

# Construyendo el Futuro con Quantum IA

XXII CIITI - 26 DE SEPTIEMBRE 2024 – JUAN PABLO BRAÑA



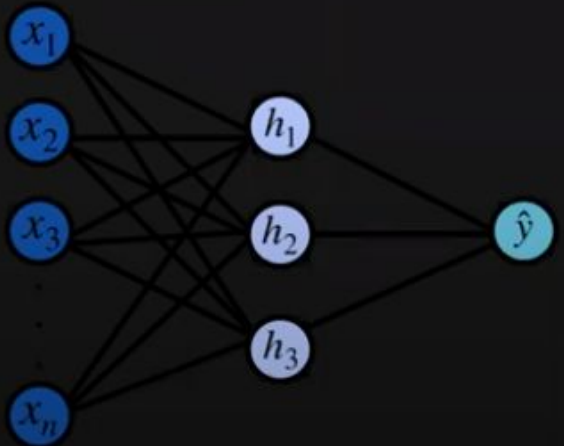
amira abbas

# Are quantum neural networks actually relevant?

Portland Quantum Computing Meetup Group

Amira Abbas

Quantum research advocate, IBM  
PhD candidate, University of KwaZulu-Natal  
Google PhD fellow



IBM Quantum / © 2021 IBM Corporation

IBM Quantum

0:18 / 46:01 • Are quantum neural networks actually relevant? >

▶ ⏪ 🔊 🔌 ⚙️ 📄 🖥️ 🗑️



Roger Penrose on quantum mechanics and consciousness | Full interview

# CONSTRUYENDO EL FUTURO CON QUANTUM + ARTIFICIAL INTELLIGENCE

QUANTUM COMPUTING IS NOT UNIVERSALLY FASTER THAN CLASSICAL COMPUTING.

IT IS ONLY FASTER FOR SPECIAL TYPES OF CALCULATIONS WHERE YOU CAN USE ALL THE SUPERPOSITION AND PARALLELISM POWER TO OBTAIN A MEASURABLE RESULT.

SO, IT IS NOT A REPLACEMENT OF CLASSICAL COMPUTING.

QUANTUM COMPUTING IS NOT UNIVERSALLY FASTER THAN CLASSICAL COMPUTING.

IT IS ONLY FASTER FOR SPECIAL TYPES OF CALCULATIONS WHERE YOU CAN USE ALL THE SUPERPOSITION AND PARALELISM POWER TO OBTAIN A MEASURABLE RESULT.

SO, IT IS NOT A REPLACEMENT OF CLASSICAL COMPUTING.

## nature

[Explore content](#) ▾

[About the journal](#) ▾

[Publish with us](#) ▾

[Subscribe](#)

[nature](#) > [spotlight](#) > [article](#)

SPOTLIGHT | 24 May 2023

# Quantum computers: what are they good for?

**For now, absolutely nothing. But researchers and firms are optimistic about the applications.**

QUANTUM COMPUTING IS NOT UNIVERSALLY FASTER THAN CLASSICAL COMPUTING.

IT IS ONLY FASTER FOR SPECIAL TYPES OF CALCULATIONS WHERE YOU CAN USE ALL THE SUPERPOSITION AND PARALELISM POWER TO OBTAIN A MEASURABLE RESULT.

SO, IT IS NOT A REPLACEMENT OF CLASSICAL COMPUTING.

## nature

[Explore content](#) ▾ [About the journal](#) ▾ [Publish with us](#) ▾ [Subscribe](#)

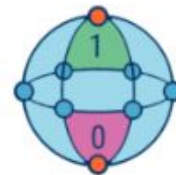
[nature](#) > [spotlight](#) > [article](#)

SPOTLIGHT | 24 May 2023

# Quantum computers: what are they good for?

**For now, absolutely nothing. But researchers and firms are optimistic about the applications.**

## Quantum Computing Vs. Classical Computing



Calculates with qubits, which can represent 0 and 1 at the same time



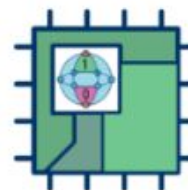
Calculates with transistors, which can represent either 0 or 1



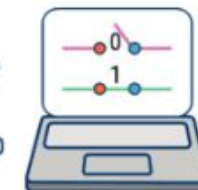
Power increases exponentially in proportion to the number of qubits



Power increases in a 1:1 relationship with the number of transistors



Quantum computers have high error rates and need to be kept ultracold



Classical computers have low error rates and can operate at room temp



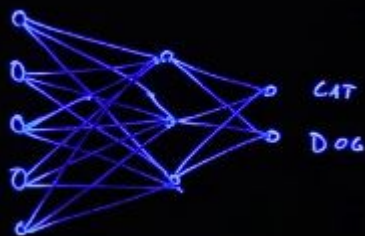
Well suited for tasks like optimization problems, data analysis, and simulations



Most everyday processing is best handled by classical computers

# CÓMO PODEMOS CREAR UN NUEVO PARADIGMA EN IA?

NO PENSAR EN



PENSAR EN



Nature isn't classical, dammit, and if you want to make a simulation of nature, you'd better make it quantum mechanical, and by golly it's a wonderful problem, because it doesn't look so easy.

— Richard P. Feynman —

## Enhanced Machine Learning Models

**Quantum Machine Learning (QML):** QML can outperform classical machine learning by reducing computational complexity. Tasks such as clustering, pattern recognition, and dimensionality reduction could see exponential speedup. Quantum versions of algorithms like k-means clustering or support vector machines (SVMs) could be dramatically faster.

**Quantum Neural Networks (QNNs):** Quantum neural networks may have the capacity to process and learn from data faster, with the potential for more complex feature extraction from unstructured data (like images or videos) in ways classical neural networks struggle with.

## Better Simulations and Modeling

**Molecular Simulations:** AI models that rely on the simulation of complex systems, such as molecules for drug discovery or materials for brain oncology, could benefit from quantum computers' ability to simulate quantum mechanical systems directly.

**Better Emulation of Natural Processes:** Quantum computers can simulate quantum systems naturally, which can improve AI models attempting to replicate cognitive processes, such as in brain oncology or neurological disorders.

CONSTRUYENDO EL FUTURO CON QUANTUM + ARTIFICIAL INTELLIGENCE



MUCHAS GRACIAS

JUAN PABLO BRAÑA

juan.brana@gmail.com | juan.brana@i-314.com | Twitter: @i\_314