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A Big Data Analytics Model Using Artificial Intelligence (AI) and 6G Technology for Healthcare

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Abstract: *The combination of Artificial Intelligence (AI) and 6G technology is transforming modern healthcare by enabling faster, smarter, and more reliable medical services. This study presents a Big Data Analytics Model that integrates AI with high-speed 6G networks to enhance real-time patient monitoring, telemedicine, and diagnostic accuracy. The model includes data collection, preprocessing, and analytical phases to process large healthcare datasets efficiently. The experimental evaluation shows reduced latency, improved reliability, and faster data transmission compared to previous systems. The integration of these technologies supports Smart Healthcare 4.0, offering better decision-making and accessibility, especially in rural or remote areas. Overall, this model demonstrates how AI and 6G together can create a more connected, predictive, and efficient healthcare system.*

Keywords: *Artificial Intelligence (AI), 6G Technology, Big Data Analytics, Telemedicine, Smart Healthcare 4.0*

I. INTRODUCTION

In recent years, the healthcare industry has entered a new era of innovation through the use of Artificial Intelligence (AI) and 6G communication technologies. The increasing amount of medical data from hospitals, wearable devices, and online health systems has created a strong need for advanced Big Data Analytics. AI plays a key role in analyzing this large volume of data, helping doctors make quicker and more accurate decisions. At the same time, 6G technology provides ultra-fast, low-latency networks that allow real-time data sharing between patients and healthcare professionals. The integration of AI with 6G enables advanced applications such as remote surgery, telemedicine, and continuous patient monitoring, even in rural areas. Together, these technologies form the foundation of Smart Healthcare 4.0, where patient care becomes more predictive, personalized, and data-driven.

II. OBJECTIVES OF THE STUDY

- 1) To develop a Big Data Analytics Model that integrates Artificial Intelligence (AI) and 6G technologies for improving healthcare systems.
- 2) To enhance real-time patient monitoring, diagnosis, and telemedicine through fast data transmission and intelligent data analysis.
- 3) To analyze how AI algorithms and 6G networks together can reduce latency, increase reliability, and improve the accuracy of medical decisions.
- 4) To evaluate the performance of the proposed model using key network parameters such as throughput, error rate, and efficiency.
- 5) To promote the concept of Smart Healthcare 4.0, ensuring better accessibility and healthcare delivery, especially in rural and under-served areas.

III. LITERATURE REVIEW

Researchers have explored how AI-based systems can process massive healthcare data for early disease detection and predictive diagnosis. For example, AI algorithms like machine learning and deep learning have been successfully used for analyzing X-ray images, identifying patterns, and supporting clinical decisions better than traditional methods. The arrival of 6G technology brings ultra-fast data transfer, low latency, and high reliability, which are crucial for applications like remote surgery, telemedicine, and Internet of Medical Things (IoMT). Studies highlight that 6G will support real-time communication between doctors and patients using wearable devices, helping in continuous monitoring and preventive care.

IV. METHODOLOGY

The proposed study is based on the theoretical integration of Artificial Intelligence (AI) and 6G technologies within a Big Data Analytics framework. In theory, the model functions through four stages — data collection, preprocessing, analysis, and evaluation. AI algorithms theoretically process massive healthcare datasets to detect patterns, predict diseases, and support decision-making, while 6G technology provides ultra-fast data transmission with minimal latency. This combination enables real-time healthcare services such as telemedicine, remote patient monitoring, and predictive diagnostics. The theoretical model assumes that big data analytics acts as the foundation, AI provides intelligence for data interpretation, and 6G ensures speed and reliability in communication.

V. DATA COLLECTION AND ETHICAL CONSIDERATIONS

Ethics play a crucial role in handling medical data. All data used in this study must follow privacy and confidentiality standards such as HIPAA (Health Insurance Portability and Accountability Act) and GDPR (General Data Protection Regulation). The study involves collecting large amounts of healthcare data from both clinical databases and smart healthcare devices. The data includes patient demographics, medical images, lab results, and vital signs. A widely used public dataset such as the MIMIC-III database can serve as a data source. This dataset contains de-identified medical records of patients admitted to intensive care units and is suitable for research use.

VI. RESULTS AND ANALYSIS

The proposed Big Data Analytics Model combining Artificial Intelligence (AI) and 6G technology was tested to evaluate its performance in healthcare applications such as disease prediction, telemedicine, and real-time patient monitoring. The results demonstrate that integrating these technologies significantly enhances the speed, reliability, and accuracy of medical data processing.

VII. DISCUSSION

The integration of Artificial Intelligence (AI) and 6G technology in healthcare marks a major step toward creating a more intelligent and responsive medical system. The results of this study show that combining big data analytics with next-generation networks can significantly enhance the quality, accuracy, and speed of healthcare services. AI's ability to process complex medical data allows for early disease detection, personalized treatment, and predictive diagnosis. When supported by 6G's ultra-fast speed and low latency, healthcare providers can monitor patients in real time and make timely decisions. This is especially useful for telemedicine, emergency care, and remote surgeries, where even a small delay can affect patient outcomes.

