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An Adaptive Approach based on Machine Learning for Covid-19 Diagnosis and Prediction using Artificial Intelligence

[1]Sana Khan, [2]Prof. Zuber Farooqui

[1]Research Scholar, [2]Assistant Professor

Department of Computer Science Engineering,

All Saints' College of Technology, Bhopal, India

Abstract : In 2020, the world has been hit by a global pandemic of COVID-19, belonging to the family of Coronavirus. Due to the rapid increase in the infection and the death rate, people have started to develop mixed feelings regarding this situation. This paper proposed a deep learning method to predict the seriousness of the decrease in COVID-19 infected patient. Using this novel method, the proposed model can both take in a large number of heterogeneous features, such as census data, intra-county mobility, inter-county mobility, social distancing data, past growth of infection, among others, and learn complex interactions between these features. Simulation is performed using python sypder 3.7 software. The simulated results shows that the 77.5% accuracy to detection of covid-19. Precision, recall and Fmeasure values is also optimized and its gives significant better performance.

IndexTerms **- Covid-19, Machine Learning, Deep learning, Artificial Intelligence, Python.**

I. INTRODUCTION

The very first infected novel corona virus case (COVID-19) was found in Hubei, China in Dec. 2019. The COVID-19 pandemic has spread over 214 countries and areas in the world, and has significantly affected every aspect of our daily lives. At the time of writing this article, the numbers of infected cases and deaths still increase significantly and have no sign of a well-controlled situation, e.g., as of 13 July 2020, from a total number of around 13.1 million positive cases, 571,527 deaths were reported in the world. Motivated by recent advances and applications of artificial intelligence (AI) and big data in various areas, this paper aims at emphasizing their importance in responding to the COVID-19 outbreak and preventing the severe effects of the COVID-19 pandemic. COVID-19 outbreak has put the whole world in an unprecedented difficult situation bringing life around the world to a frightening halt and claiming thousands of lives. Due to COVID-19's spread in 212 countries and territories and increasing numbers of infected cases and death, it remains a real threat to the public health system.

The main advantage of these AI-based platforms is to accelerate the process of diagnosis and treatment of the COVID-19 disease. The most recent related publications and medical reports were investigated with the purpose of choosing inputs and targets of the network that could facilitate reaching a reliable Artificial Neural Network-based tool for challenges associated with COVID-19. Furthermore, there are some specific inputs for each platform, including various forms of the data, such as clinical data and medical imaging which can improve the performance of the introduced approaches toward the best responses in practical applications. Artificial Intelligence (AI) intent is to facilitate human limits. It is getting a standpoint on human administrations, filled by the growing availability of restorative clinical data and quick progression of insightful strategies. Motivated by the need to highlight the need for employing AI in battling the COVID-19 Crisis, this survey summarizes the current state of AI applications in clinical administrations while battling COVID-19. Furthermore, we highlight the application of Big Data while understanding this virus.

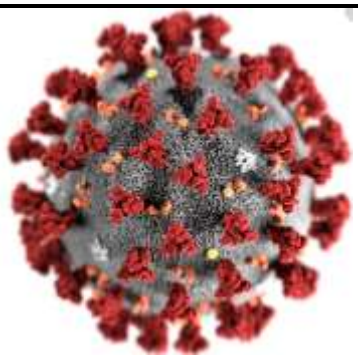

Figure 1: Corona virus

The overview of various intelligence techniques and methods can be applied to various types of medical information-based pandemic. We classify the existing AI techniques in clinical data analysis, including neural systems, classical SVM, and edge significant learning. Also, an emphasis has been made on regions that utilize AI-oriented cloud computing in combating various similar viruses to COVID-19. The unprecedented outbreak of the 2019 novel coronavirus, termed as COVID-19 by the World Health Organization (WHO), has placed numerous governments around the world in a precarious position. The impact of the COVID-19 outbreak, earlier witnessed by the citizens of China alone, has now become a matter of grave concern for virtually every country in the world.

