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Automatic Detection of Coronavirus Disease (COVID-19) Using X-ray Images and Convolutional Neural Networks

Julie Bersiyal[1] D Alan Judah Elroy[2], Hari Haran S[3], Dinesh Kumar G[4], Thoufiq Mohamed Ansari M[5]
Department of Bio Medical Engineering, Sethu Institute of Technology. juliemaggy98@sethu.ac.in

***Abstract*—** The 2019 novel coronavirus (COVID-19), with a starting point in China, has spread rapidly among people living in other countries, and is approaching approximately 12,245,417 cases worldwide according to the statistics of European Centre for Disease Prevention and Control. There are a limited number of COVID-19 test kits available in hospitals due to the increasing cases daily. Therefore, it is necessary to implement an automatic detection system as a quick alternative diagnosis option to prevent COVID-19 spreading among people. In this project, convolutional neural network-based model ResNet50 have been proposed for the detection of coronavirus pneumonia infected patient using chest X-ray radiographs. ROC analyses and confusion matrices by this model are given and analyzed using 5-fold cross validation. Considering the performance results obtained, it is seen that the pre-trained ResNet50 model provides the highest classification performance with 98% accuracy among other proposed models. In the previous solution due to limited dataset the accuracy is very low. In this project we increase the accuracy with larger dataset.

I. Introduction

The COVID-19 outbreak has created unprecedented challenges for global public health, necessitating swift and accurate detection methods. Integration of advanced technologies, particularly Deep Convolutional Neural Networks (CNNs), into medical imaging, has shown promise in automating the identification of COVID-19 from X-ray images.X-ray imaging, a longstanding diagnostic tool in radiology, provides valuable insights into pulmonary conditions, making it a crucial medium for detecting COVID-19.The distinctive lung patterns associated with COVID-19, such as ground-glass opacities and consolidations, make X-ray images highly informative for disease detection.The application of Deep Convolutional Neural Networks enhances the speed and accuracy of COVID-19 diagnosis by leveraging their exceptional proficiency in image recognition tasks. The COVID-19 pandemic has propelled the global healthcare community into a race against time to develop efficient diagnostic tools capable of combating the spread of the virus. Amidst this urgency, the convergence of artificial intelligence (AI) and medical imaging technology offers a promising solution. In particular, the fusion of Convolutional Neural Networks (CNN) with X-ray imaging presents an innovative approach to automating COVID-19 detection, revolutionizing the landscape of diagnostic medicine. This paper introduces a groundbreaking methodology for automatic COVID-19 detection leveraging

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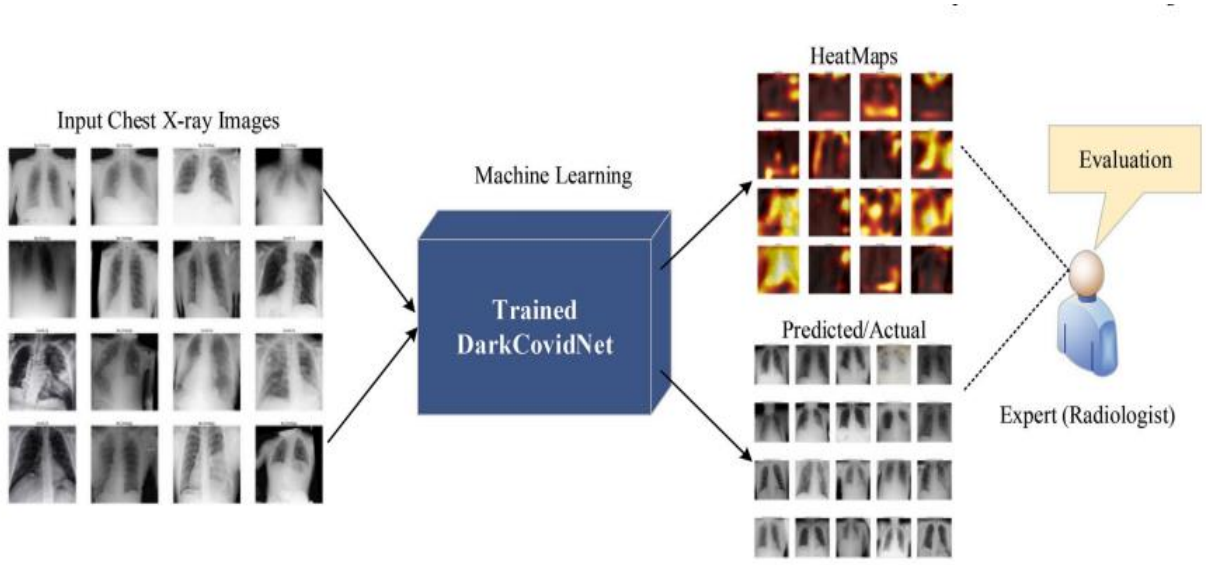
CNN algorithms and X-ray images of the chest. By harnessing the power of deep learning, our proposed model aims to discern subtle radiological patterns indicative of COVID-19 infection, facilitating rapid and accurate diagnosis. At the heart of our methodology lies the Convolutional Neural Network, a class of deep learning algorithms renowned for their ability to extract intricate features from visual data. Trained on large datasets comprising X-ray images of COVID-19 positive and negative cases, the CNN learns to discern subtle nuances in radiological patterns, thereby distinguishing infected individuals from healthy counterparts with high accuracy.

