Intelligenza Aumentata e Computer Quantistici: le frontiere dell'innovazione a supporto delle capacità umane

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AI enhances, scales, and accelerates human expertise

A cognitive system mimics how humans learn and interact

UNDERSTANDS

Cognitive systems understand imagery, language and other unstructured data like humans do.

REASONS

They can reason, grasp underlying concepts, form hypotheses, and infer and extract ideas.

LEARNS

With each data point, interaction and outcome, they develop and sharpen expertise, so they never stop learning.

INTERACTS

With abilities to see, talk and hear, cognitive systems interact with humans in a natural way.

The evolution of AI

Narrow AI

Single task, single domain

Superhuman accuracy and speed for certain tasks

Broad AI

Multi-task, multi-domain

Multi-modal

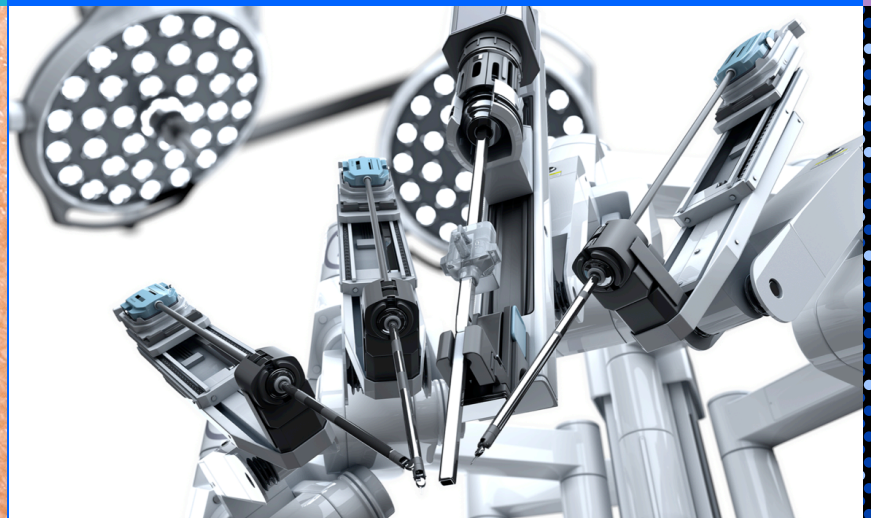
Distributed AI

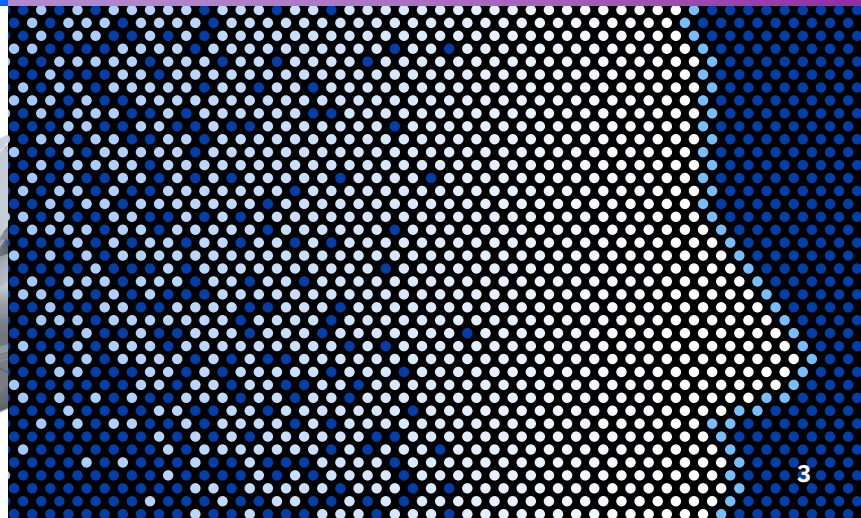
Explainable

General AI

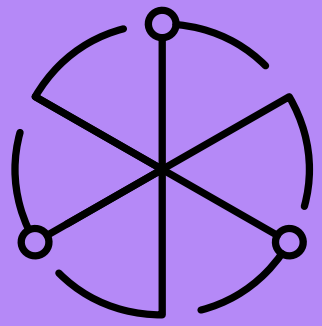
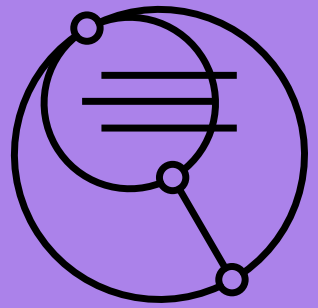
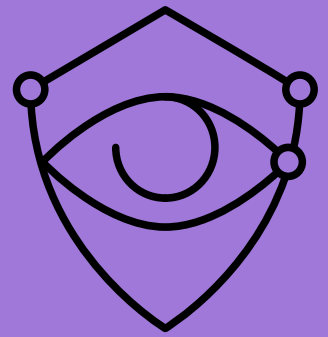
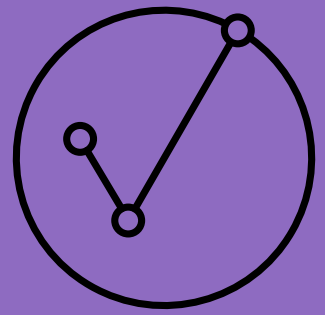
Cross-domain learning and reasoning

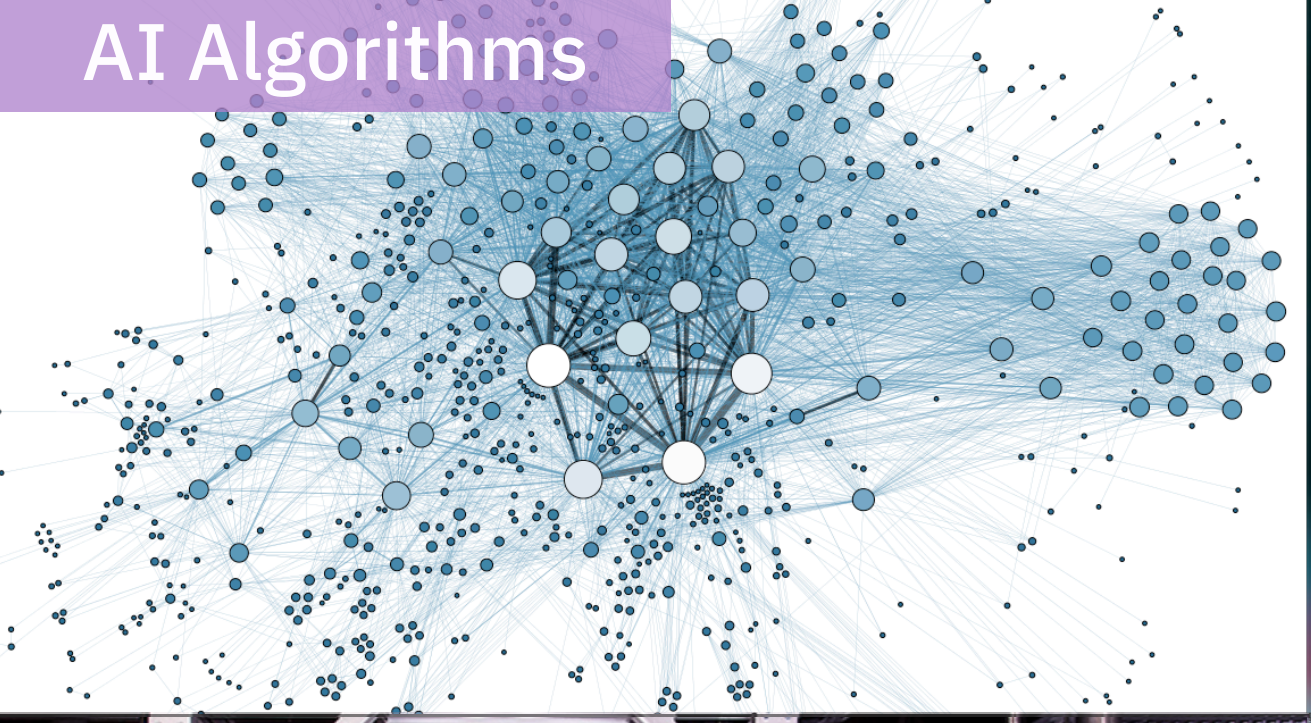
Broad autonomy





But can we trust AI?

Is it fair?	Is it easy to understand?	Is it secure?	Is it accountable?
			
