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AUTOMATED DETECTION OF COVID-19 CASES USING DEEP NEURAL NETWORKS WITH X-RAY IMAGES

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Abstract: **In the year 2020, a novel corona virus has emerged as a very pandemic disease which affects the public health throughout the world. It has become necessary to screen large number people to identify the infected ones and reduce the spread of disease. A real time PCR (polymerise chain reaction) is a standard tool for diagnosis for pathological testing. There are failure cases for this tool as it gives more false test results which make path to look for alternate tool. Chest x-rays is a better alternative for PCR for COVID-19 screening. Even though some patients are really infected but not tested positive with reports. The individual, who is tested false, unknowingly transmits the disease to others. With false results, it becomes difficult to stop the spreading of the disease. Chest X-rays proved to a better alternative with its high sensitivity. But here accuracy of results matters a lot**

.Here a diagnosis recommender system for examining lung images is proposed which can assist the doctors and reduce the burden over them. Deep neural network technique CNN (convolution neural network) is used for achieving best accuracy results.

Keywords: Convolution neural Networks, chest x-rays, PCR .

INTRODUCTION

In the year 2019 and in the month of December a new virus was born in China and spread rapidly all over the world at a fast rate. World Health Organization (WHO) has given this virus with the name COVID-19 and declared this as a pandemic in the month of February. As per the reports till today around 20.1 Million individuals tested positive for covid- 19.Many countries has been affected severly with the USA in the top position of the worst affected country in the world and India occupied second place of the worst affected country with this corona virus. The fatality rate all over the world is around 2-3% at present. As this virus is spreading very quickly,all countries are trying to isolate the patients of covid-19. In order to reduce the spread, many countries are going through a complete lockdown by not allowing anyone on the roads. Cough, fever, breathing problems, high fever for a long duration is the symptoms of the covid-19 pandemic novel corona virus. The people who are affected with long term diseases are prone to virus very quickly.Even though there are zero symptoms of covid- 19, some individuals getting tested positive for covid-19 by looking at the chest scan reports. Here besides Positive pathogenic testing, chest X-rays are also being used to diagnose the corona virus disease. For testing purposes, Real-time PCR (polymerize chain reaction) is used as a tool for diagnosis apart from this test we also have antigen and antibody tests. Many health care systems are trying very hard in attempting to increase the testing facilities for Covid-19. Many testing facilities are being implemented to identify more and more cases and to isolate the positively tested patients, and thereafter reducing the spread of disease among the community.One of the major concern for the government is with false-negative results. Even though some patients are really infected but not tested positive with reports. The individual, who is tested false, unknowingly transmits the disease to others. With false results, it becomes difficult to stop the spreading of the disease. In this case, Chest X-rays proved to a better alternative.

The rest of the paper is organised as follows , . Literature servey is explained in section II. Experimental results are presented in section III. Concluding remarks are given in section IV.

II LITERATURE SURVEY

In order to test corona virus ,we have many tests available some of the tests and their disadvantages are,

2.1 Existing System

1.Polymerase Chain Reaction(PCR):Sample collection is done using a swab to collect respiratory material found in your nose. A swab contains a soft tip on a long, flexible stick that is inserted into your nose. There are different types of nose swabs including nasal swabs that collect a sample immediately inside your nostrils and nasopharyngeal swabs that go further into the nasal cavity for collection. Either type of swab is sufficient for collecting material for the COVID-19 PCR test. After collection, the swab is sealed in a tube and then sent to a laboratory.

Disadvantages: Reports indicate that accuracy of RT-PCR results rely heavily on sample collection timing, type, storage, handling, and processing. The tests diagnose active infection only; they can't detect whether an individual was infected previously. A false negative result is possible if the sample isn't properly obtained or if an individual is tested too early after exposure to the virus or too late in their infection.

2.Antibody Tests: sometimes known as a rapid diagnostic test – RDT detect viral proteins (known as antigens). Samples are collected from the nose and/or throat with a swab.

Disadvantages:These tests are not reliable for initial covid-19 because of their poor clinical and diagnostic sensitivity.