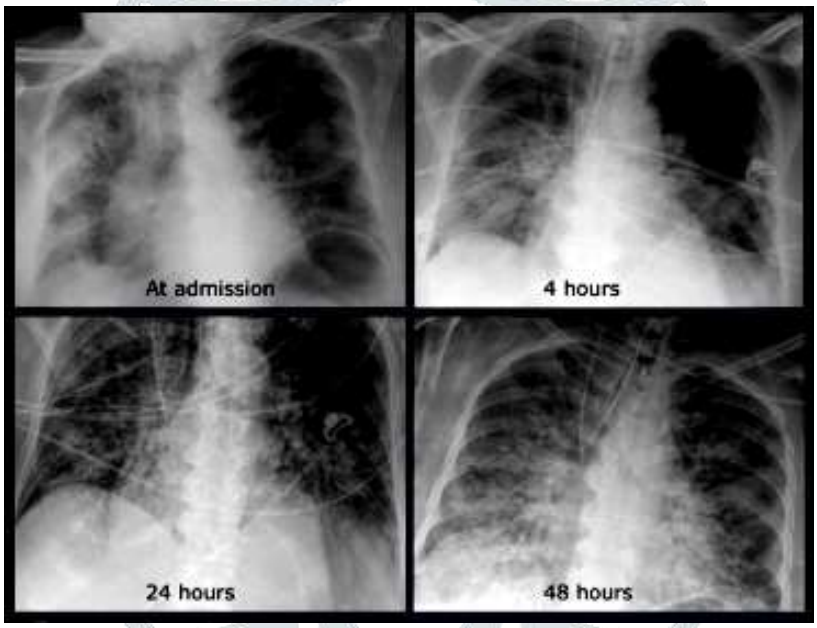

Figure 2: Chest condition due to Covid-19

The scarcity of resources to endure the COVID-19 outbreak combined with the fear of overburdened healthcare systems has forced a majority of these countries into a state of partial or complete lockdown. The number of laboratory-confirmed coronavirus cases has been increasing at an alarming rate throughout the world, with reportedly more than 3 million confirmed cases as of 30 April 2020. Adding to these woes, numerous false reports, misinformation, and unsolicited fears in regards to coronavirus, is being circulated regularly since the outbreak of the COVID-19. The pandemic of coronavirus disease 2019 (COVID-19) is spreading all over the world. Medical imaging such as X-ray and computed tomography (CT) plays an essential role in the global fight against COVID-19, whereas the recently emerging artificial intelligence (AI) technologies further strengthen the power of the imaging tools and help medical specialists. We hereby review the rapid responses in the community of medical imaging (empowered by AI) toward COVID-19. For example, AI-empowered image acquisition can significantly help automate the scanning procedure and also reshape the workflow with minimal contact to patients, providing the best protection to the imaging technicians.

II. PROPOSED METHODOLOGY

The dataset where three conventional machine learning algorithms, i.e., Naïve Bayesian (NB), K-nearest neighbour (KNN), and support vector machine (SVM) algorithm to predict the risk of the disease. CNN-based Unimodal Disease Risk Prediction (CNN-UDRP) Algorithm is used. The processing of medical image data, CNN-based unimodal disease risk prediction (CNN-UDRP) algorithm is utilized and is divided into the following steps:

