







Introduction to Qiskit

Ana Díaz Muñoz



Who I am?







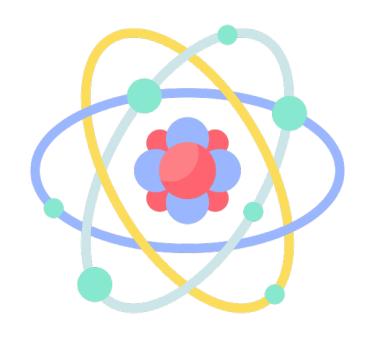
Ana Díaz Muñoz

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- 1. What is Qiskit?
- 2. Qiskit components
- 3. Qiskit gates
- 4. IBM Quantum Composer
- 5. It's your turn



What is Qiskit?

Definition



framework developed by IBM to

work with quantum computers.



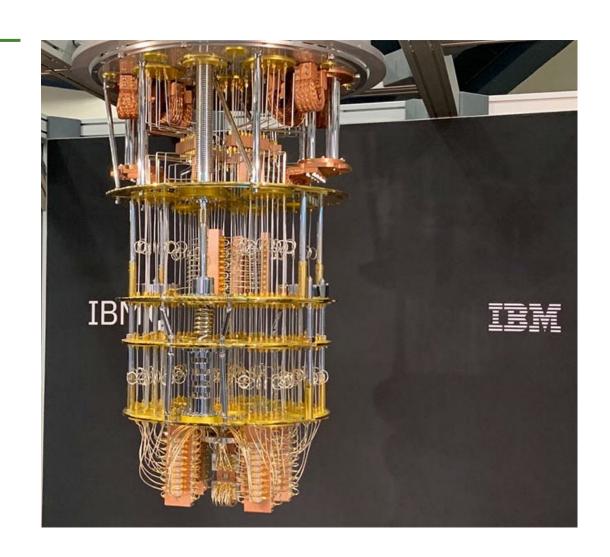




What is Qiskit?

Objective

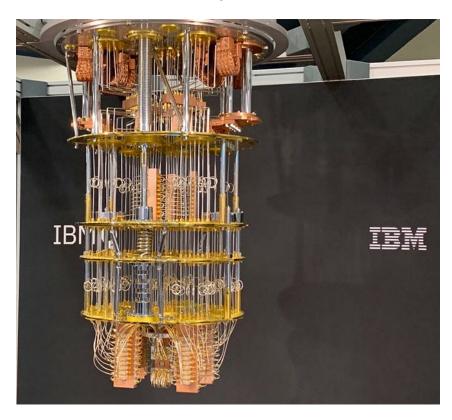
Facilitate the creation, simulation and execution of quantum algorithms on real hardware and simulators.





Quantum Computer

Thousand of qubits

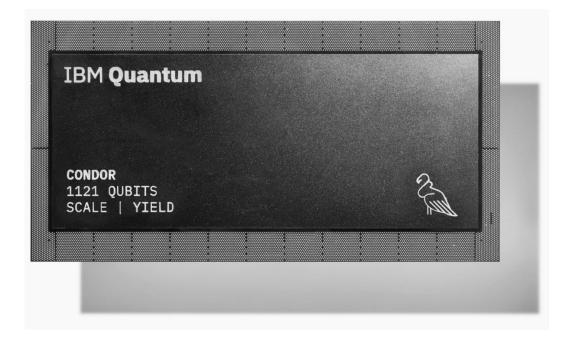


DECEMBER 5, 2023 3 MIN READ

IBM Releases First-Ever 1,000-Qubit Quantum Chip

The company announces its latest huge chip—but will now focus on developing smaller chips with a fresh approach to "error correction"

