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Usage of Artificial Intelligence to Prevent and Regulate COVID-19

Rukmani P, Vergin Raja Sarobin M, Graceline Jasmine S, L. Jani Anbarasi, Priya Mishra

School of Computer Science and Engineering, Vellore Institute of Technology, Chennai, India.

ABSTRACT

Introduction: In this current situation where COVID-19 pandemic has affected the whole world, it is high time to take a step to check the expansion of COVID-19. WHO declared it conversely a pandemic and as an emergency. The clinicians and scientists in medical industries are observing for the technologies with which they can perform screening on the medical images to detect the COVID-19 virus in a person.

Objectives: Early identification, screening, acquaintance tracing, prediction, drug/vaccine development and detection with the application of assorted models and algorithms of AI and ML for COVID-19.

Methods: Different analyses performed by various researchers using machine learning algorithms and Deep Learning Models using Chest X-rays, Blood Tests have been presented. Different techniques and devices used for acquiring the data through various experiments are also presented.

Results: This paper presented a few techniques followed by various researchers; accuracy, sensitivity, recall achieved by the methodologies have been presented.

Conclusion: Data collection plays a major role in analyzing the COVID-19 where most of the researches find it very difficult, and early diagnosis also plays a major role in the early detection and control of the widespread of COVID-19.

Key Words: COVID-19, Convolutional Neural Network, Transfer Learning Models, KNN, ARIMA

INTRODUCTION

In this current situation where COVID-19 pandemic has affected the whole world, it is high time to take a step to check the expansion of COVID-19. WHO declared it conversely as a pandemic and as an emergency.¹ The clinicians and scientists in medical industries are observing for the technologies with which they can perform screening on the medical images to detect the COVID-19 virus in a person by applying several models to perform screening on the chest images of infected patients and normal people. The symptoms of coronavirus and pneumonia are almost the same so a specific model has to be applied to differentiate between coronavirus and pneumonia. AI and ML are also used to predict the COVID-19 by using several techniques. With the help of AI, drug and vaccine development is possible as there are a large number of molecules and with physical docking, it takes a lot of time to even discover only a

few molecules at a time. So AI and ML were used for the development of many antiviral drugs that would help in the prevention of coronavirus to some extent as these drugs are only for immunity and they are not vaccines that can stop the spread of the virus. AI and ML are also used to predict the spread of coronavirus. For this ARIMA time series is used which is the best till now as compared to other time series model. Many case studies are done like coronavirus cases in Spain, Saudi Arabia, Japan, Italy, South Korea, and France where ARIMA is the best time series model. Using the current scenario the future prediction is also done. As screening is done on the X-rays of various patients it is very difficult to classify the images as there are a lot of X-rays, so AI techniques are used to classify these medical images. Figure 1A shows a sample COVID-19 image where the arrow in the image highlights the infected part. Figure 1B shows the non-COVID-19 normal images.

Corresponding Author:

Rukmani P, School of Computer Science and Engineering, Vellore Institute of Technology, Chennai, India.
Email: rukmani.p@vit.ac.in

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Figure 1: A. COVID-19 image sample and B. Non-COVID-19 image sample

CONTACT TRACING MOBILE APPLICATIONS

Artificial intelligence is used on 1020 CT images of 108 COVID-19 patients forth with 86 patients suffering from pneumonia and the results suggest the usage of convolutional neural arrangement (Resnet-101).³ The accurateness of the COVID-19 analysis tool was proposed with the advice of a new prototype called Automatic COVID-19 apprehensions that are based on an abysmal learning algorithm. A random forest algorithm was used for classification. Various countries that are adulterated have their acquaintance tracing applications that use GPS, network-based API, Bluetooth, agenda transaction data, Social graph acquaintance details, adaptable tracking data, and arrangement physical a d - dress. All these apps aggregate the advice of the infected and this advice is again processed using the application of AI and ML to trace a being who is accessible or is an acquaintance with a COVID-19 absolute patient. Table 1 shows the various apps used by different counties for controlling and identifying the pandemic.

Table 1: Various apps used by different counties

Country	Apps Used by various countries
Australia	COVIDSafe
Austria	Stop corona
Bahrain	BeWare Bahrain
China	Conjunction with Alipay
Cyprus	CovTracer
Finland	Ketju
Germany	CoronaApp
Israel	HaMagen

RELATED WORK

A novel adjustment was proposed which consists of pre-processing,⁴ characteristic extraction with characteristic selection with Iterative ReliefF (IRF), Residual Exemplar Local Binary Pattern (ResExLBP), and allocation phases. The called IRF characteristics are activated as the classifiers. LBP and LBP were acclimated for characteristic extraction and a ten-fold CV, LOOCV, and adjudicator authentication are used. In this abstraction^{5,6} characteristic, extraction models were proposed to abstract the appearance from the pa-

tient's X-ray images and abounding algorithms were used.