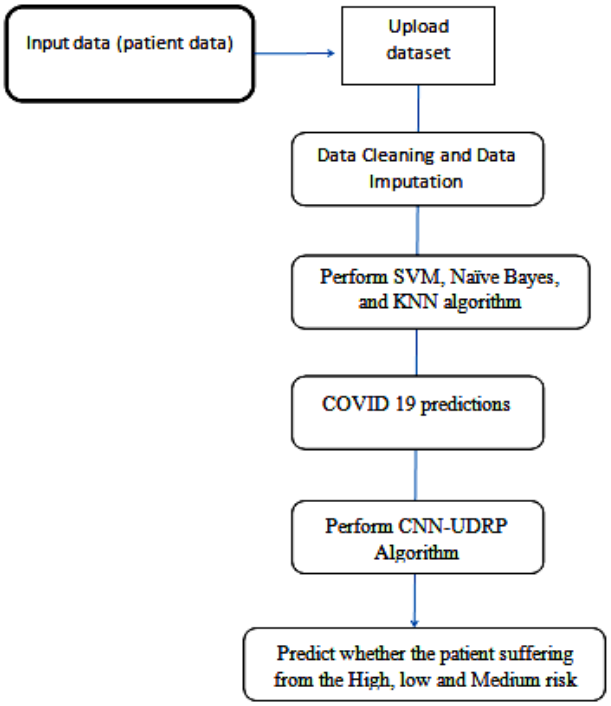

Figure 3: Flow Chart

- Representation of image data.
- Convolution layer of the image CNN: two words are choose from front and back of each vector.
- Pool layer of image CNN: The role of every pixel in the image is not completely equal, by maximum pooling the elements are choose which play a key role in the image.
- Full connection layer of image CNN: The pooling layer connected with a fully connected neural network.
- CNN classifier: The connection layer links to a classifier, a softmax classifier is choosed.
- CNN-based Multimodal Disease Risk Prediction (CNN-MDRP) Algorithm: The CNN-UDRP only uses the image data to predict whether the patient is at high-risk of the chronic disease. For structured and unstructured image data, a CNN-UDRP algorithm is designed.

III. SIMULATION RESULTS

The implementation of the proposed algorithm is done over python spyder 3.6. The sklearn, numpy, pandas, matplotlib, pyplot, seaborn, os library helps us to use the functions available in spyder environment for various methods like support vector, random forest, naive bayes, CNN etc.

(a) (b)

Figure 4: Seriousness of decease (a) Normal lungs detected (b) Pneumonia lungs detected

Figure 5: Covid-19 Detected

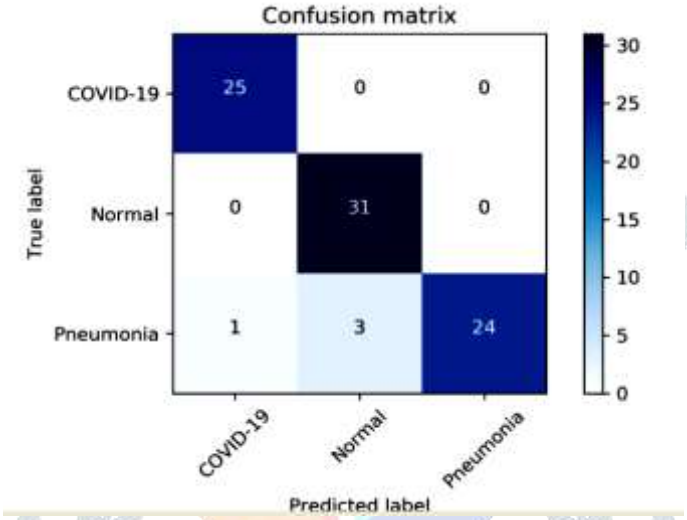

Figure 6: Confusion matrix

Figure 6 is showing the confusion matrix of proposed approach for the prediction. It is a tabular summary of the number of correct and incorrect predictions made by a classifier. It can be used to evaluate the performance of a classification model through the calculation of performance metrics like accuracy, precision, recall, and F1-score.

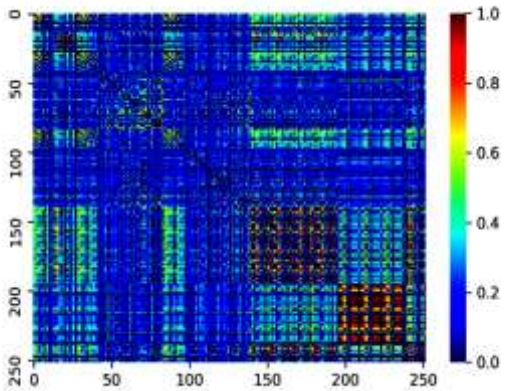

Figure 7: Correlation map

Figure 7 is showing the correlation matrix, it is a table showing correlation coefficients between variables. Each cell in the table shows the correlation between two variables. A correlation matrix is used to summarize data, as an input into a more advanced analysis, and as a diagnostic for advanced analyses.