BY DAVIDE CASTELVECCHI & NATURE MAGAZINE





Quantum Computer

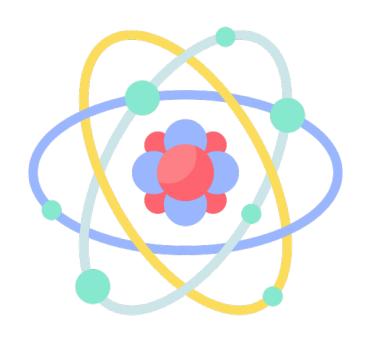
Real size







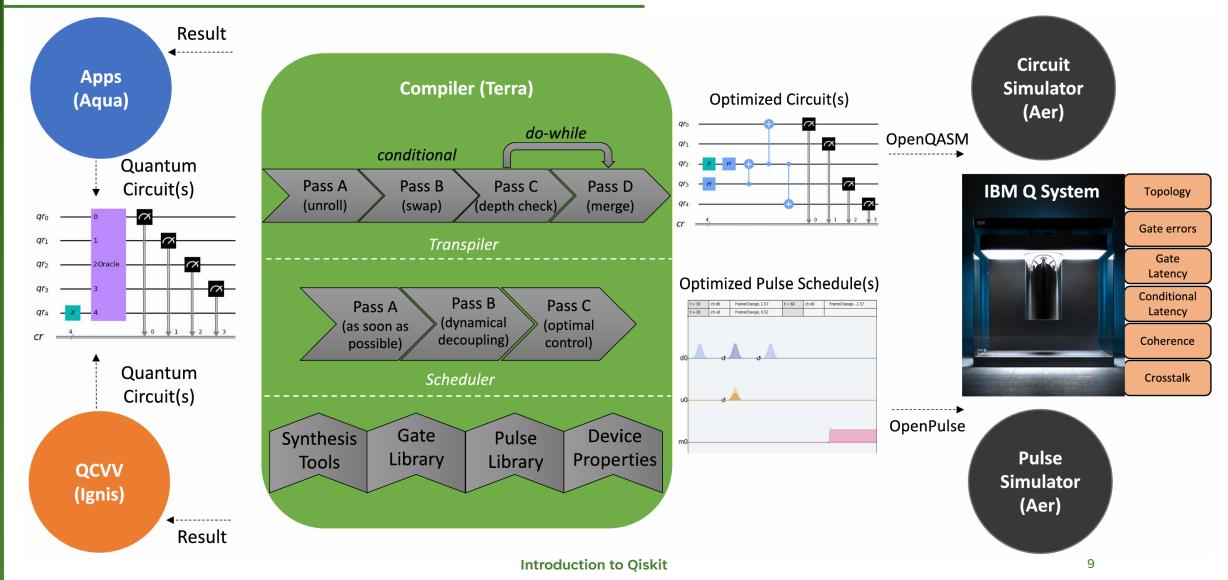




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Qiskit components





Qiskit Ignis

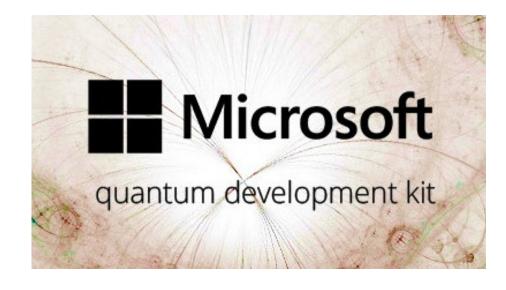
Challenging quantum noise



IBM Quantum



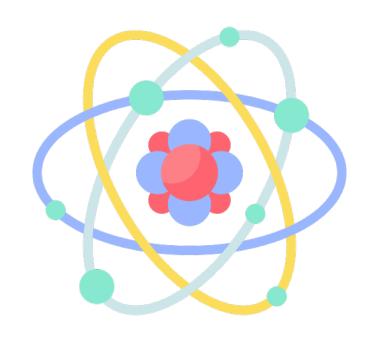












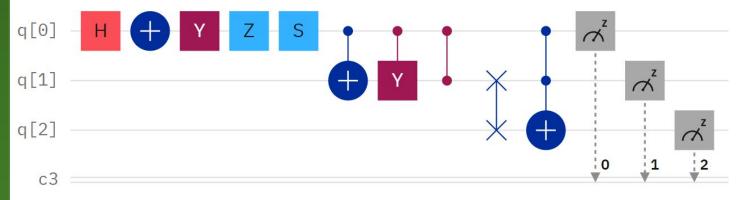
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Qiskit gates

