

# What Happens Once Quantum Computers Replace Traditional Binary Computers

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## Intro

- “In classical computers, you give me a certain input, I put it in my computer, I give you an output. But if our hardware was quantum mechanical, rather than just sequentially providing some input and reading out the answers, I could prepare the computer register in the quantum superpositions of many different kinds of inputs.”
- This [statement](#) by noted Harvard University Physics Professor Mikhail Lukin sums up the fundamental difference between our computers today and quantum computers.
- We hear all about the advent of quantum computers having a great capacity in remoulding the tech world and making our lives easier. They will not just make tasks faster to implement, but also solve many problems that our computers today are incapable of resolving. But how is the introduction of quantum computers replacing our traditional binary computers today going to affect us?

# Ways In Which Quantum Computers Will Modify Our Lives

- A popular quote from *Programming the Universe*, a book by Seth Lloyd says, “A classical computation is like a solo voice — one line of pure tones succeeding each other. A quantum computation is like a symphony — many lines of tones interfering with one another.”
- We are listing down the areas in which quantum computing will affect our lives:
- **Security:** Thanks to the property of quantum mechanics, quantum cryptography we will be able to have highly encrypted messages and even if the message is intercepted, no one will be able to read it. Quantum key distribution is one such example of a tool in which the user must have a key in order to view a message.
- This difficult encryption of data will help many sectors in their data security. For example, in healthcare, most people want to keep their health data secure and private. Every business sector and banking sector thrives hard for a good protection of their data and quantum cryptography is going to provide them with that. With the same principle, it will make fraud detection easy.
- [ID Quantique](#) (IDQ), a company based in Geneva, is already helping banks and security to help provide with securing their data. It is helping banks to keep all their high-value transactions safe. It also has a quantum random number of generators (QRNG) are used to ensure truly random encryption keys for use in IDQ’s solutions. [QuNu](#) (Quantum Light) Labs is the first and only Indian company that is struggling with Quantum Key Distribution (QKD) and also get into the field of QRNG, Key Management Solutions, Free Space and LiFi QKD in the future.

# Ways In Which Quantum Computers Will Modify Our Lives

- **Weather Forecasting:** Weather forecasting has still been a difficult thing to tackle even with today's advanced technology. Quantum computers can solve this problem and make the forecasting more robust. Since they can collect and analyse the data all at once and at a very fast pace, we will know about calamities much in advance and better climate models can be built. In the same way, it can also improve traffic control modelling. The [UK Met Office](#) is already making use of quantum computers to help them in weather forecasting.
- **Astrophysics:** Once they are here, they will be put with telescopes and then use to analyse the data collected by the telescope. Since they will have a powerful and fast analysing capacity, we will have more fasted space discoveries in our way. Needless to say, they have a great potential for [artificial intelligence](#) since information processing will be very much easier and faster in [Quantum Computing](#), helping machine learning algorithms guide them learn from it.
- **Stock Market:** Image processing, video processing, signal processing can be done with quantum computers more efficiently since they will be able to run the algorithms and models faster. Algorithmic trading to initiate stock trades according to predefined strategies and making developing strategies for the stock market will become easier.

# Are Quantum Computers Still A Far-Fetched Dream?

- Everyone talks about how Quantum Computers will change the world but the difficulties involving are plenty and here is where researchers need to get over to make one:
- **1. Temperature:** With the amount and level of processing that the quantum computers will have to deal with, it is natural to create lots of heat out of it. One of the biggest hardships that is going to make it difficult for quantum computers to function is their ability to work at low temperatures. Quantum computers cannot absolutely work on room temperatures and they require temperatures of less than 0.02 Kelvin to function, that is way lesser than 'universe'. Maintaining such a low temperature is not an easy task and we cannot think of sitting in a room which is as cold as about -273 degree Celsius and work on it. It is just not practical.
- **2. Hardware:** The best hardware processors that we have today cannot handle the enormous number of qubits that quantum computers demand to work with. These quantum particles are very difficult to control. Unless the hardware problems are solved a commercially available quantum computer is difficult, almost impossible to make.
- **3. Expensive:** D-Wave's quantum computer 2000Q costs a massive amount of \$15 million. Not everyone will be able to buy them and have the experience of a super-fast computing ability in their labs. Even if we have a quantum computer in the market tomorrow, for them to be cost-effective for commercial is going to take ages.

# Future Of Quantum Computing

- Being enormously fast and having the advantage of data security, quantum computers can revolutionize different sectors in many ways. But to have a practical and working quantum computer which can be used by everyone needs a lot of R&D and may require work for another decade or so. With the only disadvantage of us not understanding quantum mechanics as thoroughly as we should convert this into a practical computer, the technology still lags for us to see these magnificent class of computers in our everyday life.

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