

Chapter 16

A Comprehensive Overview of Artificial Intelligence in Healthcare

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ABSTRACT

Artificial intelligence's (AI) learning, reasoning, problem-solving, and perception features have given a new horizon to the modern healthcare infrastructure. AI is demonstrating best practices in different domains of healthcare, such as efficient drug discovery processes, accuracy in disease diagnosis, assisted surgeries, efficient utilization of human resources, and many more. This chapter provides a comprehensive overview of AI in healthcare, its applications, and recent research studies with respect to disease prediction and information-processing healthcare applications. Associated technologies of AI healthcare applications have been discussed as the realization of concepts is not possible without considering these technologies. Furthermore, it is essential to present the ethical aspect of AI in healthcare, and discuss the ethical boundaries the ethical boundaries of the applications. AI is becoming inevitable for modern and future healthcare; however, certain challenges are associated with the realization of smart and intelligent healthcare infrastructure.

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INTRODUCTION

Modern healthcare systems are heavily relying on technology. It is a continuous and ongoing advancement in the field of healthcare from the from a technological perspective, whether it is drug discovery or robotic surgeries, technology is transforming healthcare and opening several new avenues in healthcare with greater efficacy. The modern healthcare system is also referred to as, “Digital Healthcare.” Digital technology is revolutionizing the healthcare sector by incorporating software applications, modern hardware, and a variety of services. Computer-aided systems became a part of the healthcare infrastructure for more than 50 years as decision support systems (Tohka & Van Gils, 2021). These healthcare computer-aided systems have not only optimized and transformed health consultations, surgeries, and related human resource services, but effectively contributed to the broader healthcare industry which includes pharmacy, logistics, insurance, medical instruments, and pathology to name a few.

One of the integral components of digital technology is data, without data digital technology will not exist. Data has hidden knowledge that is apparently invisible, this invisible knowledge needs to be extracted and can be used for a variety of applications, such as, to make machines learn and imitates intelligence. In the 1950s, John McCarthy proposed the term “Artificial Intelligence (AI)” (Andresen, 2002) and defined it as

“The science and engineering of making intelligent machines”

There are essential components of AI that includes data, algorithm, processing power, and scenarios. Data is the component that serves as the relevant experience for the machines to learn for the specific application, without data machines cannot be intelligent. With the help of an algorithm machine process the data and train (learn) itself over the processing power (i.e., hardware and software capabilities), and finally machine applies the learned knowledge to a situation (scenario). Massive health-related data is being generated and accumulated by healthcare organizations and institutes in the form of datasets, lab reports, electronic health records (EHR), medical imageries, drug data, clinical trials, insurance claims, and healthcare devices [12]. This significant or considerable amount of data can serve as learning knowledge by analyzing data and extracting the hidden patterns for diagnosis, prediction, treatment planning, drug discovery, and decision-making to make an intelligent and comprehensive healthcare system of the future (Johnson et al., 2021). The significance of AI in healthcare has been portrayed in Figure 1.

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