

Chapter 15

Cloud Computing Applications in Biomedicine

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ABSTRACT

Today's biology is characterized by a rising requirement for real-time handling of massive quantities of data. New needs for information and communication tools (ICT) result from this. These needs can be satisfied by cloud computing, which also has many benefits like cost reductions, flexibility, and scaling when using ICT. This chapter aims to examine the idea of cloud computing and its associated applications in the field of biomedicine. The researchers provide a thorough examination of the application of the cloud computation method in biological analysis, broken down into framework, infrastructures, and service layers, along with a suggestion in handling huge quantities of data in the field of medicine. The chapter begins by outlining the suitable applications and technical approaches for cloud computing. Second, the cloud computing elements of the high-end computing model are examined. Finally, a discussion of this technology's promise and actual uses in biomedical study is presented.

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INTRODUCTION

Science has significantly improved our ability to quantify things and collect data in previously unimaginable quantities. This creates new demands for the creation and use of innovative techniques and information and communication technologies (ICT) that can store data and send it for later analysis or possibly use it as input for quantitative modeling. Cloud technologies are being adopted rapidly and abundantly by companies, groups, government entities, and private citizens. Businesses are opening up more to the possibility of expanding their product creation, services, and promotion via information technologies.

Any ICT infrastructure component, including virtual computers, apps, data storage areas, servers, and networking hardware, should be available as an on-demand service thanks to cloud computing. Additionally, it is possible to easily alter the architecture. Cloud tech (Anand, R. et al. 2022) has a lot of benefits like savings on ICT expenses (approximately 2 lakhs per month for a mid-size organization) etc.

Biomedicine, which also requires processing enormous quantities of data, is a major field of ICT use. Real-world scenarios and variable circumstances are frequently depicted in scientific computations based on biological data. The layout and execution of computerized medical labs, supervision services, multipurpose image centers, medical datacenters, remote tracking, bioinstrumentation, etc. are just a few examples of the complicated and comprehensive components that are covered by these issues. The real-time analysis of biological data raises the need for more processing capacity. Because there are 2n stages in one subscription, using a modification like the wavelet is not particularly challenging, but using it on sizable real-world biological datasets that demand completely concurrent processing at high speed is challenging (Pramanik, S. 2023). Cloud computing is the tool that can be used in this situation.

The use of cloud processing in biological research has many benefits, but it also creates new risks and difficulties (Gezimati, M. et al. 2023). In apps that require a lot of processing, cloud computing is regarded as being very effective. (Huang, X., et al. 2022) states that there are numerous considerations that should be made during the implementation process, including the type of business being serviced, the kind of cloud that is needed, nationalized and international quality needs dangers and laws. It is clear out of the preceding sections of the chapter that the incorporation of cloud computation strategy in biology is not only a buy of a single good, yet moreover a difficult technique that is influencing the entire study, organization, and so forth. The end outcome of cloud computing incorporation in biology without a comprehensive strategy can be unclear. The following problems and difficulties are important when using cloud computing in biomedicine.

- Governance of cloud computation
- Privacy and moral considerations
- Service frameworks and
- Grade of cloud computation facilities.

Because data in biological research is frequently extremely delicate, secret, and constrained by law or other policies, security and ethical problems are among the most crucial ones. (Guest, O., et al. 2023) identify three key difficulties in this field. A broad range of data or user-dependent policies, including preservation periods, erasure procedures, restoration schemes, allocation guidelines, access tracking frameworks, user auditing, action recording, etc., are represented by the compliance and responsibility in the first place. The second category is security and privacy, which includes techniques for reducing security risks such as illegal entry, data separation, virtual internetworking and system remoteness, flaw

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