ANNOTATED BIBLIOGRAPHY

FROM BYTES TO BETTER HEALTH: LEVERAGING BIG DATA FOR ENHANCED REMOTE PATIENT CARE

A, A., Dahan, F., Alroobaea, R., Alghamdi, W. Y., Mohammed, N. M. K., Hajjej, F., Alsekait, N. D. M., & Raahemifar, K. (2023). A smart IoMT based architecture for E-healthcare patient monitoring system using artificial intelligence algorithms. ***Frontiers in Physiology, 14.*** **https://doi.org/10.3389/fphys.2023.1125952**

This article presents a smart healthcare system that uses smart Internet of medical Things (IoMT) architecture for remote healthcare monitoring. The biosensors capture real time patient data which is then sent to clous based IoMT repository. The data is then pre-processed to eliminate the noise and most relevant features which are extracted through Linear Discriminant Analysis (LDA). A reconfigured cuckoo search algorithm selects optimal features and a hybrid model combing the ResNet-18 and Google Net helps to classify data as normal and abnormal conditions. If abnormal conditions are detected, then system sends alerts to healthcare professionals. The performance of this architecture outperforms traditional methods, and provides a better accuracy, precision and help in making predictive healthcare more efficient and responsive.

This system can be utilised in a Big Data approach to solve remote health challenges by integrating IoMT with large-scale cloud platforms like Apache Spark or HDFS. This enables real time processing and handles vast datasets ensuring scalability and predictive analysis. The AI classifiers can predict the health anomalies in real-time, which helps to prevent early interventions for

patient with chronic diseases. Thereby enhancing the efficiency and impact of remote healthcare systems.

Abidi, M. H., Umer, U., Mian, S. H., & Al-Ahmari, A. (2023). Big Data-Based Smart Health Monitoring System: Using deep ensemble learning. ***IEEE Access, 11,*** **114880–114903. https://doi.org/10.1109/access.2023.3325323**

This research focuses on a big data based smart health monitoring system designed to track elderly people's physical activities using deep ensemble learning (DEL) methods. The deep ensemble learning model incorporates classifiers like CNN, LSTM, DNN, and DBN to predict physical activities with high accuracy. It leverages the Hadoop MapReduce framework for parallel processing of the data, ensuring efficient handling of large datasets. Using an optimization algorithm called Hybrid Dingo Coyote Optimization (HDCO), the system can optimise feature selection and parameter tuning, achieving superior results when compared to traditional methods.

This paper is highly relevant to the study on big data and remote healthcare monitoring by demonstrating how large-scale data from device can be processed using Hadoop MapReduce. The DEL model combines with multiple machine learning techniques to predict accurately and the HDCO algorithms approach to optimise the parameters could be adapted to manage the vast amount of healthcare data in mobile eHealth system.

Berros, N., Mendili, F. E., Filaly, Y., & Idrissi, Y. E. B. E. (2023). Enhancing Digital Health Services with Big Data Analytics. ***Big Data and Cognitive Computing*****, 7(2), 64. https://doi.org/10.3390/bdcc7020064**

This article explores the growing role of big data in remote healthcare monitoring systems and mobile eHealth solutions by improving decision-making, clinical research, and patient care. The article discusses the challenges in handling large, varied datasets and the need for advanced tools such as machine learning algorithms for predicting health outcomes which helps to improve preventive care in remote settings. The technical insights into Apache Spark and NoSQL databases, in designing scalable and data driven solutions. The authors also highlight the importance of big data analytics for personalised medicine, timely clinical decisions and optimizing healthcare resource. It also addresses technical and organisational challenges that healthcare institutions may face when implementing big data analytics. Additionally, the paper suggests strategies for healthcare organisations to leverage big data effectively, including setting clear objectives, ensuring the security of patient data, and using advanced tools for processing real time data.

This research is particularly relevant to the advancement remote healthcare monitoring systems and provides a solid framework for using big data in real time monitoring and predictive analysis to integrate wearable devices and mobile technologies into healthcare. The emphasis on scalable technologies, like Apache Spark, for real-time data analysis aligns with the need for robust infrastructure in remote health monitoring. Moreover, the authors attention to patient data protection and utilizing data-driven decision-making is key to creating secure, efficient, and scalable healthcare solutions. Furthermore, the study's exploration of machine learning's potential to enhance precision and speed of remote diagnostics, makes this research a critical resource for pushing forward big data applications in remote and mobile healthcare systems.

