Chapter 3
Robust Diagnostic System for COVID-19 Based on Chest Radiology Images

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ABSTRACT

The proposed system is based on a diagnosis of COVID from x-ray images. In the respiratory system, 17 different viral infections are possible. Accurately discriminating COVID from other viral infections is necessary today as it spreads rapidly. The proposed system differentiates COVID infection accurately from other viral infections. The convolutional neural network (CNN) provides superior performance for disease diagnosis based on images in the deep learning era. In this chapter, to solve this issue, the authors propose a hypergraph-based convolutional neural network-based fast and accurate diagnosis system for COVID. In this work, the hypergraph represents the sophisticated features of a lung x-ray image to diagnose COVID. In-depth features are extracted from the x-ray images using residual neural networks. In order to discriminate COVID viral infection from other viral infections, the hypergraph fusion approach is used.

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INTRODUCTION

According to the World Health Organization (WHO) report, millions of people are affected by the coronavirus. There is a need to repeat the test for confirmation (Chu, 2019). As it is a fast-spreading pandemic, there is a demand for rapid and accurate diagnostic systems. Based on Fang's (Fang, 2020) study, lung radiology image-based diagnostics outperformed all other screening methods. With a strong suggestion, a diagnostic with radiological images could be a first step in monitoring the COVID (Li, 2020). Early diagnosis of 2019-nCoV is crucial for disease treatment and control. Compared to a Reverse transcription-polymerase chain reaction (RT-PCR), chest X-ray imaging may be a more reliable, practical, and rapid method to diagnose and assess COVID, especially in the pandemic region. Even though radiology images-based COVID diagnosis is faster than PCR, it requires the Artificial Intelligence (AI) based diagnosis to gain a rapid and accurate explication over the X-ray images (Kermany, 2018).

Respiratory illness includes H1NI viral infection, H5N1, Enterovirus, and viral pneumonia. Among these infections, coronavirus infection is severe as it mutates easily and rapidly. There are three basic types of coronavirus infection such as SARS, MERS, and COVID-19. There is a demand to discriminate these three viral infections from other viral pneumonia. This paper proposes the hyper graph-based approach to discriminate coronavirus infection from other virus infections in the lungs based on X-ray images.

The proposed system is based on a diagnosis of COVID from X-ray images. In the respiratory system, 17 different viral infections are possible. Accurately discriminating COVID from other viral infections is necessary today as it spreads rapidly. The proposed system differentiates COVID infection accurately from other viral infections. The Convolutional Neural Network (CNN) provides superior performance for disease diagnosis based on images in the deep learning era. Diagnosis of COVID from X-ray images needs a much more complex representational model as there is a demand to classify the images based on highly sophisticated features. In this paper, to solve this issue, we propose a Hypergraph-based convolutional Neural network-based Fast and Accurate Diagnosis system for COVID. In this work, the Hypergraph represents the sophisticated features of a lung x-ray image to diagnose COVID. In-depth features are extracted from the X-ray images using Residual neural networks. In order to discriminate COVID viral infection from other viral infections, the Hypergraph fusion is approach is used. The proposed model is evaluated based on the COVID dataset