Fairness	Explainability	Adversarial Robustness	Transparency


AI Algorithms


Application to industries

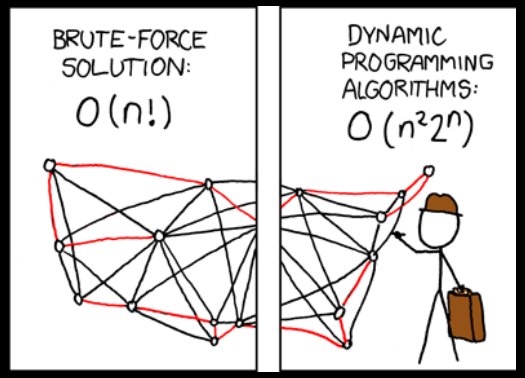

Physics of AI


AI for Shared Prosperity

Why do we need new physics for AI?

an example: the Traveling Salesman Problem

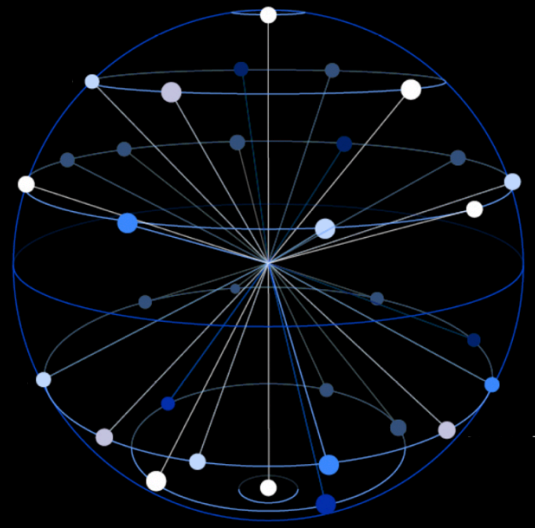
- Starting from city 1, the salesman must travel to all cities once before returning home
- The distance between each city is given, and is assumed to be the same in both directions
- Only the links shown are to be used
- Objective: minimize the total distance to be traveled



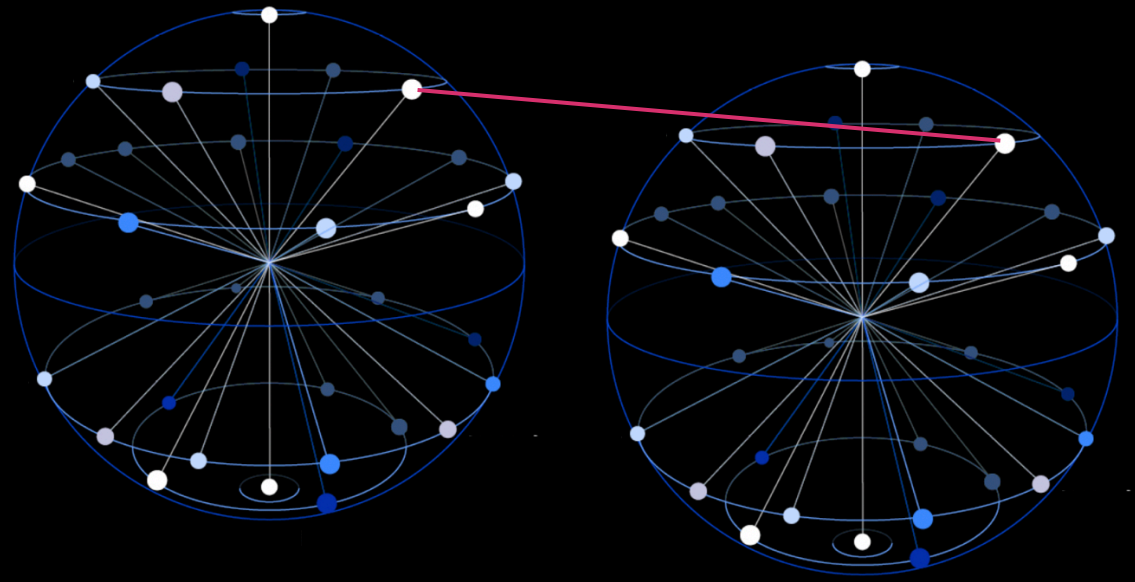
Michael Held, Richard Shareshian, Richard Karp. IBM Archives.

What is a Quantum Computer?

Universal quantum computers leverage quantum mechanical properties of superposition and entanglement to create states that scale exponentially with number of qubits, or quantum bits.



