

softserve

# QUANTUM COMPUTING FOR HEALTHCARE

Prepared by SoftServe • January 2024





# GENERAL OVERVIEW

Providing high-quality services, enhancing clinician and patient experience, and reducing costs have become the central pillars of the recent transformative efforts in healthcare. It's difficult to overestimate the role of technology and innovation as a driving force towards personalized, accessible, and affordable care for everyone. Healthcare industry players have long been focused on improving data utilization through complex analytics and AI. This approach not only drives organizational change, it also empowers practitioners with valuable insights and tools that contribute to medical research, diagnostics, and treatment planning. Now is the time for a true quantum leap.

**Healthcare and life science will be among the first to benefit from quantum computers, which offer unprecedented capabilities in molecular modeling. With rapid advancements in quantum hardware and algorithms, the range of applicability is constantly expanding. Learn how quantum computing can propel us towards a healthier and safer future. Take the first step on your quantum journey today.**

## KEY CHALLENGES

### INCREASING DATA UTILIZATION

The healthcare sector generates [about 30% of the global data volume](#), the majority of which remains unused due to limited computational capabilities. Analyzing and consolidating data from miscellaneous sources for useful medical insights is often beyond the reach of classical approaches. Quantum computing extracts the maximum benefit from heterogeneous healthcare datasets by recognizing increasingly complex patterns and correlations.

### PROTECTING SENSITIVE DATA

Considerable effort is devoted to maintaining high security standards when processing, transferring, and storing highly sensitive healthcare records, which are an easy target for cyberattacks and data breaches. With the threat of Shor's factoring algorithm in the current security landscape, the only feasible way to protect data in the long run is by implementing quantum-safe encryption protocols.

### OPTIMIZING OPERATIONAL PROCESSES AND RESOURCES

Post-pandemic, the global healthcare industry is experiencing soaring inflation, recession, and labor shortages. The latter puts a burden on healthcare practitioners and patients. Hence, the focus is on boosting productivity with currently available technical and human resources. Demand is high for innovative approaches to automate and optimize operational processes. These methods can help to efficiently distribute the workload, enhance patient experience, and reduce costs. Adopting quantum computing practices can generate numerous business advantages and give your organization a competitive edge.

### DEVELOPING FIRST RESPONSE STRATEGIES

The COVID-19 pandemic has shown that the global healthcare industry is not equipped to effectively tackle major public health crises. This calls for improvements in policies, as well as the supporting technology, which can enhance risk analysis, modeling, decision-making, and first-response strategies, ensuring healthcare is accessible during periods of turmoil. Quantum innovation cannot only help with operational challenges but also accelerate clinical research and drug discovery to ultimately eliminate the threat.

### FORECASTING AND MODELING

Developing reliable forecasting and modeling techniques is important in many areas of the healthcare industry — from epidemiology to physical therapy. Having access to accurate risk estimates and understanding how the disease will spread or affect the patients allows healthcare practitioners to adopt custom prevention and treatment strategies.

# BUSINESS BENEFITS



Accelerate biomedical and clinical research



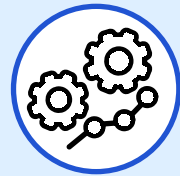
Provide personalized medical care



Accelerate diagnostics and increase its accuracy



Forecast and prevent public health emergencies



Optimize operational processes and resources



Reduce the cost of medical treatments

## USE CASES



### DRUG DISCOVERY

Thanks to transformative technologies, tremendous strides have been made in developing cures for many life-threatening health conditions. Leading the way, drug discovery initiatives have used machine learning (ML) to effectively identify lead drug candidates. This helped to fill the gaps in today's pharmaceutical market, while avoiding expensive and time-consuming in-lab research. Despite such an innovative approach, screening the entire space of molecules with desired properties remains a computationally heavy task running short on classical resources. The power of quantum computations can bring a huge advantage here as quantum computers are uniquely suited for molecular modeling utilizing quantum variational algorithms and quantum-enhanced ML to accelerate the drug discovery cycle and yield more accurate results.

### DISEASE DETECTION AND EARLY DIAGNOSTICS

Clinical studies show that early disease detection leads to better health outcomes and annually saves millions of lives globally. Having a reliable diagnosis as early as possible allows clinicians to significantly reduce treatment costs and avoid redundant and invasive interventions. The key to identifying the root of the health decline lies in the efficient processing of abundant medical data. This includes symptom records, medical images, and cellular tests. Cutting-edge quantum machine learning (QML) techniques are pushing diagnostics to a new level by solving complex classification, prediction, and decision-making tasks.



### PERSONALIZED HEALTHCARE

An individual's health status depends on a variety of external and internal factors with complex interconnections. Sometimes standard clinical approaches aren't effective because they don't consider the patient's biological peculiarities. Thus, prescribed treatments fail to provide the expected results. To improve healthcare quality, the industry is moving towards precision medicine by adopting new technologies such as quantum computing, especially QML, which can help create personalized healthcare plans. This includes estimating the risk of future diseases based on genomic insights, environmental impact, and patient habits. It also facilitates the development of tailored prevention and treatment strategies with individual drug sensitivity considered.

## WHAT TO EXPECT?

Quantum computing segment in healthcare is projected to [grow at 45% CAGR](#) until the end of the decade and is firmly on track to hit \$1 billion by 2030.

# WHY SOFTSERVE

SoftServe is a premier IT consulting and digital services provider. We expand the horizon of new technologies to solve today's complex business challenges and achieve meaningful outcomes for our clients. Our boundless curiosity drives us to explore and reimagine the art of the possible. Clients confidently rely on SoftServe to architect and execute mature and innovative capabilities, such as digital engineering, data and analytics, cloud, and AI/ML.

Our global reputation is gained from more than 30 years of experience delivering superior digital solutions at exceptional speed by top-tier engineering talent to enterprise industries, including high tech, financial services, healthcare, life sciences, retail, energy, and manufacturing.

We partner with major technology players, such as Google Cloud Platform, Amazon Web Services, Microsoft Azure, Salesforce, and NVIDIA, to give clients a competitive advantage in the market.

## LET'S TALK



info@softserveinc.com  
[www.softserveinc.com](http://www.softserveinc.com)

### **NORTH AMERICAN HQ**

201 W. 5th Street, Suite 1550  
Austin, TX 78701  
+1 866 687 3588 (USA)  
+1 647 948 7638 (Canada)

### **EUROPEAN HQ**

30 Cannon Street  
London EC4 6XH  
United Kingdom  
+44 333 006 4341

**softserve**