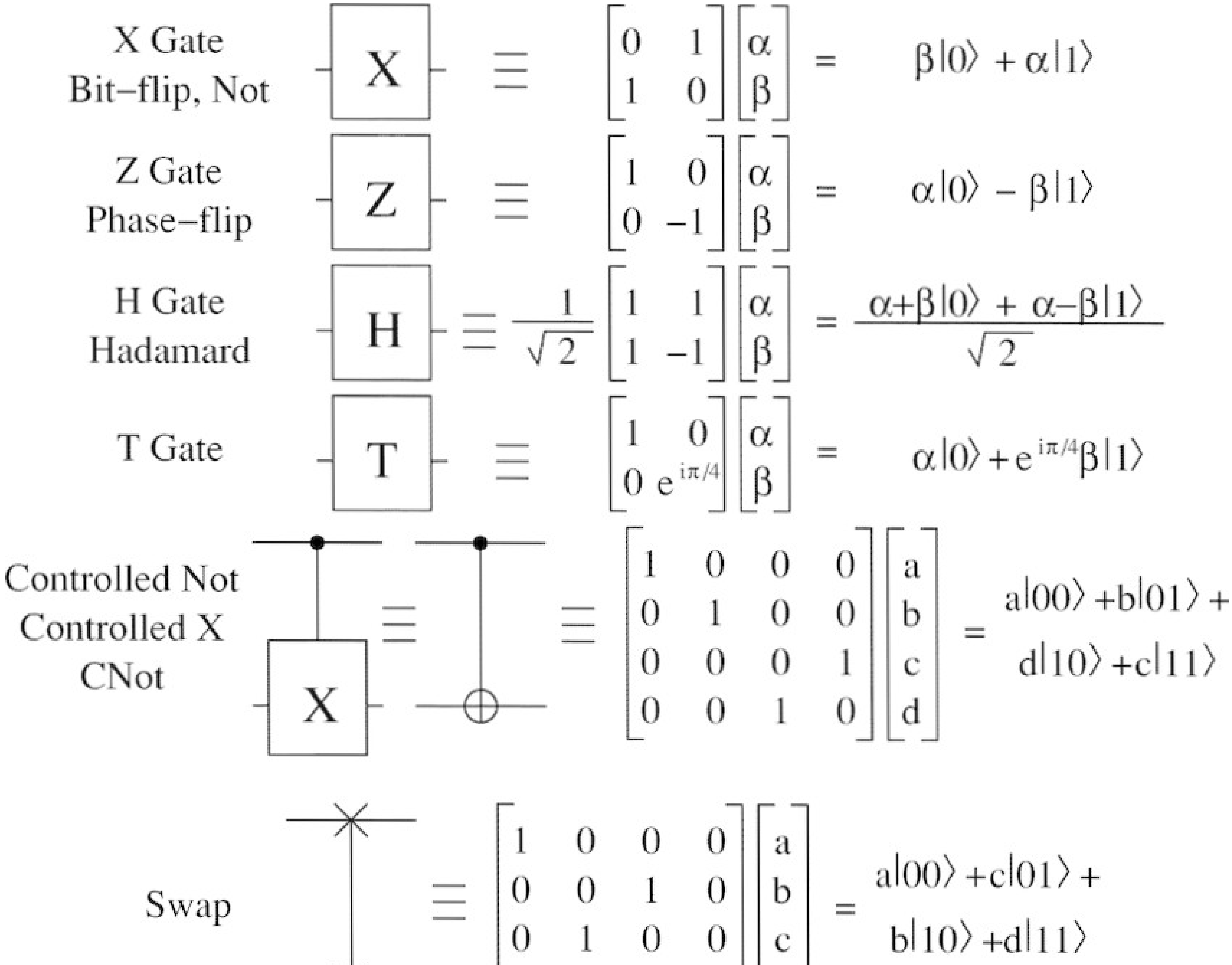
Basics Of Quantum-Computing/Physics

- **Super-Position principle:**

  A Qubit/Electron/Photon could be at two places at once.

- Position of Each Qubit is based on probability.
- **Classic-Bit is either 0 or 1**
- $|0\rangle=[10]$ # Defineatly 0
- $|1\rangle=[01]$ # Defineatly 1

We have Quantum Gates!