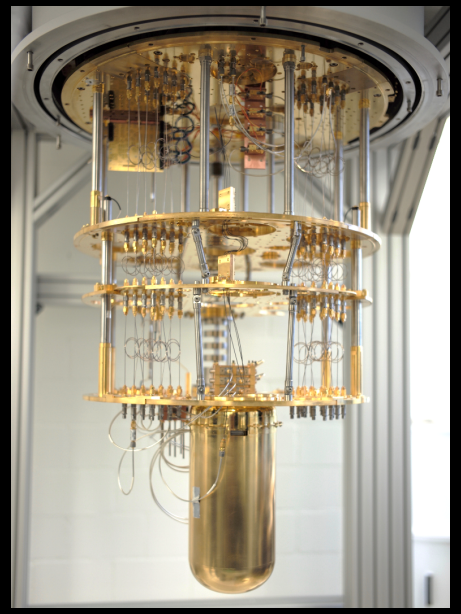
Superposition



Entanglement

Three main research streams on Quantum Computation

Quantum Computers

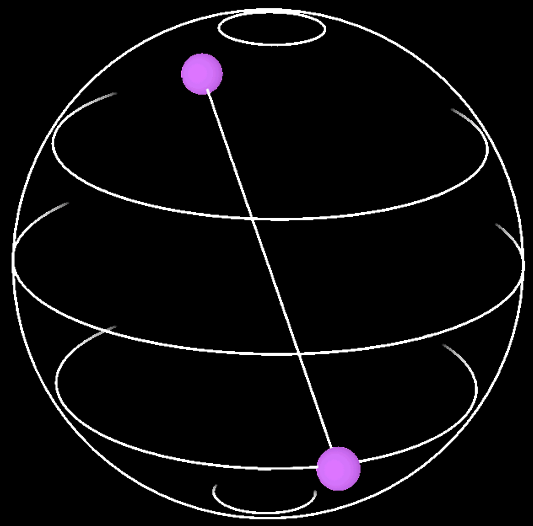


IBM **Q** Systems

Quantum Languages

IBM **Q** Experience

Quantum Applications



QISIT AQUA

Where are we on the road to Quantum Advantage?

Quantum Foundations

Fundamentals of quantum information science

Create and scale qubits with increasing coherence

Create error detection and mitigation schemes

Quantum Ready

Core algorithm development

Increase quantum volume

Standardize performance benchmarks

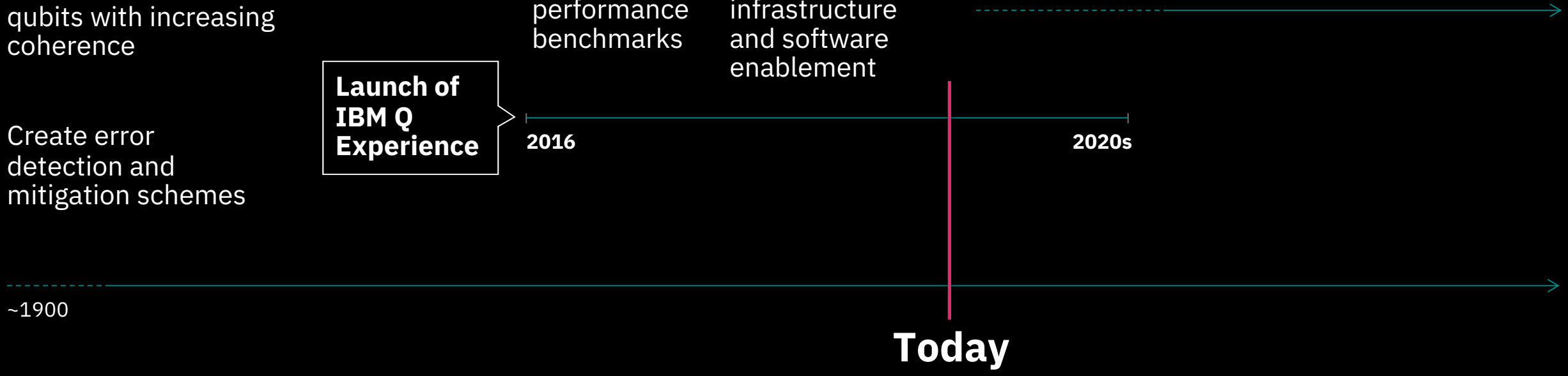
System infrastructure and software enablement

