Paper Name : Deep learning based detection and analysis of COVID-19 on chest X-ray images

Abstract

Covid-19 is a fast-spreading viral infection that affects both humans and animals . Covid-19 is a disease that is widely distributed . This deadly viral disease has an effect on people's daily lives, their health, and the economies of a nation . COVID-19 affected patients, according to a clinical report, are often infected with a lung infection after coming into contact with the disease . For diagnosing medical conditions, chest x-rays and chest CT scans are more successful imaging techniques . Nonetheless, as compared to a chest CT, a substantial chest x-ray is a less expensive procedure . Deep learning is the most effective technique of machine learning , and it can be used to analyse a vast number of chest x-ray images, which can have a significant effect on Covid-19 screening . In this study, we used various CNN models to try to identify Covid-19 patients based on their chest X-ray scans . We contrasted the Inception V3, Xception, and ResNeXt versions. We found that the XCeption net outperforms the other two versions and is better fit for use . This research focuses solely on potential mechanisms for classifying covid-19 contaminated patients and makes no medical claims .

Introduction

Covid-19 is a serious illness that claims the lives of a vast number of people every day. This disease has affected not only a single nation, but the whole world as a result of this virus disease. Several viruses, such as SARS, MERS, Flu, and others, have emerged in the last decade, but they only last a few days or months. Covid-19 disease is now affecting the whole planet, and the most important fact is that no single country's scientists have been able to develop a vaccine for it. Meanwhile, even other predictions emerged, such as plasma treatment, X-ray pictures, among many others, but the precise solution to this fatal illness has yet to be discovered . Every day, people die as a result of covid-19, and the disease's diagnosis cost is extremely high in terms of a nation and patients . X-ray photographs of healthy people and Covid-19 affected people were made available for review in March 2020 in various repositories such as Github and Kaggle . Covid-19 is a pandemic disease that has posed a worldwide threat to humanity . Diagnosing infected patients from healthy people is a difficult challenge . The novel coronavirus disease started as a throat infection, and people began to have trouble breathing . The covid-19 disease is a hidden foe that no one can defeat . Infected Covid-19 patients must be isolated, undergo proper screening, and take appropriate precautions to protect healthy individuals . This virus spreads through a chain reaction that occurs as people come into contact with covid-19 infected people . The diagnosis of this disease relies heavily on hospital personnel, nurses, physicians, and healthcare services . Medical imaging is one of the many methods that have been used to reduce the effects of Covid-19 . With the aid of CT (Computerised Tomography) images and chest X-ray images, stable individuals and Covid-19 affected patients can be studied . We used three separate models (InceptionV3, Xception, and ResNeXt) to contribute to a Covid-19 review. CNN is used to analyse the gathered data .

Related work

In [1] The first three Covid-19-infected cases in France were studied by the scientist . Two of these people were hospitalised , while the third was diagnosed in Bordeaux . In [2] Using softmax classifie , the author suggested a hybrid artificial intelligence method that used machine learning and deep learning algorithms (CNN) .

Using chest X-ray scans , the proposed device is specifically designed to monitor Covid-19 events . The authors of [3] have performed a radiologic study of MERS on a novel coronavirus . The authors looked at how infected people get treated with chest X-rays [4] . They also addressed in [5] what types of procedures hospital personnel must adopt to reduce the risk of healthy patients and what precautions must be taken while caring for covid-19 affected patients . The writers of [6] addressed the aetiology epidemic in Wuhan, China . They have posed a concern about the epidemic's exact cause. The authors of [7] looked at chest CT scans from 21 covid-19 patients in Wuhan . The authors then suggested a COVID-RENet model for extracting features with CNN for classification in [8] . In [9], the authors used a deep learning algorithm to describe the effects of Covid-19 on people who had pneumonia or lung disease using a chest CT image dataset . A research on the effects of covid-19 on the kidney and acute renal dysfunction was also published in [10]. The authors of [12] published a report that looked at the overall number of people afflicted with Covid-19 and death cases around the world.The authors of [13] proposed a deep-based technique for detecting Covid-19-infected patients using X-ray images.This procedure is useful for hospital doctors in identifying cases of covid-19 infection early on.

