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Review of Deep Learning Approach in the Medical Field for Covid-19 Diagnosis

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Abstract- For diagnosis of corona virus disease 2019 (COVID-19), a SARS-CoV-2 virus-specific reverse transcriptase polymerase chain reaction (RT–PCR) test is routinely used. The COVID-19 pandemic has rapidly propagated due to widespread person-to-person transmission. The COVID-19 pandemic has resulted in over 3 billion cases worldwide. Early recognition of the disease is crucial not only for individual patient care related to rapid implementation of treatment, but also from a larger public health perspective to ensure adequate patient isolation and disease containment. Chest CT is more sensitive and specific than chest radiography in evaluation of SARS-CoV-2 pneumonia and there have been cases where CT findings were present before onset of clinical symptomatology4. In the current climate of stress on healthcare resources due to the COVID-19 outbreak, including a shortage of RT–PCR test kits, there is an unmet need for rapid, accurate and unsupervised diagnostic tests for SARS-CoV-2. Laboratory confirmation of SARS-CoV-2 is performed with a virus-specific RT–PCR, but the test can take up to 2 days to complete. This study shows various techniques of artificial intelligence (AI) algorithms to findings with clinical symptoms, exposure history and laboratory testing to rapidly diagnose patients who are positive for COVID-19.

Keywords- corona virus, Artificial intelligence (AI), CNN, Deep learning, Machine Learning.

I. INTRODUCTION

The novel Corona virus doled out SARS-CoV-2 appeared in December 2019 to begin a pandemic of respiratory infection known as Coronavirus which validated itself as an interesting ailment that can ascend in various designs and levels of reality going from smooth to extreme with the danger of organ dissatisfaction and destruction.

From delicate, self-limiting respiratory plot illness to extreme reformist pneumonia, multi organ disillusionment, and death.

With the progression of the pandemic and rising number of the changed cases and patients who experience serious respiratory disillusionment and cardiovascular traps, there are solid inspirations to be tremendously stressed over the consequences of this viral pollution.

Choosing appropriate approaches to manage show up at answers for the Coronavirus related issues have gotten a ton of thought. In any case, another monstrous issue that researchers and chiefs need to oversee is the steadily growing volume of the date, known as large information that challenges them during the time spent doing combating against the virus. Corona viruses are a gathering of RNA viruses that cause illnesses in warm blooded creatures and birds. In people and birds, they cause respiratory lot diseases that can go from gentle to deadly.

Gentle sicknesses in people incorporate a few instances of the regular cold (which is additionally brought about by other viruses, dominatingly rhinoviruses), while more deadly assortments can cause SARS, MERS, and Coronavirus. In cows and pigs they cause looseness of the bowels, while in mice they cause hepatitisand encephalomyelitis. There are at this point no antibodies or antiviral

medications to forestall or treat human coronavirus diseases. Corona viruses are a get-together of RNA viruses that cause illnesses in warm blooded creatures and winged animals. In individuals and fowls, they cause respiratory plot contaminations that can go from smooth to destructive.

Delicate ailments in individuals consolidate a couple of cases of the essential cold (which is similarly achieved by various viruses, prevalently rhinoviruses), while all the more dangerous combinations can cause SARS, MERS, and Coronavirus. In cows and pigs they cause detachment of the guts, while in mice they cause hepatitis and encephalomyelitis. There are so far no inoculations or antiviral prescriptions to forestall or treat human coronavirus contaminations.

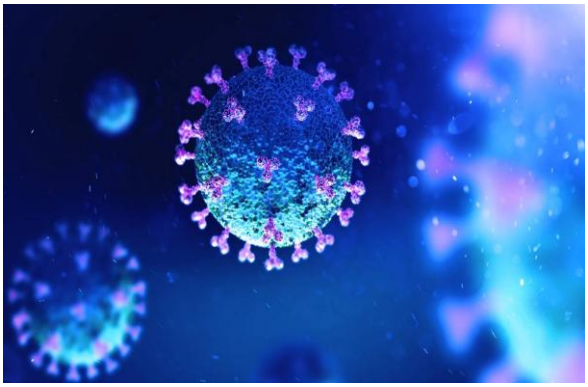

Fig 1. Corona virus.

Corona viruses contain the subfamily Ortho corona virinae, in the family Corona viridae, demand Nidovirales, and area Riboviria. They are enveloped viruses with a positive-sense single-deserted RNA genome and a nucleocapsid of helical uniformity. The genome size of corona viruses goes from approximately 26 to 32 kilobases, one of the greatest among RNA viruses. They have brand name club-shaped spikes that adventure from their surface, which in electron micrographs make an image reminiscent of the sun controlled corona, from which their name surmises.

The name "corona virus" is gotten from Latin corona, implying "crown" or "wreath", itself a getting from Greek κορώνη korṓnē, "shrub, and wreath". The name was written by June Almeida and David Tyrrell who recently watched and considered human corona viruses. The word was first used on work in 1968 by an easygoing social event of virologists in the journal Nature to allocate the new gathering of viruses.[8] The name insinuates the brand name appearance of virions (the infective kind of the virus) by electron microscopy, which have an edge of colossal, bulbous surface projections making an image reminiscent of the sun based corona or brilliance. This morphology is made by the viral spike peplomers, which are proteins outwardly of the virus.

