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Assorted Machine Learning Classifiers with Covid-19 Identification from Chest X-Ray Images Using Local Binary Patterns

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Abstract
A novel coronavirus(nCoV) is a new strain that has not been previously identified in humans. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a novel severe acute respiratory syndrome coronavirus. It was first isolated from three people with pneumonia connected to the cluster of acute respiratory illness cases in Wuhan. All structural features of the novel SARS-CoV-2 virus particle occur in related corona viruses in nature. The novel corona virus disease 2020 (COVID-19) constitutes a public health emergency globally. The number of infected people and deaths are proliferating every day, which is putting tremendous pressure on our social and healthcare system. Rapid detection of COVID-19 cases is a significant step to fight against this virus as well as release pressure off the healthcare system. One of the critical factors behind the rapid spread of COVID-19 pandemic is a lengthy clinical testing time. The imaging tool, such as Chest X-ray (CXR), can speed up the identification process. Therefore, our objective is to develop an automated system for the detection of COVID-19 samples from healthy using CXR images.This project Covid-19 identification from chest x-ray images using local binary patterns with assorted machine learning classifiers is a novel approach that helps to detect whether a person is infected with covid-19 or not. Detection of virus is done using a machine learning method Local Binary Pattern (LBP) algorithm and convolutional neural networks algorithm. Early detection of virus is crucial in the complete recovery of the patient but can be fatal if detected in the later stages.

Introduction

COVID-19 disease is increasing daily due to the lack of quick detection methods. All over the world, a huge number of people died of this disease in 2020. The respiratory tract and lungs are the media where the virus can spread easily. As a result, inflammation occurs, and air sacs can be filled with fluid and discharge. The process is responsible for creating an obstacle in oxygen intake. Quick and accurate detection of the virus is a major challenge for doctors and health professionals around the world in order to reduce the death rate caused by this virus.

Recently, the reverse transcriptase-polymerase chain reaction (RT–PCR) diagnostic method is found to be effective in detecting the virus. However, the method has some drawbacks, including longer detection time and lower detection rate of the virus. Strict requirements in the laboratory and diverse characteristics of the testing could be attributed to the drawbacks [18,19]. Researchers are working on overcoming the limitations of RT– PCR testing to enhance diagnosing and detection of the COVID-19.

Proposed System

The proposed system is built overcoming the disadvantages in existing system. This system will preprocess the data to extract the useful data. Then it classifies the data using convolutional neural networks algorithm. The proposed Covid 19 infection identification method uses the human chest X-Ray images of patients. There are two main phases in the identification; feature extraction and classification. Local Binary Patterns (LBP) are used for extracting feature sets from the input chest X-Ray images. Later, the feature sets are classified

using supervised learning algorithms. The main objective of our proposed method is to use the DCGAN-CNN method for efficient classification of CXR images into three categories: normal, pneumonia, and COVID-19.

Literature Survey

Ahammed et al. [29] proposed a deep neural network based system where CNN provided high accuracy (94.03%). The authors trained the system with normal, pneumonia and COVID-19 patient's chest X-ray images. The limitation of the work was that a dataset with only 285 images was used for developing the system, and this small number of data was not perfect for training a deep learning-based system for the COVID-19 prediction.

Chowdhury et al. [30] worked with chest X-ray images to develop a novel framework named PDCOVIDNet based on parallel-dilated CNN. In the proposed method, the authors used a dilated convolution in the parallel stack that could capture and stretch necessary features for obtaining a detection accuracy of 96.58%.

Abbas et al. [31] proposed and validated a deep convolutional neural network called decompose, transfer, and compose (DeTraC) to detect COVID-19 patients from their chest X-ray images. They proposed a decomposition mechanism to check irregularities from the dataset by investigating class boundaries for obtaining a high accuracy (93.1%) and sensitivity (100%).

Azemin et al. [32] used a deep learning method based on the ResNet-101 CNN model. In their proposed method, thousands of images were used in the pre-trained phase to recognize meaningful objects and retrained to detect abnormality in the chest X-ray images. The accuracy of this method was only 71.9%.

Implementation

The modules that are included in this project are data selection, pre-processing, splitting dataset into train data and test data, classification and result generation.

