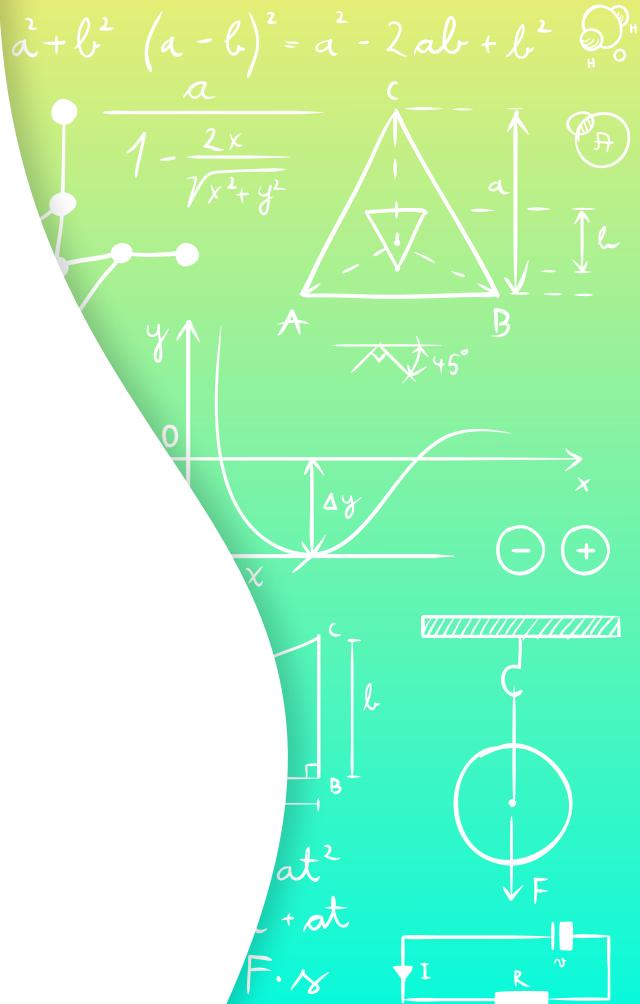


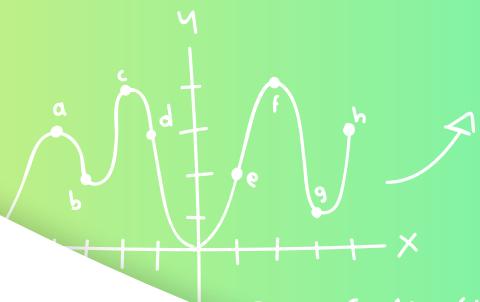
Quantum Computing and Demo of Qiskit

Christian Zaprianov



01

What is quantum computing?



$$\begin{aligned} e &= f^2(x+4gh)^2(s) \cdot (x)^3 \div (gh)^2 - x^2 \\ f &= gh^2 + (s)(x+2h)^3 \times 4x^2(h)e^3 + x^2 - 2x^2 \\ g &= x^2 \div (x)(2x)^2 + (hfe)^2 4x^3(3h) \\ h &= ef^2 - (x)^2 + (3)^2(f)^3 + x(4x) \end{aligned}$$

$$a = x(s^1) + (h)(c) + (d)(ef)^2 = x^2$$

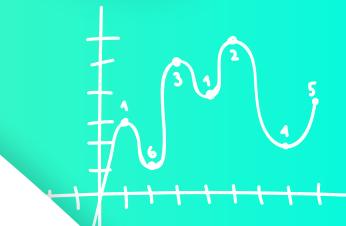
$$(h)(d) \div (s^1)(h^2)(b)^2 = 4x^2 hd$$

$$x^3 \div (x)(x)^2 2x = 2s + 4x$$

$$x^2(h)$$

$$ab = \frac{4x^2 + (ef)^2}{hc \cdot s^2(x)^3}$$

$$\frac{x^2 + ab(s)^3}{(x)(s)^1}$$



$$\begin{aligned} (x)^2 &= ab \\ (x) &= bc \end{aligned}$$

Limitations of classical computers

- Classical computers are kind of slow
 - We have complicated problems no supercomputer can solve in the lifetime of the universe
 - Solution?