Gupta, Poonam Mithailal. (2023). The Role of Big Data in Smart Healthcare. ***International Journal of Internet of Things*** **11(4), 11–18.** **http://article.sapub.org/10.5923.j.ijit.20231101.02.html**

The paper "The Role of Big Data in Smart Healthcare" explores how big data, combined with Internet of Things is revolutionizing healthcare. It explains how the IoT devices collect vast amounts of real time data and then are processed using big data analytics. These tools capture real time data such heart rate, oxygen levels and blood pressure, allowing healthcare providers to perform continuous monitoring. The further explores key technical challenges in Big Data integration, including data security, data governance, high speed data processing through tools like Hadoop and Spark and ensures the data veracity and reliability across multiple sources.

This paper introduces the technical concept which are vital to solve challenges in remote health monitoring. Other key highlights include the use of machine learning algorithms that analyse volumes of patient data to drive predictive analytics capable of foreseeing an adverse health condition. For example, some wearable devices can detect abnormal rhythms in heartbeats or blood glucose level and alert health professionals to take immediate action. It also presents the use of distributed storage systems like Hadoop and Apache Spark for efficient processing of real-time large data and ensures actionable results in less time.

Khan, Z. F., & Alotaibi, S. R. (2020). Applications of Artificial Intelligence and big data Analytics in M-Health: A Healthcare System Perspective. ***Journal of Healthcare Engineering,*** **1–15.** **https://doi.org/10.1155/2020/8894694**

This paper focuses on the review of how m-health will be enriched by the integration of big data analytics and AI by offering benefits through remote health monitoring and personalized care using wearable sensors and smartphones. AI technologies, such as machine learning algorithms, will analyze large volumes of data including electronic health records, medical images, physiological data, among others for the detection of abnormalities and prediction of outcomes. This paper presents an AI-driven m-health model that processes real-time data from patients through telemonitoring devices, supporting clinical decision-making with immediate alerts and enabling remote diagnostics. Key challenges, including data privacy, security, and infrastructure limitations are highlighted, underscoring the importance of secure and scalable solutions in m-health system.

This research can significantly provide a solid foundation for exploration of big data and remote healthcare by showing how AI and big data analytics enhance remote patient care. The use of AI algorithms to analyse unstructured data, such as medical images and patient-generated health data, is important in understanding the real-time monitoring in healthcare. The paper's predictive analytics in remote systems can anticipate critical health events, reducing emergency hospital visits. Additionally, the architecture proposed for integrating AI with big data platforms can inform the design of scalable and secure remote healthcare systems.

Paul, M., Maglaras, L., Ferrag, M. A., & Almomani, I. (2023). Digitization of healthcare sector: A study on privacy and security concerns. ***ICT Express*****, 9(4), 571–588. https://doi.org/10.1016/j.icte.2023.02.007**

This paper investigates Digitization of health-one of the most important concepts today-including EHR, remote patient monitoring, AI, and telemedicine. It brings to light the fact that digital tools will enhance patient care by improving the way data is shared and enhancing real-time monitoring. On the other hand, the paper also demonstrates some key privacy and security issues in relation to increased use of IoMT, where connected devices raise vulnerabilities through large-scale data sharing. The paper thus suggests employing federated learning and blockchain for enhancing data privacy and security in healthcare.

This paper aligns closely on in depth exploration of the impact of digitization on healthcare with a focus on security and privacy risks of integrating technologies such as IoMT, AI and telemedicine in health systems. The privacy and security frameworks outlined, such as the federate learning, can be used to address challenges of handing sensitive data. Furthermore, the paper's exploration of big data's impact on healthcare management offers an insight to enhance predictive analytics and decision making in remote health monitoring systems.

Renugadevi, N., Saravanan, S., & Sudha, C. N. (2021). Revolution of smart healthcare materials in big data analytics. ***Materials Today Proceedings*****, 81, 834–841. https://doi.org/10.1016/j.matpr.2021.04.256**

This study focusses on how big data and IoT technologies converge to bring a revolution in health care in smart cities because of COVID-19. The paper elaborates on the integration of Information and Communication Technology within health systems, giving rise to the development of Electronic Health Records and connected health platforms that enable medical services more

effectively and at lower costs. It has also focused on the role of IoT in the monitoring of patients from a distance through smart devices and sensors by collecting health data in real time.