Quantum circuit



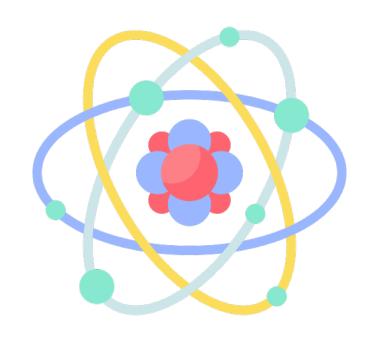
Quantum algorithm

```
1 from qiskit import QuantumRegister,
   ClassicalRegister, QuantumCircuit
 2 from numpy import pi
 4 greg g = QuantumRegister(3, 'g')
 5 creg c = ClassicalRegister(3, 'c')
 6 circuit = QuantumCircuit(qreg_q, creg_c)
 8 circuit.h(qreg_q[0])
 9 circuit.x(qreg q[0])
10 circuit.y(qreg_q[0])
11 circuit.z(qreg_q[0])
12 circuit.s(qreg_q[0])
13 circuit.cx(qreg_q[0], qreg_q[1])
14 circuit.cy(qreg_q[0], qreg_q[1])
15 circuit.cz(qreg_q[0], qreg_q[1])
16 circuit.swap(qreg_q[1], qreg_q[2])
17 circuit.ccx(qreg_q[0], qreg_q[1], qreg_q[2])
18 circuit.measure(greg g[0], creg c[0])
19 circuit.measure(qreg_q[1], creg_c[1])
20 circuit.measure(qreg_q[2], creg_c[2])
```





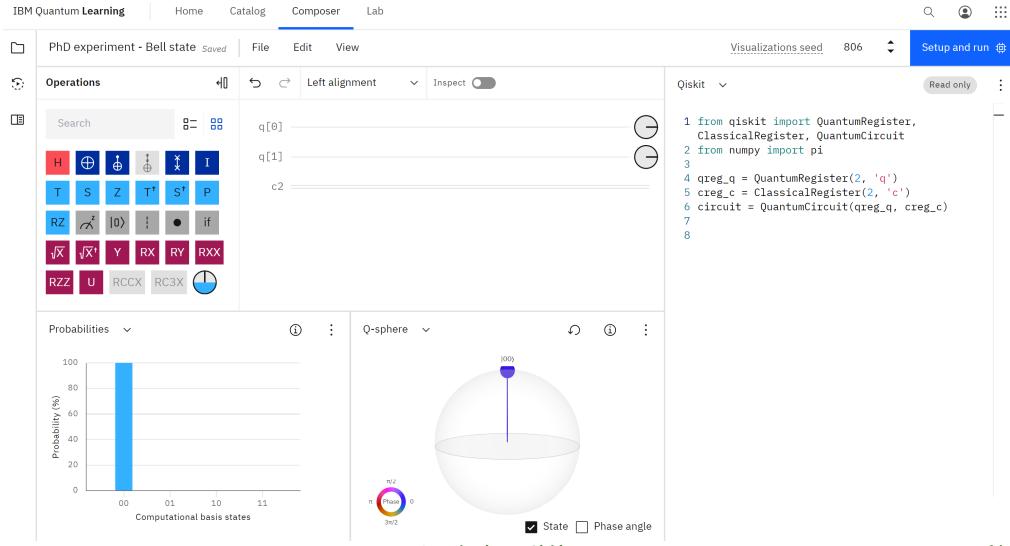




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IBM Quantum Composer





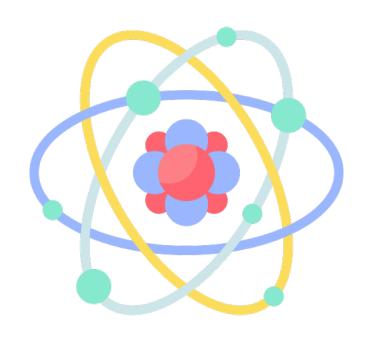
IBM Quantum Composer

https://quantum.ibm.com/composer/









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It's your turn

https://algassert.com/quirk#

```
1 from qiskit import QuantumRegister, ClassicalRegister, QuantumCircuit
   from numpy import pi
 3
   qreg q = QuantumRegister(2, 'q')
  creg_c = ClassicalRegister(2, 'c')
   circuit = QuantumCircuit(greg g, creg c)
  circuit.h(greg g[1])
   circuit.swap(qreg_q[0], qreg_q[1])
10 circuit.s(qreg_q[0])
   circuit.cz(qreg_q[0], qreg_q[1])
12 circuit.measure(qreg_q[0], creg_c[0])
   circuit.measure(qreg_q[1], creg_c[1])
```

.h(target)



.x(target)



.y(target)



.z(target)



.s(target)



.swap(target, target)



.rx(control, target)



· .ry(control, target)



.rz(control, target)



· .ch(control, target)



.cx(control, target)



.cy(control, target)



.cz(control, target)



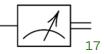
.cs(control, target)



• .ccx(control, control, target)



· .measure(target qubit, target bit)









Bell state

https://forms.gle/jBGmktXhktXDUQfY6









Thank you for your attention



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Check your email