

Why the World Must Pay Attention to Quantum Computing—Now

Quantum computing is gaining momentum as the supercomputing world races towards exascale performance. With nations and corporations investing billions in research and development, the time to pay serious attention to quantum computing is now. The era of quantum advantage, where quantum computers outperform classical systems on selected real-world problems, is rapidly approaching.

Classical supercomputers have limitations, as they are bounded by classical physics. Quantum computers excel at factoring large numbers, modeling quantum chemistry for next-generation materials, optimizing complex systems, and searching massive unstructured data with exponential speedups. These limitations make quantum computing a necessary complement, not a competitor.

National security and economic stakes are high, as governments view quantum technology as essential for national security and global economic competitiveness. Quantum computers could eventually break RSA and elliptic curve encryption, upending digital security. Technology leadership can drive advances in AI, 6G networks, energy discovery, and pharmaceuticals, creating geopolitical leverage. Countries that fall behind in quantum infrastructure risk dependency on others for critical technologies in the near future.

Another urgent issue is the global shortage of quantum scientists and engineers. Initiatives like Qiskit, QuEra's open platforms, and Quantum Tech Hubs aim to address this, but progress is uneven. Without investment in education, training, and interdisciplinary collaboration, breakthroughs may stall.

Quantum and HPC are converging, with hybrid computing, where quantum processors are tightly integrated with classical HPC systems. Institutions are already experimenting with quantum-classical workflows, such as using quantum kernels to speed up specific subroutines in classical algorithms. Cloud-based quantum platforms from AWS, Microsoft, and Google enable remote experimentation at scale.

The time for policy and global collaboration is now, as standard-setting, ethical considerations, and global cooperation must shape the future of quantum technologies. Key questions include ensuring quantum technologies are used responsibly, democratizing access, and establishing a global alliance for quantum cybersecurity standards.

In conclusion, quantum computing is a foundational shift that should be front and center at the global supercomputing table.

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