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Quantum vs. Classical Computing: A Comparative

Analysis

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Abstract: Computing has completely changed the way we live, work, and connect with the world. From the phones in our pockets to the most powerful supercomputers, classical computing has been at the heart of every digital innovation for decades. But as the problems we're trying to solve get more complex, we're starting to bump into the limits of what classical computers can do. That's where quantum computing comes in.

Quantum computers work in a completely different way—using strange but powerful ideas from quantum physics, like superposition and entanglement. These machines have the potential to solve certain problems way faster than classical computers ever could. Still, they come with their own set of challenges, especially when it comes to building stable and scalable systems.

In this paper, we're going to break down what makes classical and quantum computing different, where each one shines, where they fall short, and how they might work together in the future. Rather than replacing classical computers, quantum systems are more likely to work alongside them—creating a new kind of partnership that could push computing to exciting new levels..

Keywords: Quantum computing, classical computing, qubits, superposition, entanglement, computational complexity, hybrid computing

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