The allocation of pneumonia aches with the advice of AI systems and ML, Togacar et al⁷ analysed X-ray images of the chest using Deep learning which shows VGG-19, and AlexNet showed improved accuracy. The accuracy of the above model in the given set of data has resulted in 99%. Sousa et al.⁸ provided automated pneumonia analysis through computer-aided systems from radiographic images. The classifier used is K- Nearest Neighbor, Naïve Bayes and Support Vector Machines. It identified that the best classifier is the Support Vector Machine.⁹ ARIMA time series model is the best model till now for the forecasting and anticipation of COVID-19.

ARIMA model is analyzed for the COVID-19 cases in south Korea from Wind Database.^{10,11} This case abstraction also shows that the ARIMA time series archetypal is the best archetypal for forecasting and prediction.¹² In this COVID-19 is detected with the help of X-rays application nCOVnet algorithm. The after-effects that were acquired have been evaluated by parameters called as- AUC of ROC, confusion matrix, and Training Accuracy. The Methodology was as follows: Data collection, Data pre-processing, Data leakage, Convolutional Neural Network (CNN).

The algorithm 'Covent is based on deep learning model.¹³ A three-fold adjustment was proposed focused to ascertain whether an X-ray of chest area healthy or COVID-19 and all-encompassing pulmonary diseases and, already disclose the COVID-19 ache and to accentuate the chest X-ray areas that indicate the affection of COVID-19. A deep neural network this is based on VGG-16 base transfer learning was proposed to accomplish on the ImageNet database. Fine-tuning was employed. The layer of VGG-16 is Flatten, AveragePooling2D, Dense, Dropout, Dense. The Grad-CAM algorithm explores in this study, to alter the models visually and accept where the suggested arrangement investigate images of chest X-ray.

A deep network technique was proposed.¹⁴ to discriminate from COVID-19 from non- COVID-19. Ten convolutional networks have been involved in this where SqueezeNet, AlexNet, VGG-19, VGG-16, MobileNet- V2, GoogleNet, ResNet-a hundred and one, ResNet- eighteen, ResNet-fifty, and Xception. The precision achieved is with the aid of Xception models and ResNet-101. The dataset used here composed of 1020 CT slices that are received from 108 patients who had been affected by COVID-19 and 86 from Pneumonia or different peculiar diseases. With the help of this dataset, networks were evaluated.¹⁵ The autoregressive included transferring average (ARIMA) version was used for forecasting the daily quantity of the latest COVID-19 cases in Saudi Arabia. ARIMA model becomes an excellent version for forecasting. MA (transferring average) model has a less commonplace version shape compared to AR. The facts

that become gathered turned into examined for desk-bound with the assist of Augmented Dickey-Fuller (ADF) check.^{13,14} For the prediction of the upcoming cases in a correct and timely way a PDR- NML technique became designed for this purpose.¹⁵ To examine the effects on the prediction performance of different hyperparameters putting, a support vector regression is carried out. The maximum commonly used capabilities in system gaining knowledge of fashions are polynomial and Gaussian kernels.

VARIOUS MODELS USED

Different Methodologies used for analyzing, predicting and classifying the COVID-19 pandemic is shown in table 2.

Table 2: Various Models used in various research work

Sr. No	Models Used for Predictions
1	ARIMA model: ARIMA models are used for forecasting and prediction and is used in various case studies performed.
2	VGG-19
3	LOOCV
4	CNN
5	SUPPORT VECTOR MACHINE
6	LBP
7	ResExLBP
8	Box-Jenkins method
9	KNN
10	Random Forest Algorithm

CONCLUSION

Distinct AI and ML methods and functions can be used for the prediction, detection, forecasting and improvement of medicine and vaccine for COVID-19. CNN (convolutional neural networks) had been used for extracting the primary signs and symptoms of COVID- 19 from the X-Ray and CT scans. Methods that was based on transfer learning has been exploring. Mainly two forms of assessments had been executed to predict COVID-19, the first one is the RT-PCR test and another one is an antibody test. The antibody testing detects whether the immune machine is wholesome or is encountered with corona viruses. It's far oblique testing. A PDR-NML version became delivered for a unique and timely prediction of COVID-19. Two specific models had been used that have been the first one the PDLFR for correct predictions and robustness and some other the PPDLR for well-timed predictions. By integrating all the gaining knowledge of models, ML has completed better for data evaluation. Different analyses performed by various researchers using machine learning algorithms using the images have been

presented. Different techniques and devices used for acquiring the data through various experiments are also presented.

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