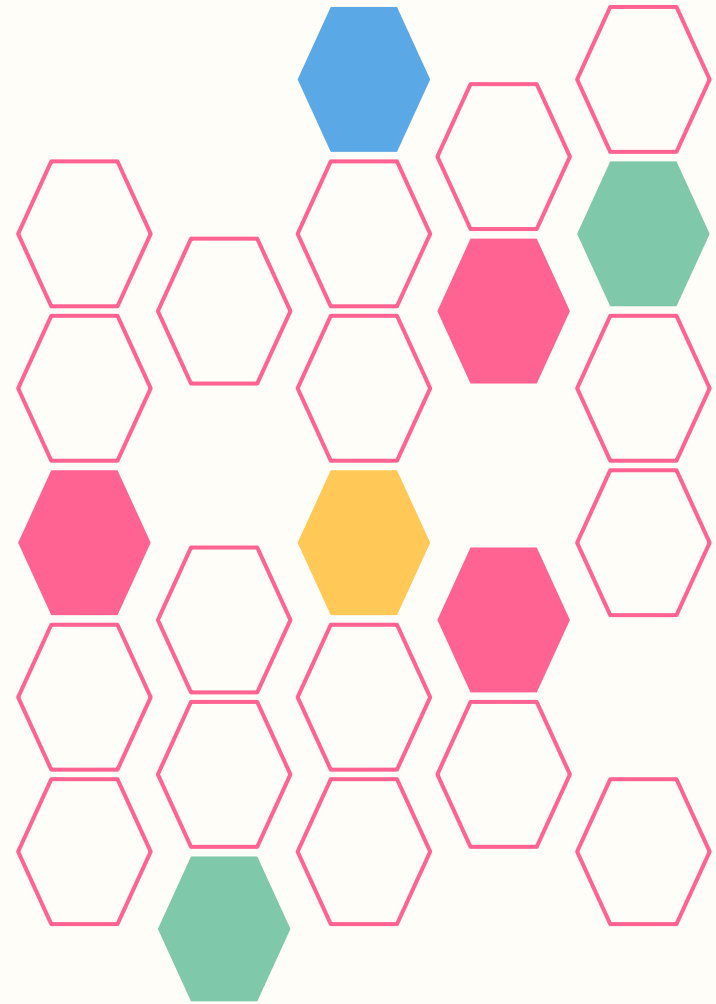


TECHNICAL SEMINAR

Quantum Computing

A beginner-friendly look at qubits and what they could change



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GUIDE

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Agenda

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Overview

02

Core concepts

03

Applications

04

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05

Future

Introduction

- Classical computers use bits that are either 0 or 1
- Quantum computers use qubits that can be in superposition
- Some problems may become dramatically faster to solve
- Today's machines are still small and error-prone



Image

Evolution

1981

The idea

Simulating physics with
quantum machines

2019

Early milestones

First narrow speed-up
claims

1994

Shor's algorithm

Fast factoring in theory

2020s

NISQ era

Noisy, intermediate-scale
devices

Key concepts

1

Superposition

A qubit can represent 0 and 1 at the same time.

2

Entanglement

Qubits linked so one's state depends on another.

3

Interference

Amplifying right answers and cancelling wrong ones.

How it works

- | | | |
|---|-------------------|------------------------------------|
| 1 | Initialise | Qubits prepared in a known state |
| 2 | Gates | Quantum gates create superposition |
| 3 | Entangle | Qubits linked into a circuit |
| 4 | Measure | Result read out as classical bits |

Architecture

A quantum computer is a classical computer wrapped around a very cold, very quiet core.

Control electronics send precise pulses to qubits kept near absolute zero. Results are measured and post-processed classically, many times over.



