



## Written documentation


 IBM Quantum


# What is quantum computing?

Quantum computers could spur the development of new breakthroughs in science, medications to save lives, machine learning methods to diagnose illnesses sooner, materials to make more efficient devices and structures, financial strategies to live well in retirement, and algorithms to quickly direct resources such as ambulances.

But what exactly is quantum computing, and what does it take to achieve these quantum breakthroughs? Here's what you need to know.



 IBM Quantum

Launch IBM Quantum Experience 

Learn more about quantum computing fundamentals

01 Quantum properties 

02 Quantum computation 

03 Scaling quantum systems 

## Code documentation

```
import numpy as np
from qiskit import(
    QuantumCircuit,
    execute,
    Aer)
from qiskit.visualization import plot_histogram

# Use Aer's qasm_simulator
simulator = Aer.get_backend('qasm_simulator')

# Create a Quantum Circuit acting on the q register
circuit = QuantumCircuit(2, 2)

# Add a H gate on qubit 0
circuit.h(0)

# Add a CX (CNOT) gate on control qubit 0 and target qubit 1
circuit.cx(0, 1)

# Map the quantum measurement to the classical bits
circuit.measure([0,1], [0,1])

# Execute the circuit on the qasm simulator
job = execute(circuit, simulator, shots=1000)

# Grab results from the job
result = job.result()

# Returns counts
counts = result.get_counts(circuit)
print("\nTotal count for 00 and 11 are:",counts)


# Draw the circuit
circuit.draw()
```

```
import numpy as np
from qiskit import(
    QuantumCircuit,
    execute,
    Aer)
from qiskit.visualization import plot_histogram
```



In more detail, the imports are

- `QuantumCircuit`: can be thought as the instructions of the quantum system. It holds all your quantum operations.
- `execute`: runs your circuit / experiment.
- `Aer`: handles simulator backends.
- `plot_histogram`: creates histograms.

## Community documentation



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
 

IBM Research Blog Topics Labs About


Quantum Computing

### Quantum Computers Flip the Script on Spin Chemistry

Recent research by IBM and University of Notre Dame serves as a new use case for quantum computing, showing that qubit noise, typically an impediment to quantum computer use, can actually be an advantage over a classical computer for chemical simulations.

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
### Rising above the noise: quantum-limited amplifiers empower the readout of IBM Quantum systems

A key pillar for deploying IBM Quantum systems into the cloud is the ability to read out their quantum states with high fidelity in real time. This critical capability is made possible using special kinds of low-noise microwave amplifiers, known as quantum-limited amplifiers.

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### Quantum Takes Flight: Moving from Laboratory Demonstrations to Building Systems

Last year we at IBM declared that in order to achieve quantum advantage within the next decade, we will need to at least double the Quantum Volume of our quantum computing systems every year. What better way to start this first full week of 2020 than by announcing that we have added our fourth data point to our progress road map and achieved a system demonstrating Quantum Volume of 32.

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### IBM and Daimler use quantum computer to

National Accelerator Laboratory, has joined the IBM Q Network. As a member organization, Q-FARM will collaborate with IBM to accelerate joint research in quantum computing and develop curricula to help prepare students for careers that will be influenced by this next era of computing across science and business.

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## Qiskit – Write once, target multiple architectures

Qiskit has the flexibility to target different underlying quantum

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## IBM and Wells Fargo Collaborate to Accelerate Innovation

IBM Research is embarking on a multi-year, collaborative effort with Wells Fargo focused on research and learning that is intended to enhance the company's artificial intelligence and quantum computing capabilities. Together with IBM Research, Wells Fargo plans to accelerate its learnings to inform innovation initiatives that reimagine the future of financial services in a way that is designed to deliver customer experiences that are simple, fast, safe and convenient.

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## IBM and the Unitary Fund Unite for Open Source Projects for Quantum Computing

We are pleased to announce our support to grow the community of quantum enthusiasts and explorers, by partnering with the Unitary Fund to provide funding for grants and priority access to certain IBM Q systems.

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