II. related works

The main problem of our study is the limited number of COVID-19 X-ray images used for the training of deep learning models. In order to overwhelm this problem, we have used deep transfer learning models. If we reach more data in the coming days, we are planning to improve working with different models.

Models trained on specific datasets may not generalize well to different populations, imaging devices, or conditions. The lack of diversity in training data can lead to overfitting and reduced performance on real-world, diverse datasets. The existing solutions faces challenges in providing rapid results, affecting their usefulness in time-sensitive scenarios. CNNs trained on X-ray images may not perform as well on other types of medical imaging, such as CT scans or MRIs. The choice of imaging technique can impact the model's effectiveness.



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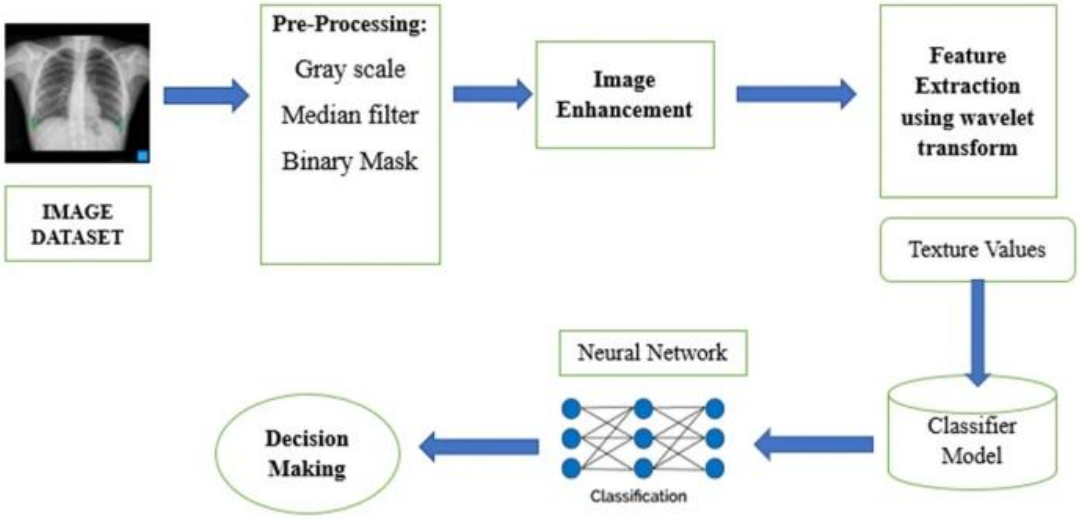
III. proposed method

- This project built deep convolutional neural network (CNN) for the classification of COVID-19 Chest X-ray images to normal and COVID-19 classes.
- This project applied transfer learning technique that was realized by using ImageNet data to overcome the insufficient data and training time.
- The schematic representation of conventional CNN for the prediction of COVID-19 patients and normal.



IV. Conclusion and Future work

As the cases of COVID-19 pandemic are increasing daily, many countries are facing shortage of resources. During this health emergency, it is important that not even a single positive case goes unidentified. With this thing in mind, we proposed a deep learning approach to detect COVID-19 cases from chest radiography images. The proposed method (CoroNet) is a convolutional neural network designed to identify COVID-19 cases using chest X-ray images. The model has been trained and tested on a small dataset of few hundred images prepared by obtaining chest X-ray images of various pneumonia cases and COVID-19 cases from different publically available databases. CoroNet is computationally less expensive and achieved promising results on the prepared dataset. The performance can further be improved once more training data becomes

available. Notwithstanding the encouraging results, CoroNet still needs clinical study and testing but with higher accuracy and sensitivity for COVID-19 cases, CoroNet can still be beneficial for radiologists and health experts to gain deeper understandings into critical aspects associated with COVID-19 cases.

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Here's the corrected reference section formatted consistently:

V. REFERENCES

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