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001111110000001111100100110001101110010100111111111101  
11101111110000110101111101100011110111111010101100110  
110111110000110001101010010111010011111000110001000110  
1100011101111011111101111111111010001111110111101111110  
11110011011110111100011111010111010001111110111101111110  
11001101111101100010010000001011101110111111111111111  
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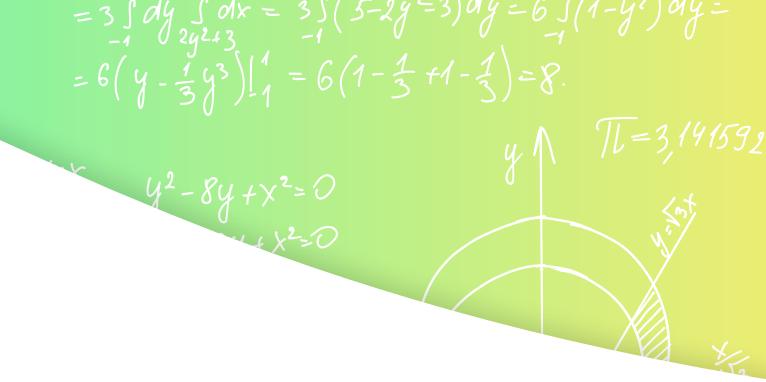


Quantum computer basics

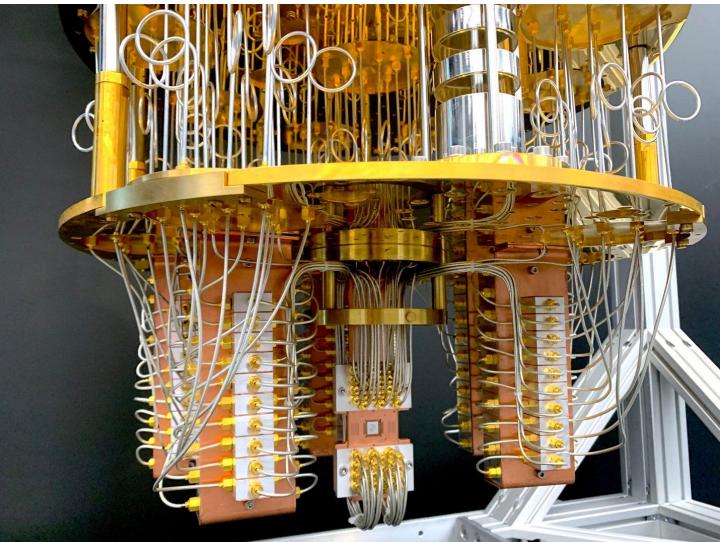
- Based on quantum systems
 - Quantum objects are not like “classical” ones we interact with everyday
 - Superposition: can exist in two ways at once
 - Entanglement: state of one object depends on the state of another far away
 - Qubits (i.e. quantum bits) are quantum objects that store information (superposition of 0s and 1s) and can be entangled with one-another.
- Scientists have devised clever ways to use superposition and entanglement to solve complicated problems at theoretically faster rates.

Viability

- Quantum computers exist!
 - But they're not very good...
 - Decoherence
- Research going into:
 - Error correcting codes
 - Shielding qubits from decohering processes

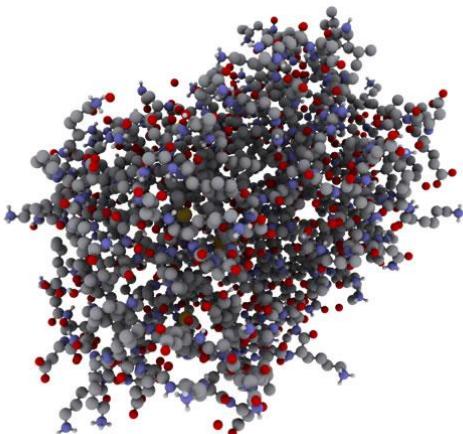


IBM quantum computer - 127 qubits



Applications?