This research is directly applicable to advancing remote healthcare monitoring and mobile eHealth systems. It demonstrates how big data and IoT can be integrated to support real-time monitoring, predictive diagnostics, and patient self-management. The discussion on IoT devices and wearable technologies, provides a roadmap for building systems that enable continuous patient monitoring. Additionally, it focuses on the challenges of data storage, privacy, security and provides insights into addressing the technical and ethical concerns inherent in implementing a large scale and data driven solutions. This makes the study a valuable resource for modern healthcare development.

Shajari, S., Kuruvinashetti, K., Komeili, A., & Sundararaj, U. (2023). The Emergence of AI-Based Wearable Sensors for Digital Health Technology: A review. *Sensors*, 23(23), 9498. https://doi.org/10.3390/s23239498

The research paper reviews the evolution and application of AI-based wearable sensors in digital health technologies. These sensors, capable of monitoring various physical, chemical, and biological signals, are transforming remote health care by offering real-time, continuous data collection for personalized diagnostics and treatment. AI algorithms are needed to analyse these data to improve sensors accuracy and to enable personalised medical care. Despite the progress, challenges like data accuracy, sensitivity and energy consumption in wearable devices limit their full potential in real world medical applications.

This paper helps to gain insights by focusing on the integration of AI in wearable sensors that generate significant amount of health data, ideal for big data analysis. This data can be processed and analysed to offer personalized care remotely and sustainable eHealth solutions. The paper's focus on energy-efficient AI models and accurate data processing along with big data to work together to improve accuracy, reliability, and scalability of remote healthcare monitoring systems.

Son, Y. S., & Kwon, K. H. (2024). Utilization of smart devices and the evolution of customized healthcare services focusing on big data: a systematic review. *mHealth*, 10, 7. https://doi.org/10.21037/mhealth-23-24

The article "Utilization of Smart Devices and the Evolution of Big Data-Driven Precision Healthcare Services: A Systematic Review" aims to explore smart devices integrated with big data analytics in healthcare. It discusses how wearable devices, from fitness trackers to smartphones, continuously gather an ocean of information from users about their activity levels, glucose levels, heart rate, and more. Big data analytics then processes this tremendous information to enable personalized health care, prevention, and more accurate diagnosis. They further raise a case that the described technology can improve disease prevention and health monitoring among elderly people through the use of real-time data. However, data privacy, security, and equitable access are major concerns.

This article applies directly to a study of big data and remote healthcare, as it outlines the technical infrastructure necessary to monitor health from a distance.

By using wearable devices in concurrence with big data, for example, one can monitor in real time various health metrics, including glucose and heart rate levels, making remote monitoring of chronic conditions easier. On one hand, big data applications ensure the potentiality of predictive analytics and personalized health interventions to reduce hospital visits and optimize patient care. Ensuring challenges in data privacy and scalable infrastructure will lead towards a secure, accessible, and scalable remote health care system.

Xiao-Yong, C., Bo-Xiong, Y., Shuai, Z., Jie, D., Peng, S., & Lin, G. (2022). Intelligent health management based on analysis of big data collected by wearable smart watch. ***Cognitive Robotics*****, 3, 1–7. https://doi.org/10.1016/j.cogr.2022.12.003**

The paper highlights several key big data techniques which are important to wearable health monitoring. Firstly, the study focuses on physiological data such as pulse, heart rate, and blood oxygen that can be continuously monitored and transmitted through 5G Internet to a health management platform, where the physicians use an intelligent math model to evaluate health conditions. Secondly, development of advanced algorithms and machine learning models to enable early diagnosis, predict diseases, and alert people to health problems in advance. AI integrated into the system supports the automatic detection of health anomalies, reducing the burden on the workforce while increasing the speed of intervention. The system will also integrate predictive analytics, which can determine how health will change in the future from past trends in data, to enable preventive measures.

This approach is highly relevant in highlighting big data's role in remote healthcare monitoring. The use of big data to manage vast, continuously generated data from wearable devices aligns with providing scalable eHealth solutions. The paper’s emphasis on real-time data collection, automated feedback loops through smartphone applications and 5G-enabled transmission can serve as a model for designing robust eHealth solutions. Additionally, the application of predictive analysis AI to wearable data can inspire the design of intelligent remote health monitoring systems, where patient health is monitored in real time, and help prevent emergencies before they occur though predictive models.