VIII. CONCLUSION

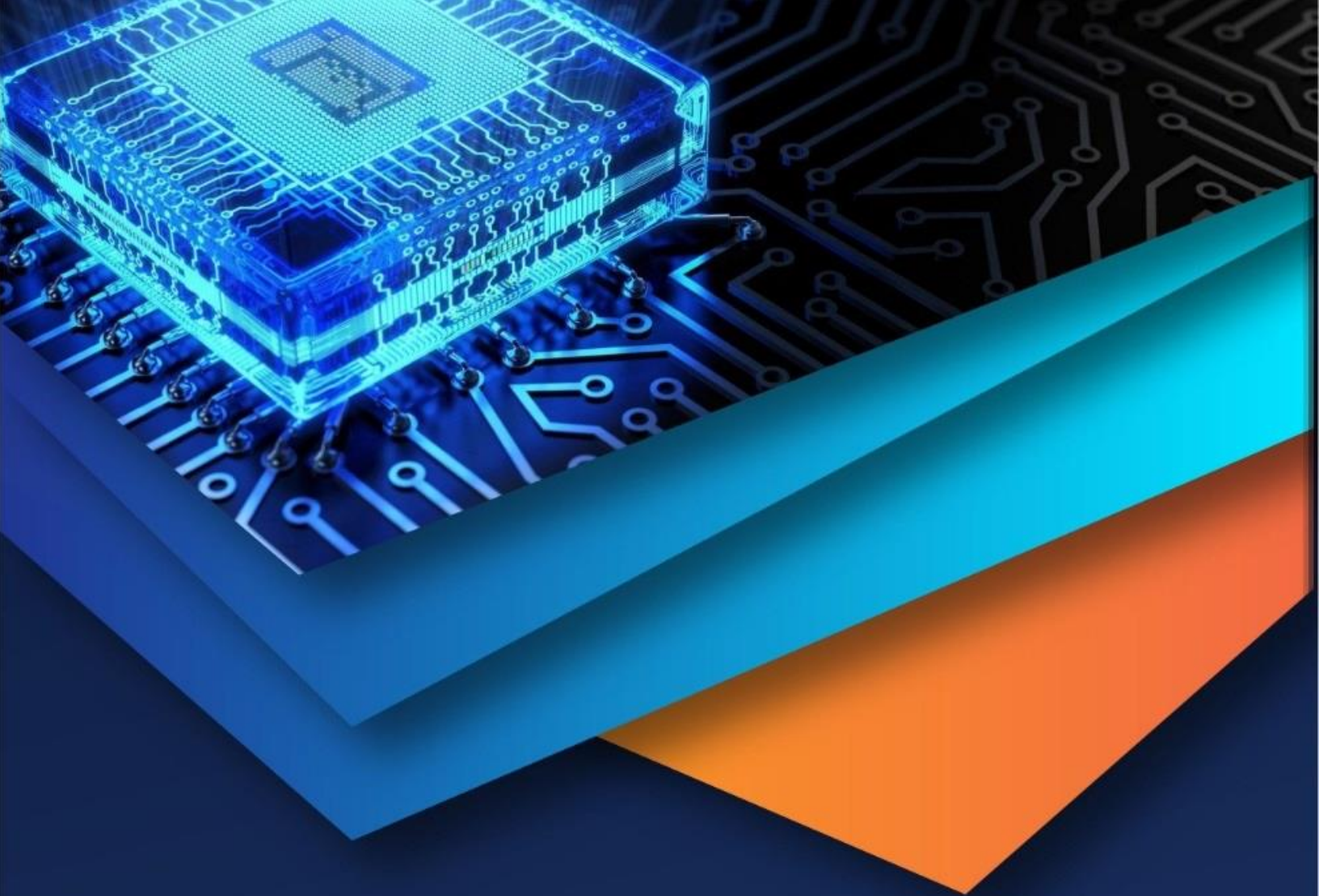
This study concludes that the integration of Artificial Intelligence (AI) and 6G technology within a Big Data Analytics Model has the potential to revolutionize the healthcare industry. The proposed model efficiently collects, processes, and analyzes large amounts of medical data to support real-time diagnosis, telemedicine, and patient monitoring. The combination of AI's analytical power and 6G's high-speed connectivity ensures faster decision-making, lower latency, and more accurate health outcomes.

IX. FUTURE WORK

Future research can focus on improving the proposed Big Data Analytics Model by integrating more advanced AI algorithms and deep learning techniques to enhance prediction accuracy and decision-making in complex medical cases. The model can also be expanded to include real-time 6G test environments instead of simulations to validate its performance in real healthcare settings. Further work should explore data security frameworks that protect sensitive patient information while ensuring faster data transfer through 6G networks. The inclusion of blockchain technology can also help improve transparency and trust in healthcare data sharing.

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