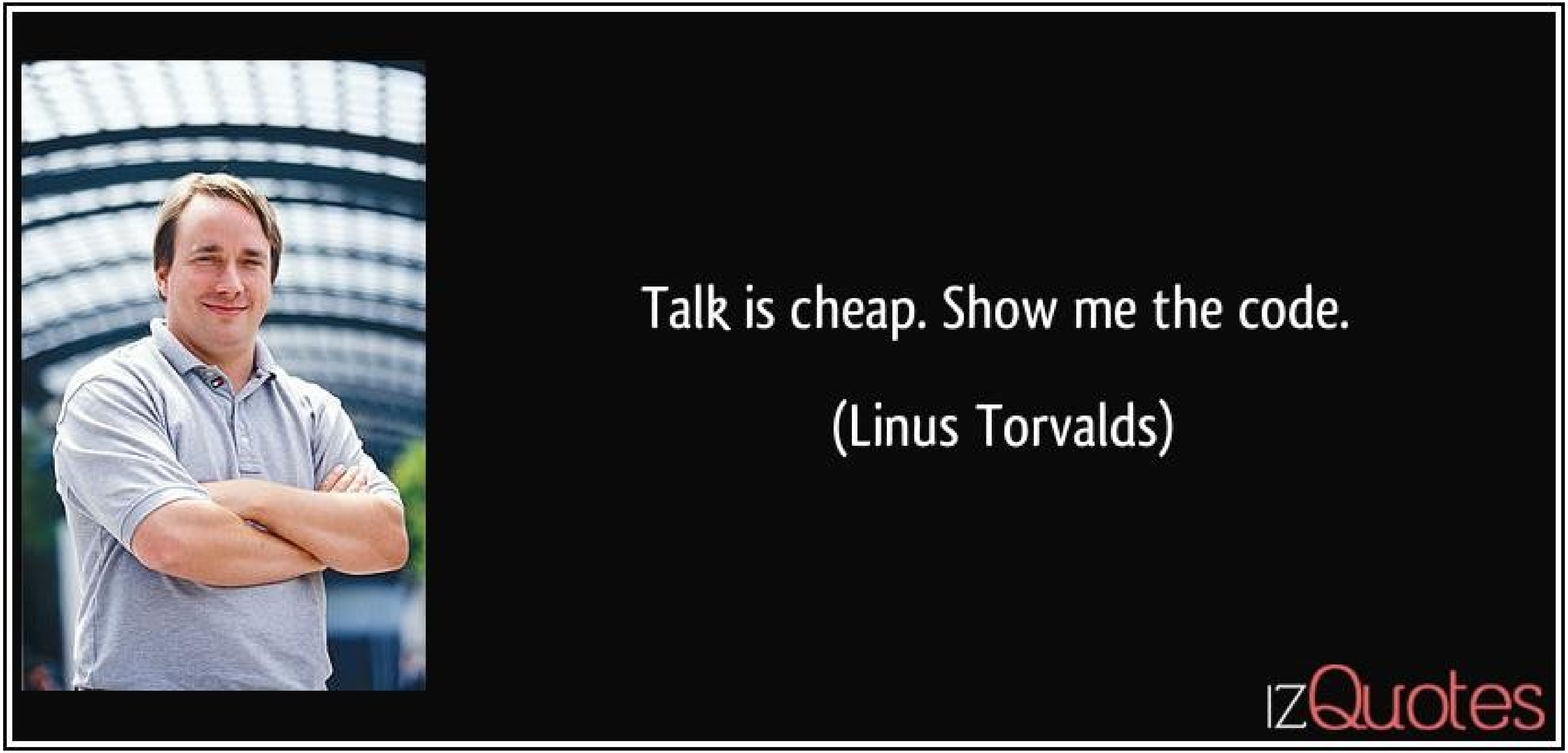


Quantum-Entanglemet

- Spooky Action at distance!
- When we get two or more than two Qubits Entangled, measuring the results of one Qubit will let us know the state of other.
- A two part Documentry (Mind Bending)

  https://www.youtube.com/watch?v=ISdBAf-ysI0

How to run things on Quantum Computer?



Set of Pythonic Libraries!

- Qiskit by IBM (https://qiskit.org/)
- Cirq by Google (https://quantumai.google/cirq)
- Amazon bracket
- And ....
- Pennylane! (My favorite one!)

Why Pennylane?

- Write **Single set of Python-Code** and Run it on each available Quantum-Computer/Simulator Which supports Pythonic-APIs.
- Supports Tensorflow, PyTorch, Numba, Jax as Quantum-Interfaces!
- Development is mostly targeted to Build Machine-learning Solutions!

Hello World Quantum-Computing!

```python
import pennylane as qml
from pennylane import numpy as np

# create a quantum device
dev1 = qml.device("default.qubit", wires=1)

@qml.qnode(dev1)
def circuit(phi1, phi2):
   # a quantum node
   qml.RX(phi1, wires=0)
   qml.RY(phi2, wires=0)
   return qml.expval(qml.PauliZ(0))

def cost(x, y):
   # classical processing
   return np.sin(np.abs(circuit(x, y))) - 1

# calculate the gradient
dcost = qml.grad(cost, argnum=[0, 1])
```

Different Quantum Computers Support!

- import pennylane a qml
- Dev1 = qml.device(**“cirq.qsim”**,wires=1, shots=100) # Runs on Google
- Dev2 = qml.device(**“qiskit.aer”**,wires=1, shots=100) # Runs on IBM
- Dev3 = qml.device(**“'microsoft.QuantumSimulator'”**,wires=1, shots=100) # Runs on Microsoft

QML in Action

- **Activity:**

  1. Create a Finance Model,

  2. Train it for T+100 Close-price Feature vector

  3. Get Results

  4. Add Quantum-layer and Re-Train!