Chapter 7
An Exhaustive Inference of Machine Learning Applications in Healthcare:
Analyzing Research Studies on Diagnosis and Prevention

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ABSTRACT

Machine learning has become an important tool in healthcare research to solve complex classification problems effectively, efficiently, and quickly. Generally, doctors treat patients according to their medical knowledge and personal experience. Since different professionals have different experiences, they may sometimes make a wrong diagnosis and need more time for treatment. Current research mainly focuses on the problem of classifying/predicting medical data based on machine learning. There is a need to create an intelligent structure that can distribute the information stored in the database. Human data analysis capabilities are less compared to data storage. This is more important in the case of medical records because it helps search, diagnose, and treat patients based on individual records. This paper's main goal is to review the pre-researched methodologies of machine learning techniques to analyze healthcare data to diagnose and prevent illnesses. Finally, these research articles are classified based on healthcare data, machine learning techniques, and performance parameters.

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1. INTRODUCTION

The current chapter covers machine learning techniques and healthcare data management strategies for effective decision-supporting and insight-producing. Additionally, it covers a few recent studies on data mining applications in medical research. These days, computers help individuals in ways that were not feasible in the past. Before, we could only do work with the help of human ability; today, we can accomplish activities on a scale we never could have dreamed of with computers. The main problem is developing an intelligent system that will analyze, evaluate, and use this information as medical information increases daily. One of the most important tools of medical data analysis is data mining. Therefore, data mining has been increasingly developed in healthcare services to increase the quality of healthcare services while reducing costs. Consequently, several research publications that use healthcare data have been evaluated and analyzed t to improve the efficacy of data analytics in the medical field. A few relevant papers on analyzing healthcare data (using machine learning techniques and illness datasets) are outlined and classified.

The healthcare sector is undergoing evolutionary changes. The digitization of healthcare systems is producing a significant amount of health data. Today, Health Information Technology (HIT) has advanced to instantaneously gather, store, and transmit data electronically from anywhere globally. It is now a helpful instrument for raising the standard and productivity of healthcare.

All medical records that are digitally saved are generally considered to be healthcare data. It could include comprehensive medical history information on the patient, clinical reports, doctor's prescription notes, etc. These data are all large, multidimensional, and diverse, which leads to big data in the healthcare industry (Tripathi & Mohan, 2016). These data come from various internal and external sources, including social media, biometrics, healthcare, and picture data.

An additional significant challenge facing today's Healthcare Information Systems (HISs) is the daily exponential growth of healthcare data. In addition to the massive volume of healthcare data, this shift is marked by a sharp increase in the pace and diversity of data output.

Healthcare data encompasses the vast amounts of information generated within the healthcare sector, which includes patient records, clinical trials, administrative data, and more. This data is critical for improving patient care, researching, and informing healthcare policies.

2. BACKGROUND

The term healthcare refers to improving healthcare services to meet people's needs. In healthcare delivery, patients, doctors, nurses, researchers and the healthcare sector work hard to manage and obtain medical information. In recent years, with the rapid development of science and technology, the increasing amount of information in many areas, including healthcare, has increased the need to seek information.

Machine learning, data mining, and statistical techniques are basic sciences that enhance a person's ability to make good decisions and maximize profit in any field (Ajay et al., 2023; Belwal & Belwal, 2017; Indu et al., 2023).

This research focuses on the problem of classification/prediction of medical data based on machine learning (monitoring) techniques. Many learning algorithms can be used together with data mining techniques to solve clinical classification problems, thereby increasing diagnosis's speed, accuracy, and reliability.