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Implementation and Utilization of Deep Learning Approach in the Medical Field

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Abstract- The COVID-19 epidemic has brought about an unusually terrible circumstance for the entire planet, terrifyingly stopping life as we know it and taking thousands of lives. Due to the expansion of COVID-19 to 212 countries and territories, as well as the rise in infection cases and fatalities. The public health system continues to be seriously threatened. The deep learning strategy for predicting the severity of the decline in COVID-19-infected patients was proposed in this research and is based on CNN. The suggested model may learn complicated connections between a variety of heterogeneous parameters using this new methodology, including census data, intra-county movement, inter-county mobility, data on social distance, previous infection growth, and more. According to the simulated results, total accuracy is 23.85% higher than prior work, and classification error is 32.86% lower than prior methodology. The prior method yielded precision values of 6.29%, recall values of 78%, and f-measure values of 36.01%. The simulation results demonstrate that the overall enhancement of performance parameters is superior to the current method.

Keywords- deep learning, CNN, Covid-19, Machine Learning, Deep learning, AI, 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.

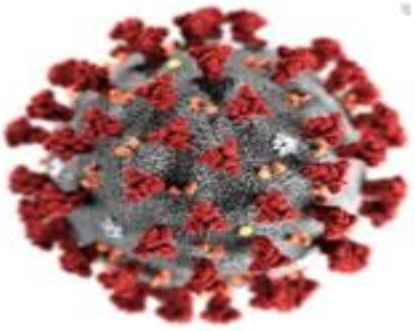


Fig 1. Corona virus.

The overview of various intelligence techniques and methods that 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.

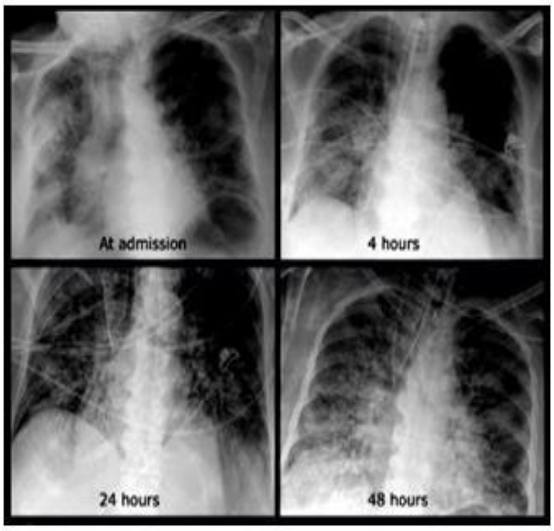


Fig 2. Chest condition due to Covid-19.

A majority of these nations are currently in partial or total lockdown due to a lack of resources to combat the COVID-19 epidemic and concern over overstretched healthcare systems. Worldwide, the number of laboratory-confirmed coronavirus cases has been rising alarmingly, with more than 3 million cases apparently confirmed as of 30 April 2020. Since the COVID-19 outbreak, there have been several false claims, inaccurate information, and unwarranted concerns about coronavirus that have only served to exacerbate these problems.

The global coronavirus disease pandemic of 2019 (COVID-19) is escalating. The use of medical imaging techniques like computed tomography (CT) and X-rays is crucial in the fight against COVID-19 on a worldwide scale, and recently developed artificial intelligence (AI) technologies have the potential to enhance the effectiveness of imaging tools even further. The quick reactions to COVID-19 in the medical imaging community (driven by AI) are reviewed here. AI-powered picture acquisition, for instance, can greatly assist in automating the scanning process and also reorganize the workflow with little touch to patients, offering the best protection to the imaging technicians.

II. PROPOSED METHODOLOGY

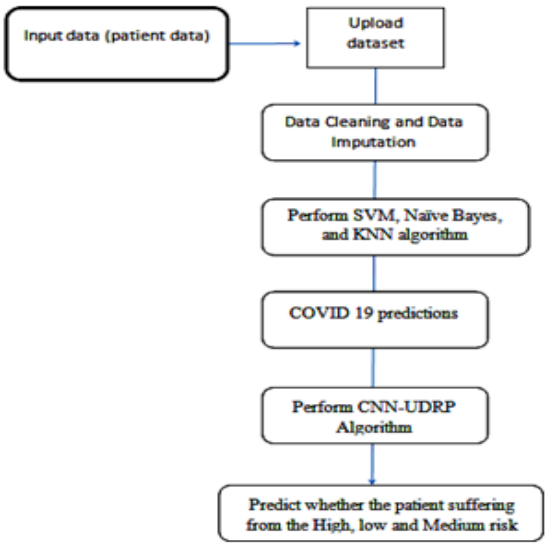


Fig 3. Flow Chart.

- The dataset used the Naive Bayesian (NB), K-nearest Neighbor (KNN), and Support Vector Machine (SVM) methods to forecast the likelihood of contracting the disease.
- The algorithm known as "CNN-based Unimodal Disease Risk Prediction" (CNN-UDRP):
- The following steps are involved in processing medical imaging data using the CNN-based unimodal disease risk prediction (CNN-UDRP) algorithm: data representation for images.
- Image's convolution layer CNN: Each vector's front and rear are each given two words to choose from.Image layer pool According to CNN, not every pixel in the image has an equally important role; instead, by using maximum pooling, the elements that are most important to the image are chosen.
- The image's complete connecting layer CNN: A fully connected neural network was used to connect the pooling layer. • CNN classifier: A softmax classifier is selected as the classifier to which the connection layer is linked.
- CNN-based Multimodal Disease Risk Prediction (CNN-MDRP) algorithm: This algorithm solely analyses image data to determine whether a patient is at high risk for developing a chronic illness. Unstructured and structured picture data are both supported by the CNN-UDRP algorithm.

