Chapter 12
Deep Learning and Big Data for Biomedical Image Processing in Employee Health:
Sparking a Digital Twin in an Era of Lifestyle Upheaval

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ABSTRACT

Digital twins emerge as the cornerstone, ushering in an era of personalized healthcare and wellness recommendations. It guides the reader through the intricate network of Big Data and explains its crucial role in the examination of biological images. The foundation of these cutting-edge fields is the creation of digital twins, complex virtual depictions of individual health profiles. This chapter is about improving employees health, advocating for preventative care and providing people with the knowledge and resources they need to take control of their own lives. Simultaneously, it navigates the dynamic IoT ecosystem, revealing its multifaceted contributions to real-time health data acquisition. Deep learning with its neural networks and convolutional prowess, further enhances our understanding and interpretation of biomedical images.

DOI: 10.4018/979-8-3373-2210-0.ch012

1. INTRODUCTION

The sheer volume, velocity, and variety of biomedical data demand sophisticated analytics and storage solutions, driving the need for scalable and efficient frameworks. As it navigate this data-driven landscape, the paper aims to unravel the complexities of utilizing Big Data in the context of biomedical image processing, emphasizing its role in enhancing precision, improving diagnostic accuracy, and fostering real-time analytics for informed decision-making.

Concurrently, the Internet of Things has infiltrated the healthcare sector, establishing a smooth network of information by tying together gadgets, sensors, and wearables. This networked network of intelligent medical equipment makes it possible to monitor patients continuously, do remote diagnostics, and give people the power to take an active role in their own health. In this article, the many uses of IoT in healthcare will be examined, from wearables that track vital signs to smart hospitals with IoT-enabled infrastructure (Sejdic & Falk, 2018). By examining the impact of the IoT universe on healthcare, the research aims to showcase its potential to revolutionize patient care, improve treatment outcomes, and elevate the overall quality of health services.

Through deep learning, computers learn to recognize patterns, anomalies, and subtle nuances in medical images, assisting radiologists and clinicians in diagnostics and treatment planning. Furthermore, AI-powered virtual assistants are emerging as intelligent interfaces for patients, offering real-time health recommendations and support. At the heart of this technological synergy lies the digital twin, an amalgamation of Big Data analytics, IoT data streams, and deep learning algorithms. Digital twins are personalized avatars, encapsulating an individual's health status. They herald an era of personalized treatment, preventive healthcare, and wellness management.

The transformative potential is evident across the healthcare spectrum, from precision medicine and proactive interventions to enhancing diagnostic accuracy and democratizing remote healthcare access. It becomes evident that the impact of this convergence extends beyond the realm of healthcare. Policy frameworks, ethical considerations, and data governance become paramount, necessitating interdisciplinary collaboration. The healthcare revolution catalyzed by Big Data, IoT, and deep learning is not an isolated phenomenon but a precursor to a broader upheaval in lifestyle management. Through illuminating case studies, this article underscores how organizations harness this transformative synergy to craft digital twins, providing personalized healthcare and wellness recommendations that empower individuals to lead healthier lives.