In[14] the authors addressed the various methodologies used for covid-19 disease identification as well as the difficulties they encountered They also suggested that an automated system for detecting the Covid-19 virus be developed in order to deter the disease from spreading by communication. The authors of [15] addressed the use of chest radiography (CXR) to detect lung abnormalities. in [16] They discussed the difficulties of applying AI tools on a smaller dataset of X-ray images. The researchers used deep learning and transfer learning algorithms to diagnose Covid-19 diseases using a dataset of X-rays and CT images from multiple sources. In [17] The writers used the SVM technique to detect pneumothorax . They mined the features of lung images using a Local Binary Pattern. In [18] The primary goal of this paper was to propose a new deep learning system to aid healthcare practitioners in diagnosing Covid-19 disease using X-ray pictures. The authors of [19] created sub-datasets by extracting two subsets of patches.To define the processed results, the authors used SVM, and the CNN model was used to pass learning. As a result, when compared to set 1, they found that set 2 had better accuracy . In[20] The authors suggested a model that uses Chest X-ray images to automatically detect the Covid-19 . They classified the real-time object tracking system using the DarkNet model. In [21] The use of thermoplasmonic in the identification of Covid-19 diseases was discussed . The writers of [22] look at people that have been diagnosed with covid-19 pneumonia. They divided CT scan patients into various categories, and the image's characteristics and distribution were studied further. The authors suggested a KE Sieve Neural Network architecture in[23], which aids in the detection of Covid-19 analyses using chest X-ray images. The writers of [24] published an analysis of covid19 on people who were isolated in Rawalpindi's BBH care home.The authors used a chest X-ray dataset to develop a CNN based algorithm for studying pneumonia in [25].The authors discussed the use of a deep anomaly detection system for accurate screening of Covid-19 patients in [26].

Reference

1. Stoecklin SB, Rolland P, Silue Y, Mailles A, Campese C,Simondon A, Mechain M, Meurice L, Nguyen M, Bassi C,Yamani E (2020) First cases of coronavirus disease 2019 (COVID-19) in France: surveillance, investigations and control measures. Eurosurveillance 25(6):2000094 .
2. Alqudah AM, Qazan S, Alqudah A (2020) Automated Systems for Detection of COVID-19 using chest X-ray images and lightweight Convolutional neural networks .
3. Choi WJ, Lee KN, Kang EJ, Lee H (2016) Middle East respiratory syndrome-coronavirus infection: a case report of serial computed tomographic findings in a young male patient. Korean J Radiol 17(1):166–170
4. Ayan E, Ünver HM (2019) Diagnosis of pneumonia from chest X-Ray images using deep learning. In 2019 Scientific Meeting on Electrical-Electronics & Biomedical Engineering and Computer Science (EBBT) (pp. 1-5). IEEE .
5. Basile C, Combe C, Pizzarelli F, Covic A, Davenport A, Kanbay M, Kirmizis D, Schneditz D, van der Sande F, Mitra S (2020) for the prevention, mitigation and containment Of the emerging SARS-CoV-2 (COVID-19) pandemic in Haemodialysis centres. Nephrol Dialysis Transplantation 35:737–741
6. Bogoch II, Watts A, Thomas-Bachli A, Huber C, Kraemer MU Khan K (2020) Pneumonia of unknown etiology in Wuhan,China: Potential for International Spread Via Commercial AirTravel. J Travel Med
7. Chung M, Bernheim A, Mei X, Zhang N, Huang M, Zeng X, Cui J,Xu W, Yang Y, Fayad ZA, Jacobi A (2020) CT imaging features of 2019 novel coronavirus (2019-nCoV). Radiology 295(1):202–207 .
8. Cohen JP, Morrison P, Dao L (2020) COVID-19 image data col-lection. arXiv preprint arXiv:2003.11597
9. Dadário AMV, Paiva JPQ, Chate RC, Machado BS, Szarf G (2020) Regarding artificial intelligence distinguishes COVID-19 from Community acquired pneumonia on chest CT. Radiology:201178
10. Diao B, Feng Z, Wang C, Wang H, Liu L, Wang C, Wang R, Liu Y,Liu Y, Wang G, Yuan Z (2020) Human kidney is a target for novel acute respiratory syndrome coronavirus 2 (SARS-CoV-2)Infection. medRxiv
11. Fu S, Fu X, Song Y, Li M, Pan PH, Tang T, Zhang C, Jiang T, Tan D, Fan X, Sha X (2020) Virologic and clinical characteristics for Prognosis of severe COVID-19: a retrospective observational study Wuhan, China. medRxiv
12. Hassani RTJ, Sandali O (2020) Le nouveau coronavirus Covid-19:Quels risques ophtalmiques? J Francais D'Ophtalmologie 43(4):291
13. Hassanien AE, Mahdy LN, Ezzat KA, Elmousalami HH, Ella HA(2020) Automatic X-ray COVID-19 lung image classification sysTem based on multi-level Thresholding and support vector machine.medRxiv
14. Ilyas M, Rehman H, Nait-ali A (2020) Detection of Covid-19 from chest X-ray images using artificial intelligence: an early review.arXiv preprint arXiv:2004.05436
15. Jacobi A, Chung M, Bernheim A, Eber C (2020) Portable chest X-Ray in coronavirus disease-19 (COVID-19): a pictorial review. ClinImaging 64:35–42