- Quantum computers are best at complex problems
- Determining how large molecules fold
- Optimizing supply-chains



- Decryption
- Military strategy

demo of superposition

$$\begin{aligned}
 e &= f^2(x+4gh)^2(s) \cdot (\wedge)^3 \div (gh)^2 - x^2 \\
 f &= gh^2 + (s)(x+2h)^3 \times 4x^2(hc)^3 + x^2 - 2x^2 \\
 g &= x^2 \div (x)(2x)^2 + (hf)^2 4x^3(3h)(f)^2(e)^2 + x^2 4s^2 \\
 h &= ef^2 - (x)^2 + (3)^2(f)^3 + x(4x)^2 \\
 (d)(ef)^2 &= x^2 \\
 (b)^2 &= \frac{4x^2 hd}{2s+4x} \\
 ab &= \frac{4x^2 + (ef)^2}{hc \cdot s^2(x)_3} \\
 dc &= \frac{3x^2 + ab(s)^3}{xy^3 - (x)(s)_1}
 \end{aligned}$$

03

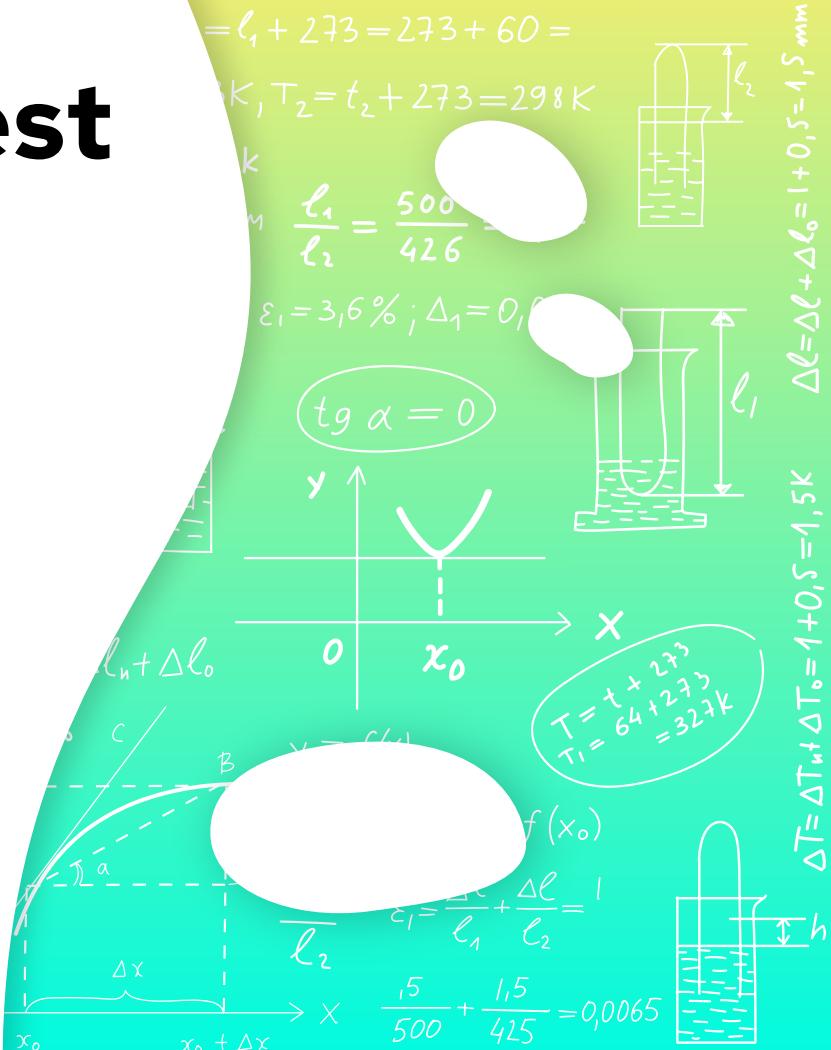
Implications for the future?

Accessibility to knowledge

- Anyone with a computer can code with Qiskit for free
 - Mariana Muzzucato - Ease of access to knowledge lubricates the path to innovation
 - Recruiting minds
 - Serendipitous discoveries

Government interest

- A computational arms race
 - US and China already competing
 - CHIPS Act of 2022
 - Nations seek dominance in computation, and by proxy military dominance
 - Decryption, military strategy by quantum computing



The Future?

- US and China already competing for viable quantum computers
 - Computational arms race
 - CHIPS Act of 2022
 - Tensions will rise
 - Haste will be placed on progress
 - Secrecy in methods within supply chains
 - Progress in quantum computers will be quick
 - Immense good can emerge

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