III. SIMULATIONS 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)

Fig 4. Seriousness of decease (a) Normal lungs detected (b) Pneumonia lungs detected.

Fig 5. Covid-19 Detected.

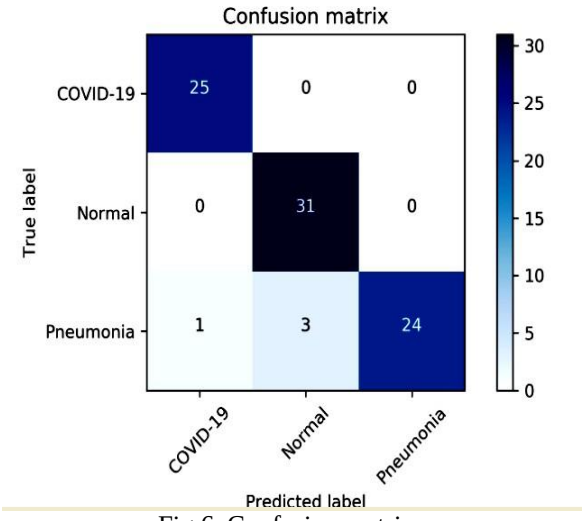


Fig 6. Confusion matrix.

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.

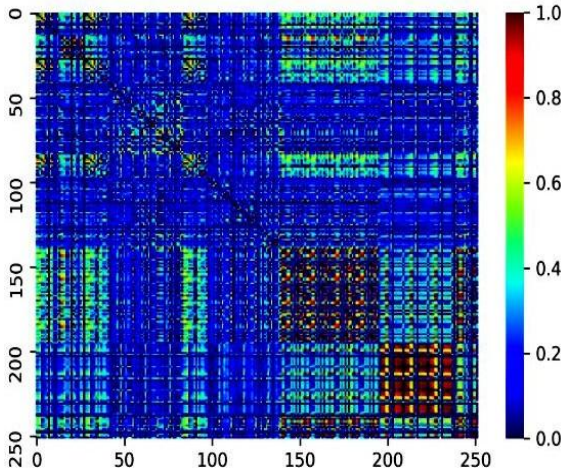
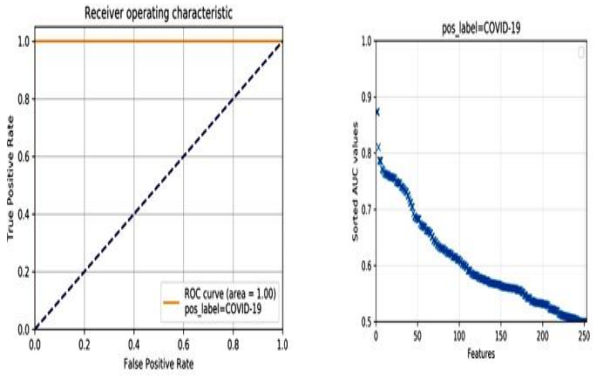


Fig 7. Correlation map.

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.



(a) (b)

Fig 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	80.5%
2	Classification error	23.5%
3	Precision	75.91%
4	Recall	89%
5	F-measure	80%
6	Specificity	69.09%

Table 2. Comparison of previous and proposed work

Sr. No.	Parameters	Previous Work	Proposed Work	
1	Accuracy	65.0%	80.5%	23.85%
2	Classification error	35%	23.5%	-32.86%
3	Precision	71.42%	75.91%	6.29%
4	Recall	50.0%	89%	78%
5	F-measure	58.82%	80%	36.01%

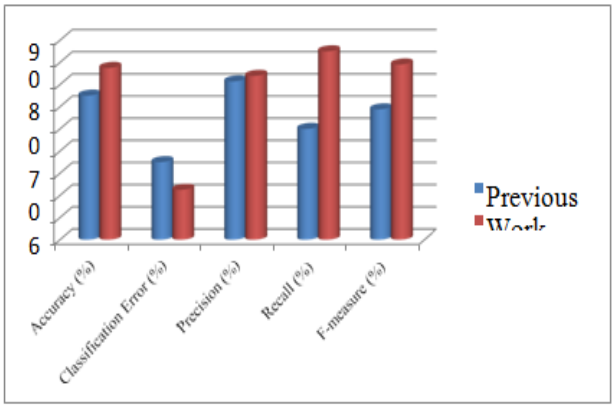


Fig 9. Chart

IV. CONCLUSION

The paper proposed an efficient approach based on Deep Learning for Covid-19 Diagnosis and Prediction. Organizations providing healthcare Medical care,they urgently need decision-making innovations to combat this infection and assist them in gradually receiving appropriate ideas to stop its spread. Computer-based intelligence efficiently mimics human intelligence. Additionally, it might play a crucial role in understanding and suggesting the enhancement of a COVID-19 vaccination.

This outcome-driven innovation is used for legal patient screening, investigation, forecasting, and tracking. The notable programmes are used to track data on confirmed, recovered, and fatal cases.Artificial intelligence is a creative invention that is helpful in the fight against the COVID-19 pandemic. This innovation helps with proper patient screening, follow-up, and forecasting for both present and prospective patients. The important applications of this artificial intelligence are in the early detection and determination of contamination.The simulation results achieve According to the simulated results, total accuracy is 23.85% higher than prior work, and classification error is 32.86% lower than prior methodology. The prior method yielded precision values of 6.29%, recall values of 78%, and f-measure values of 36.01%.

The simulation results demonstrate that the overall enhancement of performance parameters is superior to the current method.We presented models that can deconstruct clinical imaging, encouraging the culmination of a cycle that perceives COVID-19-related infections, taking into account that imaging workflows can motivate propels in AI strategies suitable for assisting radiologists who seek an analysis of complex imaging and text data.

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