Quantum Advantage

Demonstrate an advantage to using QC for real problems of interest

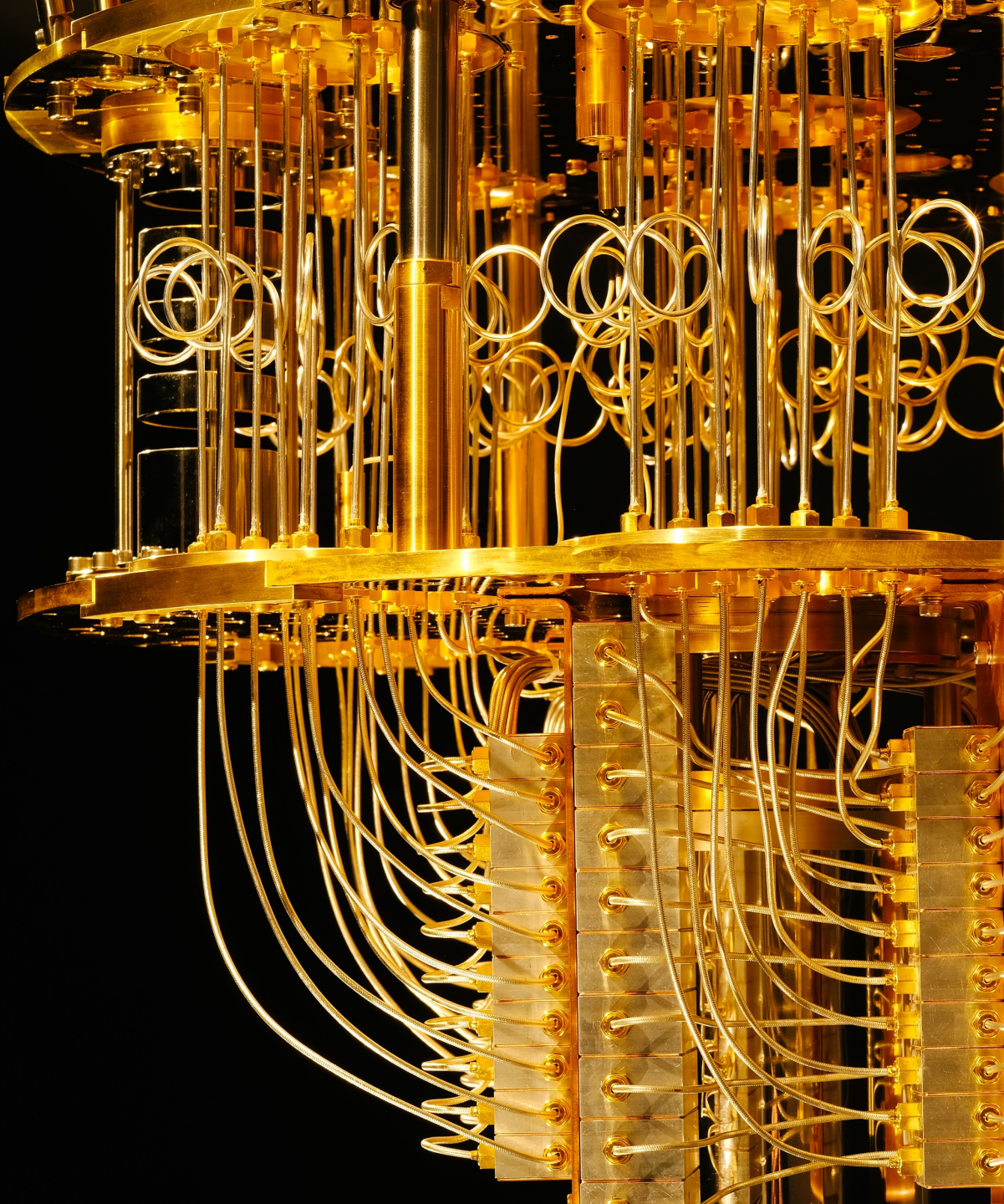
Extract Commercial Value

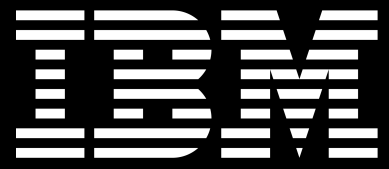
Enable scientific discovery



What can we do to leverage Augmented Intelligence and Quantum Computers?

- Define a **Scope**
- Enable **Transparency**
- Build new **Skills**

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