Rapid antigen tests will also fall in this category .Proposed System

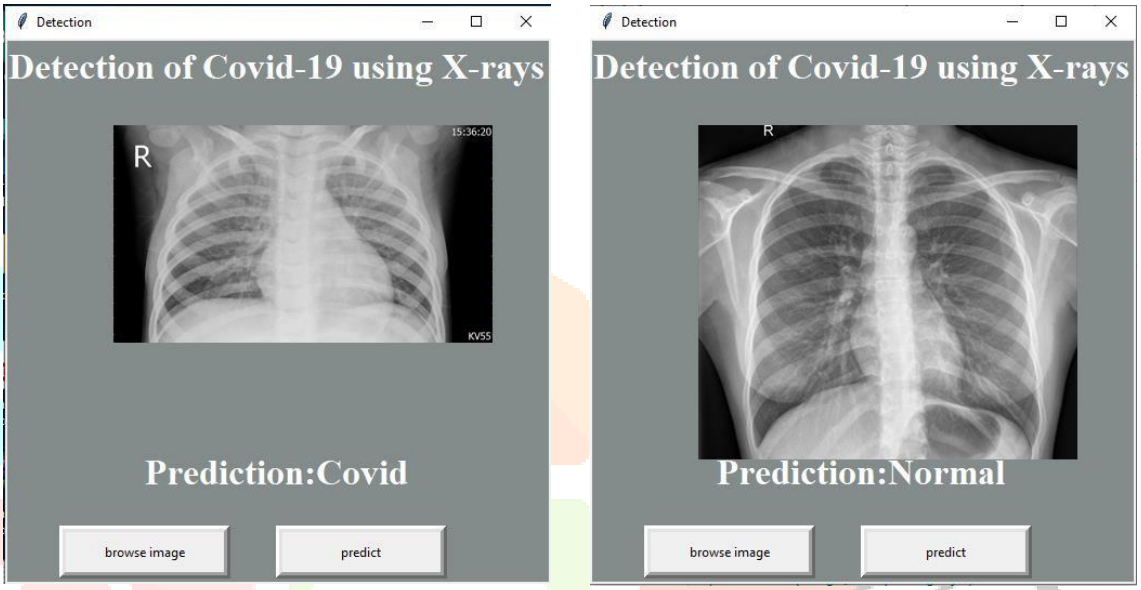
By considering the above existing systems and their disadvantages ,the proposed model is introduced that is convolution neural networks. Deep learning, it is a popular research area of artificial intelligence (AI) . Deep learning techniques have been successfully applied in many problems such as arrhythmia detection , skin cancer classification , breast cancer detection , brain disease classification , pneumonia detection from chest X-ray images , fundus image segmentation , and lung segmentation . The COVID-19 epidemic's rapid rise has necessitated the need for expertise in this field. This has increased interest in developing the automated detected systems based on AI systems.

By using AI approaches , in the field of medicine especially corona virus, the disadvantages in the PCR Tests , antigen and antibody tests can be eliminated.

III EXPERIMENTS AND RESULTS

3.1 Experiments: Several categorized experiments were performed to evaluate the efficiency of the ConvNet on the image database consists of chest x-rays and should compare ConvNet with other models using the basic statistical characteristics of the images, which can provide effective information for classification. They included the use of four different network architectures with varying numbers of convolutional and fully connected layers, and image pre-processing techniques to test the results using various structures and pre- processing methods. The first structure (ConvNet#1) consisted of two convolutional layers with 64 and 16 filters, respectively, with two fully connected (dense) layers with 128 and 8 neurons. It was the lightest architecture considered in this study. The second and third ConvNet structures (ConvNet#2 and ConvNet#3) included three convolutional layers with 256, 128, 64 and 128, 64, 32 filters, respectively, and two fully connected layers were implemented with 128 and 8 neurons. ConvNet#4, which was the deepest architecture in this study, consisted of four convolutional layers (256, 128, 128, and 64 filters) and three fully connected layers (128, 64, and 8 neurons). The filter sizes were considered as 3×3 for all structures, and 0.2 dropout was used for each layer. Pooling was applied as maximum pooling, and 2×2 pooling was considered

3.2 Results:



IV CONCLUSION

The performed experiments should be analyzed separately to evaluate the performance of the applied techniques and considered models. In two-class experiments, a variety of image pre-processing methods were applied with different image sizes and four ConvNet architectures to provide the highest detection accuracy of COVID-19 in chest X-ray images. In COVID-19/Normal classification experiments, it was relatively easier to classify COVID-19 because the normal X-ray images do not contain any abnormalities. At present health of the individuals in the entire world is getting affected at a quick rate. It is very difficult to test a large number in a short time to stop the spread of the disease. Major points to worry for the governments are with false- negative results.By using chest x-rays and classification using CNN we can predict the virus with more accuracy ,So the suggested proposed methodology proved to best for classification of covid-19 patients which used convolution neural network with maximum F1 score. we qualitatively assessed CNN methods investigated here using class activation mappings whereby we visualized the regions on X-ray images utilised by CNNs to make their final prediction scores. Positive or negative class predictions by CNNs must be treated cautiously unless qualitatively inspected or segmented regions of interest feed into CNNs in both training and testing phases. Figures contain multiple examples where texts, medical device traces on X-rays can be used by CNNs which prevent them from learning the actual features of the disease. Future research directions, and in progress work, contain segmenting the lung region from chest X-rays and removing other artefact such as text and medical device traces on chest Xrays. Data from other sources need to be incorporate to build CNN models that can be generalized and not biased towards a specific country, such as China/Italy, or a targeted population.Future work suggests the development of the architecture for large amounts of datasetstoo.

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