Chapter 17
Optimizing COPD Management:
Machine Learning Solutions for Early Detection and Data Privacy

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ABSTRACT

Worldwide, Chronic obstructive pulmonary disease (COPD) is one of the reasons for the high number of deaths. Patients who have COPD face many struggles and lose their quality of life. Machine learning has the ability to enhance the life of the patient through the proper treatments by doctors in the early stages. Machine Learning technology has gained more attention in the medical sector, its main objective is to enhance the accuracy and speed of the physicians. Machine learning-based models help to find the disease at its early stage. This work imparts an overall analysis of machine learning utilization in disease diagnosis and data privacy-preserving. In this work, COPD diagnosis by the machine learning method is overall analyzed. This imparts utilization of two machine learning methods in identifying COPD and its severity level namely Support Vector Machine (SVM) and Random Forest (RF). Both techniques have high-level impacts in medical impacts by lower training time. This work examines some pre-processing

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steps in obtaining quality input.

1. INTRODUCTION

The medical industry faces many challenges with the rapid spread of disease and identifying the disease within a time was a major issue faced by the healthcare experts. Currently, in the digital world numerous techniques have been introduced in many fields but in the healthcare industry AI and robotics play a vital role in prompt diagnostics (Alowais et al., 2023). In the assessment of medical images automatically accurate evaluation was done by the AI, so it helps to decrease the workload of doctors. Further, it enhances the performance of diagnosis and forecasting the disease since the physicians need more time for disease detection in the healthcare because they employ the manual process and periodically cause many errors but the AI reduces the above issues accurately. Enhanced computer algorithms are deployed by AI in the healthcare industry for treatment planning, forecasting, and diagnosing (Khanna et al., 2022).

In the healthcare industry, AI methods depend on medical image processing to find abnormalities and patterns that are not exactly visible to the human eye (Mansour et al., 2021). The reprogrammable machine is the other name of a robot it provides more security accuracy in the medical field and it performs in many critical treatment areas like spinal surgery and joint replacement. In addition, robots help to deliver medicine to the clinical, and many types of robots were designed in the healthcare industry such as surgical robots and physical robots in which the surgical robot acts in the operating rooms (Maibaum et al., 2022).

In the occurrence of an epidemic disease physicians are not in direct contact the humans at that time humans need medical robots' support for monitoring the patient activity and it offers treatments. The healthcare industry achieves many advantages by employing the integration of medical robots and AI such as security, decreased cost, and decreased time complexity (Holland et al. 2021). Chronic obstructive pulmonary disease (COPD) mainly affects the respiratory region because it is one kind of lung disease. The main symptoms of this disease such as chronic cough, wheezing, and chest tightness, so early detection and treatment of this disease are crucial to decrease the death rate of patients (Hussain et al., 2021). Therefore AI includes many machine learning techniques that help to early detection and categorize the disease with high accuracy rates (Ma et al., 2020).

2. IMPACT OF M-HEALTH

The impact of m-health in the isolation period helps to manage the mental health of the patients and decrease stress (Wu et al., 2018). Further, it manages the patient's daily activities and also observes the symptoms of the chronic disease. The user and physician directly contact with the help of m-health applications to discuss the health conditions

Advancement in M-Health

In the digital world, the advances in m-health are rapidly increasing in the medical field because it helps to track patients and make communication easier (Cao et al., 2022). Physicians need more time for disease detection in healthcare because they employ the manual process and periodically cause many