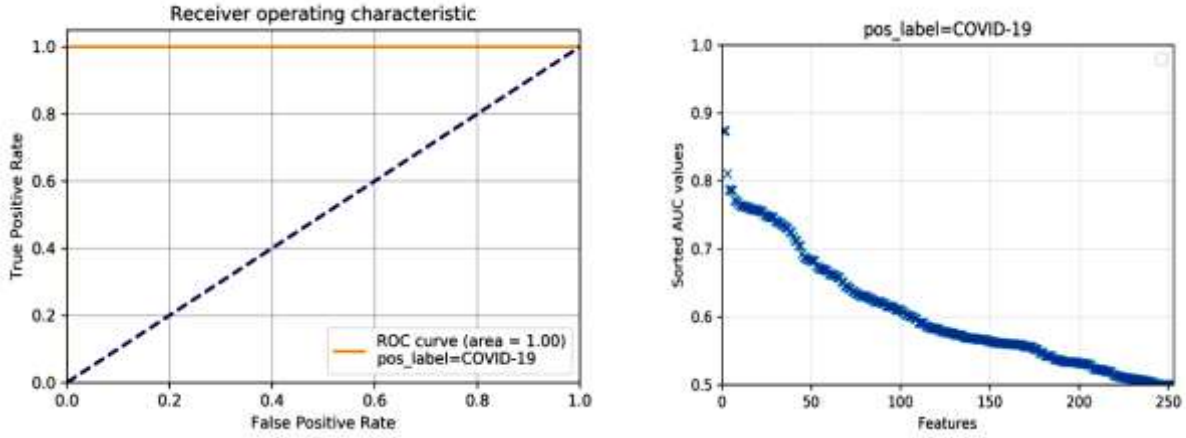

Figure 8: (a) ROC Curve (b) AUC curve

Figure 8 is showing the Receiver Operating Characteristic (ROC) curves and area under the curve (AUC). Roc shows the typically feature true positive rate on the Y axis, and false positive rate on the X axis. This means that the top left corner of the plot is the "ideal" point and a false positive rate of zero, and a true positive rate of one. This is not very realistic, but it does mean that a larger area under the curve (AUC) is usually better.

Table 1: Simulation Results

Sr. No.	Parameters	Proposed Approach
1	Accuracy	77.5%
2	Classification error	22.5%
3	Precision	73.91%
4	Recall	85%
5	F-measure	79.06%
6	Specificity	70%

IV. CONCLUSION

The introduced conceptual structures and platforms in the research field of AI-based techniques, which are suitable for dealing with COVID-19 issues. Different techniques have been developed, incorporating COVID-19's diagnostic systems, such as RNN, LSTM, GAN, and ELM. The geographical issues, high-risk people, and recognizing and radiology were the main problems with COVID-19 and have been studied and discussed in this work. This paper showed a mechanism for selecting the appropriate models of estimation and prediction of desired parameters using a number of clinical and non-clinical datasets. Considering these platforms assists AI experts to analyze huge datasets and help physicians train machines, set algorithms or optimize the analyzed data for dealing with the virus with more speed and accuracy. We discussed that they are desirable because of their potential for creating a workspace while AI experts and physicians could work side by side. However, it should be noted while AI speeds up the methods to conquer COVID-19, real experiments should happen because a full understanding of advantages and limitations of AI-based methods for COVID-19 is yet to be achieved, and novel approaches have to be in place for problems of this level of complexity. Simulated results show that the significant achievement in performance parameters.

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