Which Quantum Computing language to use for starting your own Quantum Journey

Since its inception in the 1980s, quantum computing has grown at an exponential rate. Until recently, being a researcher at a world-class facility was the only way to get access to a real Quantum Computer. However, now that Quantum Computers are available in the cloud, the process has gotten much easier. This has made it feasible for anybody to set out on their own Quantum adventure.
The job of a Quantum Software engineer is to create and build algorithms that use Quantum Hardware to address real-world problems. These algorithms are deconstructed into smaller quantum circuits, which are then easily implemented using Quantum Programming languages. While there are many packages for Quantum Computing to choose from, picking which one to start with might be difficult. This blog post will tell you of your options, allowing you to pick the ideal one for you. So that you can start experimenting with Quantum Circuits yourself.

Choosing a programming language

Software engineers work with a variety of programming languages- like C++, Python, Java, and Fortran. Python is, in my opinion, the most recommended one for Quantum Programming!

Why is python better than other programming languages ?

Python is a widely used programming language with a simple syntax and a large number of features. It is significantly easier to grasp, and Python code is frequently 3-6 times shorter than Java code and 5-10 times shorter than C++ code, resulting in significant time savings. It is also commonly used in machine learning, artificial intelligence, web development, and now Quantum Computing.
Python's popularity and widespread use have resulted in a plethora of educational resources. There are numerous tutorials and books available, as well as interactive websites that allow you to practise your skills.
All of the preceding reasons are good. But the best reason to start with Python is because there are many more Quantum Programming packages available than for any other programming language.

Different Quantum Programming Packages

Packages are the fundamental components of every programme. The import command in Python is used to incorporate features from various packages into a programme. Quantum Programming modules are used to create higher level circuits and algorithms without having to start from scratch.

QISKIT

Qiskit is one of the most developed packages and is provided by IBM. It is divided into four sections: Terra, Ignis, Aqua, and Aer. QISKIT Terra is the foundation that enables us to create

circuits, Aqua contains all of the Quantum algorithms, Ignis' primary function is to battle noise and error, and Aer provides simulators for testing our circuits and algorithms.
All circuits designed with QISKIT can be implemented on IBM Quantum Experience's real hardware.

Cirq

Cirq is a software library developed by Google for constructing, editing, and optimising Quantum Circuits. Cirq's principal goal has been to use NISQ-era technology to tackle real-world challenges.
In 2019, Google scientists used their own programming language and the Google Sycamore device to achieve Quantum Supremacy.
Algorithms designed by Cirq can be executed on Google's Quantum machines.

Q#

Q# is Microsoft’s package which enables you to develop Quantum algorithms for NISQ devices as well as future technology. . The development kit for Q# enables users to construct and implement various algorithms, as well as optimize Quantum Circuits using compute resources from Microsoft Azure.

Ocean

D-Wave provides us with Ocean software which is a suite of tools for solving problems using Quantum Computers. Ocean can be connected to the Leap platform provided by D-Wave for running jobs on real hardware as well as simulators.

PyQuil

PyQuil is a Python package provided by Rigetti Computing, a full stack quantum computing business. It creates, compiles, and executes algorithms and circuits using Quil (Quantum Instruction Language). PyQuil-created programmes can run on Quantum Virtual Machines or Quantum Cloud Services provided by Rigetti Computing.

…………………………………………………………………………………………………….

We just reviewed the top five software packages, but there are many others in the works that could take over in the next few years. I hope that this helps you to find the perfect Quantum Package for you.

Resources

1. https://www.python.org/doc/essays/comparisons/#:~:text=Python%20programs%20are%20generally%20expected,much%20less%20time%20to%20develop.&text=For%20these%20reasons%2C%20Python%20is,together%20make%20an%20excellent%20combination.
2. https://www.linkedin.com/pulse/programming-quantum-computing-what-language-should-you-marchenkova/
3. https://qiskit.org/documentation/stable/0.24/the_elements.html
4. https://quantumai.google/cirq
5. https://azure.microsoft.com/en-us/resources/development-kit/quantum-computing/
6. https://docs.ocean.dwavesys.com/en/stable/
7. https://github.com/rigetti/pyquil