Architecture diagram

Applications



Image 1

Drug discovery

Simulating molecules more accurately



Image 2

Optimisation

Logistics and scheduling problems

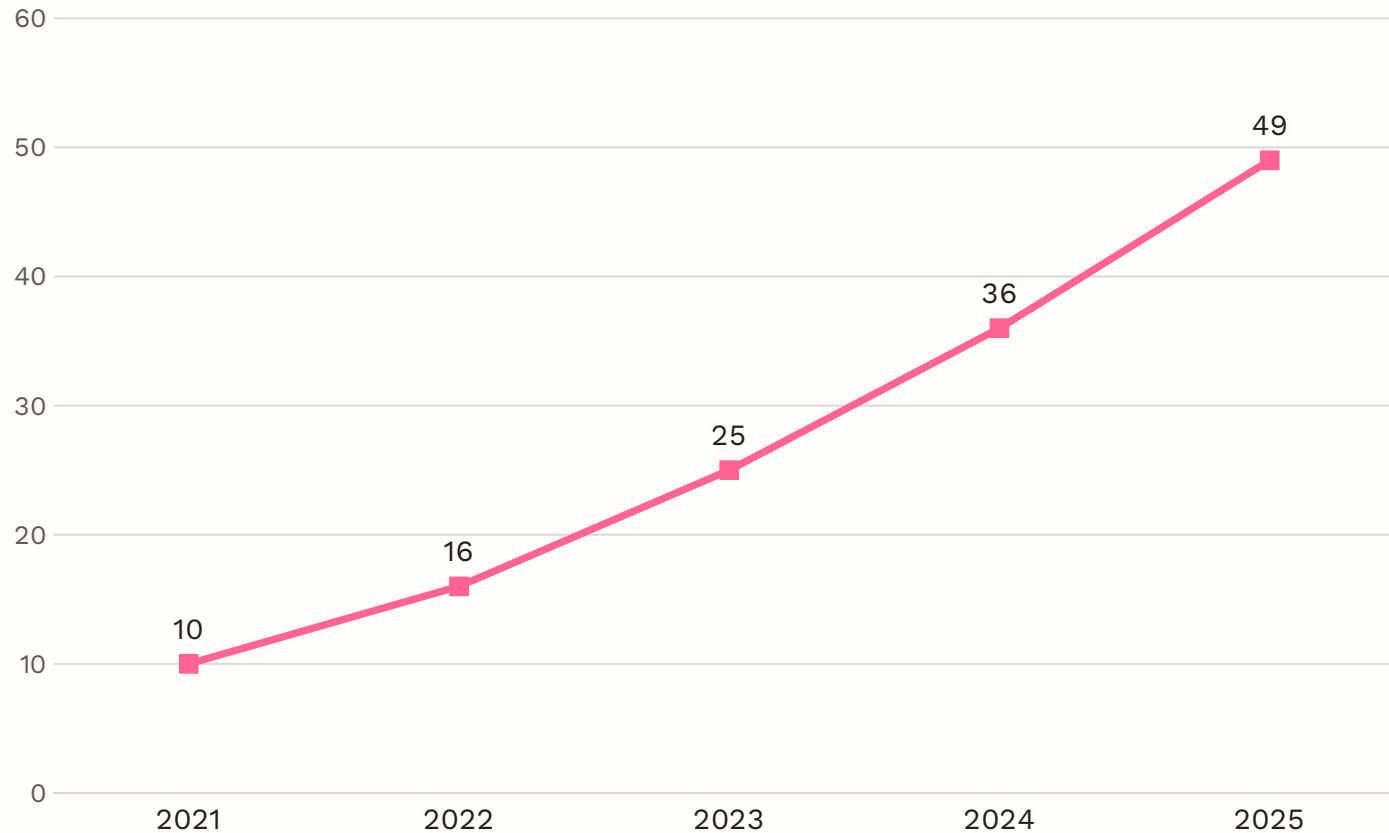


Image 3

Cryptography

New, quantum-safe security methods

Adoption trend



Sample data for illustration — replace with your own figures.

Research activity keeps rising, though practical advantage is still limited to narrow tasks.

Advantages and limitations

Advantages

- Potential speed-ups for some problems
- Natural fit for simulating chemistry
- Drives new cryptography

vs

Limitations

- Qubits are fragile and noisy
- Needs extreme cooling
- Few useful algorithms so far

Open challenges

1

Error correction

Many physical qubits per reliable qubit.

2

Scaling

From hundreds to millions of qubits.

3

Software

Tools and skills are still scarce.

**Quantum computers will not
replace laptops — they will
solve problems laptops cannot.**

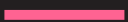
Looking ahead

Conclusion

- Qubits use superposition and entanglement
- Real advantage is narrow but growing
- Error correction is the key milestone to watch

References

- [1] Survey paper on the topic, IEEE Access, 2024.
- [2] Textbook chapter covering fundamentals, 2023.
- [3] Recent conference paper on applications, 2025.
- [4] Industry white paper (generic reference).



Questions?

Thank you for listening.