16. Maghdid HS, Asaad AT, Ghafoor KZ, Sadiq AS, Khan MK (2020) Diagnosing COVID-19 pneumonia from X-ray and CT images Using deep learning and transfer learning algorithms. arXiv preprint arXiv:2004.00038
17. Chan YH, Zeng YZ, Wu HC, Wu MC, Sun HM (2018) Effective pneumothorax detection for chest X-ray images using local binary pattern and support vector machine. J Healthcare Eng 2018:1–11
18. Hemdan EED, Shouman MA, Karar ME (2020) Covidx-net: a framework of deep learning classifiers to diagnose covid-19 in x-ray images. arXiv preprint arXiv:2003.11055
19. Ozkaya U, Ozturk S, Barstugan M (2020) Coronavirus (COVID-19) classification using deep features fusion and ranking technique. arXiv preprint arXiv:2004.03698
20. Ozturk T, Talo M, Yildirim EA, Baloglu UB, Yildirim O, Acharya UR (2020) Automated detection of COVID-19 cases using deep Neural networks with X-ray images. Comput Biol Med:103792
21. Qiu G, Gai Z, Tao Y, Schmitt J, Kullak-Ublick GA, Wang J (2020) Dual-Functional Plasmonic Photothermal Biosensors for Highly Accurate Severe Acute Respiratory Syndrome Coronavirus 2 Detection. ACS nano
22. Shi H, Han X, Jiang N, Cao Y, Alwalid O, Gu J, Fan Y, Zheng C (2020) Radiological findings from 81 patients with COVID-19 pneumonia in Wuhan, China: a descriptive study. Lancet Infect Dis 20:425–434
23. Thejeshwar SS, Chokkareddy C, Eswaran K, Precise Prediction of COVID-19 in Chest X-Ray Images Using KE Sieve Algorithm
24. Durrani M, Haq I u, Kalsoom U, Yousaf A (2020) Chest X-rays Findings in COVID 19 patients at a University Teaching Hospital-A Descriptive study. Pakistan J Med Sci 36(COVID19-S4):S22
25. Yadav SS, Jadhav SM (2019) Deep convolutional neural network Based medical image classification for disease diagnosis. J Big Data 6(1):113
26. Zhang J, Xie Y, Li Y, Shen C, Xia Y 2020 Covid-19 screening on Chest x-ray images using deep learning based anomaly detection. arXiv preprint arXiv:2003.12338