



The Open Biology Journal

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EDITORIAL

Exploring Potential of Quantum Computing in Creating Smart Healthcare

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Article History

Received: May 25, 2021

Revised: September 9, 2021

Accepted: September 20, 2021

The healthcare sector supports people extensively in combating illnesses and disorders. Healthcare professionals provide humanity with newer therapies and medications to overcome the consequences of illness or ailments [1]. Furthermore, nowadays, patients want a newer and better healthcare system that meets the speed of modern life and is more personalized. A quantum computing system is an answer to meet the latency and energy efficiency requirements for real-time health data collection and analysis. Now, the question is, what is Quantum computing? Quantum computing is a revolutionary computing system, based on the quantum mechanics and incredible phenomenon of quantum physics. It is a great combination of physics, maths, information theory, and computer science. It enables large computational capacity, lower energy use, and exponential speed over conventional computers by manipulating the behavior of microscopical particles, such as atoms, electrons, photons, *etc.*, [2].

A jump from bit to qubits: this two-letter leap might bring completely new prospects for healthcare. Quantum computing might include supersonic drug development, full-speed whole-genome sequencing, and analytics, in silico clinical trials with virtual humans simulated 'live', hospital movement into the cloud, predictive health or safety of medical data by quantum uncertainty [3]. It is difficult to grasp the significance of the Quantum Computer in health care, but it can be a tool, possibly the best tool, to expand our understanding of the complexities of genetics, physiology, pharmacology, and other health and medical fields [4].

With diagnostics speed and treatment accuracy becoming a need for quality care, quantum computing assures unmatched processing speed and power. The technology enables enormous quantities of healthcare data to be analyzed and patient-centric care. Doctors may identify correlations and propose diagnoses or available treatments using quantum computing [5]. The use of qubit technology helps in the development of super drugs,

super transdermal patches, and super diagnostic technologies [6]. Quantum computing helps to revolutionize the medical sector with technologies that reduce the burden of uncertain therapies [7]. Quantum imaging techniques can provide very accurate images that permit single molecules to be visualized. Machine learning algorithms with quantum computing can help a physician to interpret the results of treatments. Machine learning can aid in detecting human body anomalies and quantum computation may be used to evaluate therapy results. The conventional MRIs can identify bright and dark regions and they must be assessed by the radiologist. However, quantitative imaging methods can differ amongst tissue types that enable better and more accurate imaging [8].

The quantum computing system in precision medicine enables doctors to understand the illness in detail. Using this data, they can deliver therapies that are most efficient in taking into account age, race, gender, genetic makeup, and other patient variables. Drug discovery is a possible application field that will find a lot of applications for these smart technologies. As a prominent example, quantum simulation will make molecular systems faster and more precise than present quantum techniques [9]. In addition, algorithmic advancements in quantum machine learning offer exciting alternatives to conventional machinery learning approaches that can also contribute to the early phase of drug discovery.

A quantum computer is used to direct a radiation beam that destroys the cancer cells with extreme precision and spares all surrounding tissue. This rapid detection of a tiny cluster of cancer cells and their destruction is one of many potential advances in medicine that could occur pending the realization of quantum computing. Quantum computing can be used for the interpretation of diagnostic images using artificial intelligence. Image qualities are not only enhanced tremendously, but also the clinician can be aided in the analysis of data, as efficient machine learning can enable a quantum computer to detect errors more precisely than the human eye [10]. In cancer treatment, quantum computing will contribute to improved therapies. Computers are currently used to deal with the thousands of variables used to develop a radiation plan that targets cancer cells without damaging healthy ones [11]. The

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result would be an ideal radiation dose pointed at the right target and thus lead to more effective treatment with reduced side effects [12].

Big data research and machine learning are probably one of the areas where real-world functional quantum computers will progress quickly. Machine learning, which in real-time affects clinical practice, is dependent on increasing databases that consistently update medical data and are linked to other data sources (e.g., wearable technology). Future machine learning systems will require the quantum computational capability to produce real-time results to deal with this complexity [13]. Big data research and machine learning are some of the areas in which health outcomes in health systems have become fully understandable. The potential of the quantum computer is also employed to endorse health records in big data systems or a data lake. Quantum computers can analyze this vast amount of data from different data sources, creating correlations and inferences to give an overall overview of a certain medical condition [14]. You probably would not understand enough about how quantum physics functions, yet scientists use these difficult techniques to make healthcare simpler, less painful, and more customized. Quantum technology redefines our perspective on hospital care, health records, and even our biology. Using the unique characteristics of quantum physics, scientists at the conference (and other people from all around the globe) create high-precision and ultra-personalized medical devices, diagnostics, and therapies that ultimately prolong and improve our quality of life.

Employing a comparatively new procedure called the biological barcode test, scientists may now identify indicators or “biomarkers,” which may be seen in the blood of humans by using gold nanoparticles that use medical resonance imaging technology with unique quantum properties that allow them to attach to disease-fighting cells. This methodology is also less costly, more adaptable, and more accurate than conventional techniques. Scientists at York University have invented a patch for the treatment of the skin without hypodermic needles to achieve targeted therapy. The patch, named Nanject, is employed without affecting healthy cells to administer cancerous medicines. A research team of Australia recently developed a technique to examine a living cell's inner structure working with a new kind of laser microscopy based on quantum mechanics concepts. Moreover, we can sequence DNA quickly using quantum computers and resolve other large-scale healthcare data challenges. This allows for a personalized treatment based on the unique genetic makeup of individuals.

Quantum mechanics have the potential for delivering more insight on human biology, in addition to improved health screening and highly targeted, needleless treatment. Nicolas Gisin, one of the participants of quantum conferences, works with ID Quantique, an organization that uses the unique quirks of quantum processes to securely protect our data. Quantum cryptography protects the data from being accessed by anybody other than the intended receiver *via* quantum connectivity is one of the most practical applications of this phenomenon. ID Quantique helps banks and governments already with security and eventually has promising results in the health sector [15, 16]. The Quantum mechanics principles are based on innovations that can influence almost all health care levels, from

care and prognosis to data storage and transmission. We are at the forefront of amazing progress and everyone should discover how quantum technology in the coming years will transform healthcare.

FUNDING

None.

CONFLICT OF INTEREST

Dr. Rishabha Malviya is the editorial board member of the journal The Open Biology Journal.

ACKNOWLEDGEMENTS

Declared none.

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