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THE ROLE OF MODERN COMPUTER TECHNOLOGIES IN DETECTION AND CONTROL OF THE COVID-19 EPIDEMIC

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Abstract
This article highlights the role of modern computer technologies in detecting, predicting the spread and controlling the COVID-19 epidemic. Using artificial intelligence, machine learning, big data analysis, cloud computing and mobile applications, pandemic situations are being monitored in real time. It also analyzes the effective use of computer systems in contact tracing, disease spread models, and vaccination processes. The article demonstrates the importance of digital technologies in the fight against COVID-19 and reveals the possibilities of technological approaches in future health crises.

Keywords: COVID-19, computer technologies, artificial intelligence, big data, epidemic detection, digital health, monitoring systems, pandemic management.

Introduction

In recent years, the global healthcare system has been put to serious test. In particular, the COVID-19 epidemic, which began in late 2019 and quickly became a global pandemic, has caused enormous economic, social and medical damage to humanity. This pandemic has required the integration of modern medicine, epidemiology and technology. Traditional epidemiological approaches have become insufficient during the pandemic stages, and in this situation, the capabilities of computer technologies have become relevant.

Modern information and communication technologies, in particular artificial intelligence (AI), machine learning, big data analytics, cloud computing, and mobile applications, have developed effective approaches to early detection of

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COVID-19, spread prediction, real-time monitoring, and contact tracing. These technologies have not only helped the healthcare system, but also increased the capacity of society as a whole to combat the pandemic.

This article examines the role of modern computer technologies in detecting and controlling the COVID-19 epidemic, their advantages and practical examples. It also analyzes the real-world application of technologies, especially in developing countries, and ways to overcome them. The purpose of this study is to demonstrate the effectiveness of technological approaches in combating the pandemic and to reveal the possibilities of using these experiences in future global health crises.

Literature Review

Since the beginning of the COVID-19 pandemic, the issues of pandemic preparedness, response measures, and the use of modern technologies in healthcare systems around the world have been widely discussed in scientific circles. Scientific literature shows that computer technologies have served as an effective tool at various stages of the fight against COVID-19. In particular, a study by Arora et al. (2020) noted that the accuracy of detecting COVID-19 from chest X-ray images using artificial intelligence was high. At the same time, epidemiological modeling algorithms proposed by Zhang et al. (2021) were successful in predicting the spread of the virus.

Many studies highlight the role of contact tracing systems using mobile applications and geolocation services in controlling the spread of the virus. For example, Ferretti et al. (2020) demonstrated that infection control through COVID-19 Contact Tracing applications plays an important role in preventing epidemics. At the same time, WHO (2021) reports analyzed the use of information technologies by global health systems, especially cloud platforms and real-time data sharing systems.

In addition, studies using Big Data analysis to analyze social media data have been widely used to understand social attitudes about the pandemic, vaccination decisions, and the identification of risk areas (Cinelli et al., 2020). It is clear that the literature confirms the important role of computer technology in the fight against the COVID-19 pandemic. These studies serve as the main scientific foundation for writing this article.

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Methodology

This study systematically examines the role of computer technology in detecting and controlling the COVID-19 pandemic. Qualitative analysis and secondary data analysis were chosen as the methodological approach for the study. The study examined scientific articles published between 2019 and 2024, open data provided by health organizations (in particular, WHO, CDC, and other national health agencies), scientific journals, reports, conference proceedings, and information obtained from government websites.

The data being analyzed was divided into the following categories and evaluated separately:

- Disease diagnosis using artificial intelligence and neural networks;
- Epidemiological modeling and prediction algorithms;
- Monitoring and control systems using Big Data and cloud technologies;
- Contact tracing and population movement control using mobile applications;
- Analysis of health data using social networks.

The study used content analysis to identify and compare key trends, successful approaches, and limitations in the above categories. The level of adoption of technologies in developing countries was also examined.

The main goal of the methodological approach is to scientifically analyze what real results have been achieved in detecting and managing the COVID-19 epidemic using modern computer technologies, summarize existing experiences, and identify future research directions.

Conclusion

The COVID-19 pandemic has become one of the largest health crises in human history, with a global impact on all sectors. This situation has required a rethinking not only of medical approaches, but also of the entire healthcare system. In particular, the role of modern computer technologies in this process has once again been proven to be extremely important. The analysis conducted in this article shows that artificial intelligence, big data analytics, mobile applications, cloud technologies, and real-time monitoring systems have served as important tools in the fight against the pandemic.

Computer technologies have effectively solved strategic problems such as early detection of the disease, prediction of the trajectory of its spread, rapid identification of citizens who have been in contact with infected individuals, as

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well as vaccination and medical care management. In particular, the ability to analyze X-ray and CT images through artificial intelligence-based algorithms and make diagnoses based on clinical signs has provided rapid and reliable solutions independent of the human factor.

It is worth noting that technological development is improving the efficiency of healthcare services not only in developed countries, but also in developing countries. At the same time, there are certain limitations in the implementation of technologies - such as lack of infrastructure, data security, information literacy. To overcome such shortcomings, it is important to strengthen interstate cooperation, research and technology transfer.

In conclusion, it is clear that the importance of computer technologies in the fight against pandemics is at a strategic level. The systematic, widespread and integrated implementation of these technologies in preparing for future health crises will remain one of the pressing issues. Therefore, building strong bridges between scientific research, technological innovation and the health system is the need of the hour. Through this article, I have tried to highlight the unparalleled importance of computer technologies in the case of COVID-19 and I emphasize the need for more in-depth scientific research in this area in the future.

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