Data Selection

The dataset required in this system is chest x-ray images of patients infected with covid-19 and pneumonia and also normal people datasets. These are required to train the model. Chest imaging is commonly used in medicine, and it plays an important role in the detection of COVID-19.

Data Pre-Processing

Data pre-processing is the process of extracting useful data from the raw data by removing unwanted data. The unwanted data includes noise data, missing data etc. In this system, image preprocessing is done. In this method, x-ray images are converted from ROI images to RGB and then to gray scale images.

Splitting Dataset into Train and Test Data

Data splitting is the act of partitioning to be had statistics into two portions, normally for cross-validatory purposes. One part of the data is used to increase a predictive model. And the opposite to assess the model's performance. Separating data into training and testing sets is an essential a part of evaluating data mining models. Typically, while you separate a data set right into a training set and testing set, maximum of the data is used for training, and a smaller part of the data is used for testing.

Classification

Classification is done using convolutional neural networks algorithm. CNNs are equipped with an input layer, an output layer, and hidden layers, all of which help process and classify images. The hidden layers comprise convolutional layers, ReLU layers, pooling layers, and fully connected layers, all of which play a crucial role. CNN is a machine learning algorithm for machines to understand the features of the image with foresight and remember the features to guess whether the name of the new image is fed to the machine.

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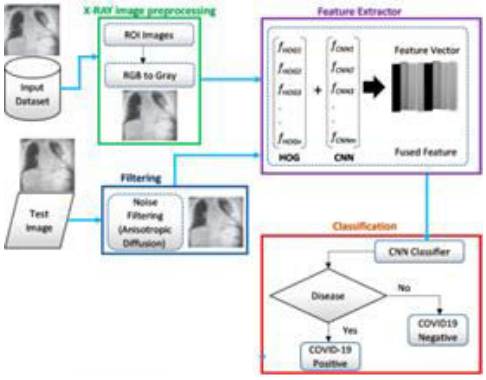
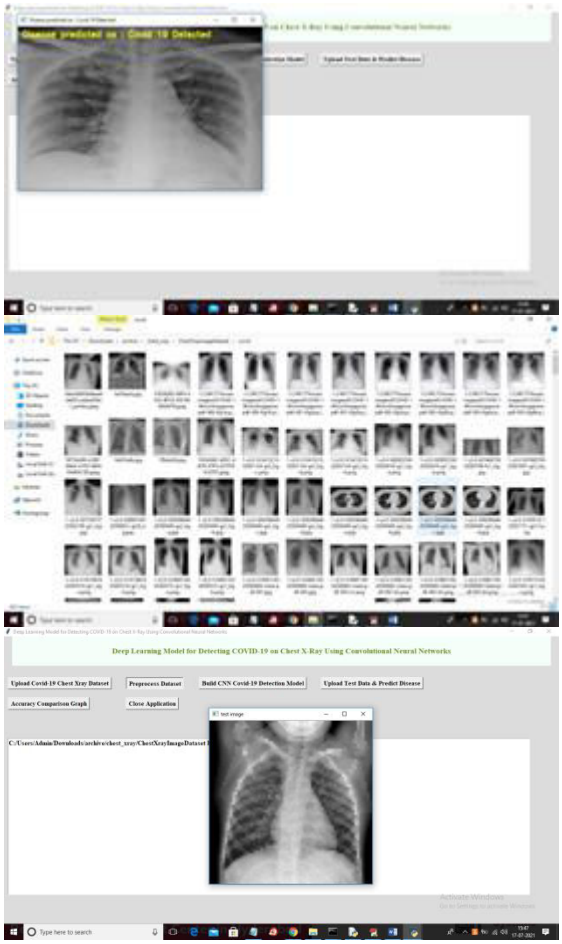


Result Generation



Conclusion

In this study, the machine learning classifiers are used to predict covid-19 virus. Chest x-ray images are taken as input data and applied into pre-processing method. In pre-processing method, the process will actually be like cleaning the dataset and extract the useful data such like feature extraction. Then it processed into feature selection method, in this method the dataset is split into training dataset and testing dataset. Finally, the classification method machine learning algorithm is used to predict the covid-19 virus. By using this system, we can detect the virus at earlier stage to reduce the fatality rate of humans.

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