Chapter 5
Detection of COVID-19 Infection Using Chest X-Ray Images

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ABSTRACT

Coronavirus (COVID-19) is an infectious viral illness that causes health concerns. It was initially recorded in Wuhan (China). Early diagnosis of the disease aids in preventing its spread. Real-time reverse transcription-polymerase chain reaction (RT-PCR) is a laboratory test method for detecting the COVID-19 virus. To avoid the spread of COVID-19 disease, the researcher researched other techniques of diagnosis. One such technique is the classification of COVID-19 using medical images, notably chest x-ray (x-ray), computed tomography (CT), and ultrasound images. This chapter suggests merging canny edge detection techniques with traditional machine learning and deep learning techniques to diagnose COVID-19.

INTRODUCTION

Image processing techniques are critical in automatically diagnosing diseases such as cancer, diabetes, pneumonia, and others. With the increasing number of COVID-19 cases around the world, numerous image processing algorithms based on medical images have been proposed for detecting COVID-19. The SARS-CoV-2 virus causes

COVID-19, a highly contagious disease that first surfaced in Wuhan (China). The World Health Organisation declared it a global pandemic on March 11th, 2020 (Lee, 2020; Tavakoli et al., 2020). COVID-19 can be spread via a droplet by coughing or sneezing (Stadnytskyi et al., 2021). RT-PCR and Rapid Anti-body Test (RAT) are recommended laboratory procedures for detecting COVID-19. However, RT-PCR takes a long time and produces a high number of false-negative results (Kanji et al., 2021). As a result, COVID-19 can be detected using different diagnostic medical imaging procedures like X-ray and CT images (Rubin et al., 2020; Wong et al., 2020). These medical imaging techniques aid in the identification of the damaged area.

Image Feature provides essential information for classification algorithms and helps in automatically classifying images. Extracting crucial features from the image and building the models from those features are vital for medical image classification. Feature extraction algorithms help to identify the critical features that best represent the image containing fewer parameters. Once the features are extracted, the images can be further classified using Machine Learning Techniques.

Machine Learning is an extensive field of research and is still expanding to date. It acts as the driving force behind the advancement of artificial intelligence and comprises elements of mathematics, statistics, and computer science. It has been employed in the various healthcare sector as well. Machine Learning can be characterized as supervised, unsupervised, and reinforcement learning.

Types of Machine Learning

Supervised Machine Learning

It is an approach that involves training of model on various inputs (or features) and is related to a known outcome. In other words, the machine learning algorithms are trained on labeled data. The trained algorithm can be used to predict the new data. The supervised model can be further classified as a regression or classification model. If the output is discrete, the models are said to be classification models; otherwise, if a model gives continuous value prediction, it is referred to as a regression algorithm.

Unsupervised Machine Learning

It deals with unlabeled data. In unsupervised learning, algorithms seek patterns without giving any input from the user. Clustering, dimensionality reduction, or outlier detection can be performed using unsupervised learning.

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