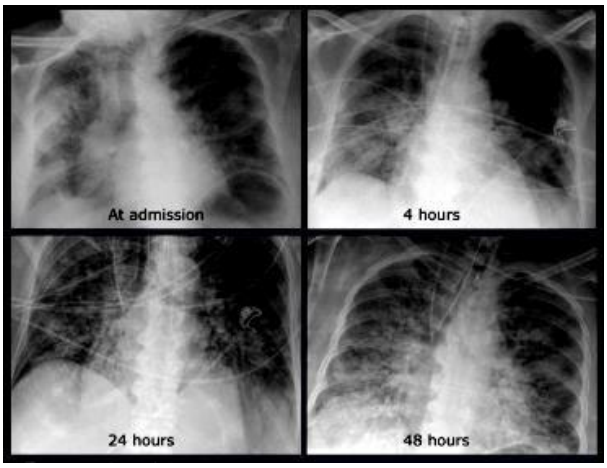

Fig 2. Chest condition due to CORONA.

II. HISTORY OF CORONAVIRUS DISEASES IN HUMAN

Corona virus disease was first found in a long time during the 1930s. The virus, Human corona virus 229E (HCoV-229E) was first bound in 1965.[16] Thus, six further coronaviridae were recognized in individuals, these being the normal Human corona virus NL63 (HCoV-NL63), Human corona virus OC43 (HCoV-OC43), Human corona virus HKU1 (HCoV-HKU1), similarly as novel MERS-CoV, SARS-CoV and SARS-CoV- 2.[17] HCoV-229E and HCoV-NL63 are Alpha corona virus (α-CoV or Alpha-CoV),[17] while HCoV-OC43, HCoV-HKU1, MERS-CoV, SARS-CoV and SARS-CoV-2 are Beta corona virus (β-CoV or Beta-CoV). In November 2002 an episode of Extreme Intense Respiratory Condition (SARS) was found. This contamination began in China and in like manner spread to Vietnam, Hong Kong, Taian, Singapore and Canada.

Corona viruses are named for the crown-like spikes on their surface. Infection with severe acute respiratory syndrome corona virus 2, or SARS-CoV-2, causes corona virus disease 2019 (COVID-19). The virus that causes COVID-19 spreads easily among people. Data has shown that the COVID-19 virus

spreads mainly from person to person among those in close contact.

The In December 2019, a novel coronavirus (nCoV) was recognized in Wuhan, China, which was isolated on 7 January 2020. The World Prosperity Affiliation proposed the between time name of the ailment as 2019-nCoV intense respiratory illness (2019-nCoV ARD) and 2019 novel coronavirus (2019-nCov) as the virus. In any case, the ailment has thus been renamed as coronavirus contamination 2019 (Coronavirus) and the virus as extreme intense respiratory condition coronavirus 2 (SARS-CoV-2).

III. CLINICAL SYMPTOMS

Most patients experience mild flu-like symptoms including fever, cough, malaise, fatigue, sputum production and respiratory problems. Less common symptoms such as headache, hemoptysis and gastrointestinal symptoms with diarrhea and serious symptoms like pneumonia and bronchitis were also observed.

Complications like Acute Respiratory Distress Syndrome, RNAaemia, acute cardiac injury, acute kidney injury and secondary infections [19] were reported in some patients. Other lab parameters associated with COVID-19 were low white blood cells and lymphocyte count, an increase in erythrocyte sedimentation rate, C-reactive protein, infiltrates and bilateral ground-glass opacity in lung CT scans.

IV. PREVENTION & CONTROL

It is imperative to adopt control measures such as case isolation, contact tracing, quarantine to limit human-to-human COVID-19 transmission. Personal hygiene measures such as frequent hand washing, respiratory hygiene, social distancing, use of face masks/shields and disinfection of surfaces can help in reducing the transmission.

V. APPLICATION OF ARTIFICIAL INTELLIGENCE IN COVID-19 DISEASE MANAGEMENT

The essential piece of breathing space of these reenacted knowledge based stages is to enliven the pattern of end and therapy of the Coronavirus infection. The most recent related disseminations and clinical reports were analyzed to pick data sources and focal points of the organization that could empower showing up at a strong Fake Neural Organization based contraption for challenges related with Coronavirus. Also, there are some specific commitments for each stage, including various kinds of the information, for instance, clinical information and clinical imaging which can improve the display of the introduced approaches toward the best responses in rational applications.

Computerized reasoning (reproduced insight) objective is to support human cutoff focuses. It is getting a position on human associations, filled by the creating openness of supportive clinical information and fast development of keen frameworks. Convinced by the need to highlight the necessity for using computerized reasoning in drawing in the Coronavirus Crisis, this investigation summarizes the current status of man-made insight applications in clinical associations while battling Coronavirus. Additionally, we highlight the use of Huge Information while understanding this virus.

VI. APPLICATION OF ARTIFICIAL INTELLIGENCE

Unprecedented pace of efforts to address the COVID-19 pandemic situation is leveraged by big data and artificial intelligence (AI). Various offshoots of AI have been used in several disease outbreaks earlier. AI can play a vital role in the fight against COVID-19.

AI is being successfully used in the identification of disease clusters, monitoring of cases, and prediction of the future outbreaks, mortality risk, and diagnosis of COVID-19, disease management by resource allocation, facilitating training, record maintenance and pattern recognition for studying the disease trend. Several applications of AI that are garnering a lot of interest and raising hopes in the fight against COVID-19 are as follows:

- AI in prediction & tracking,
- AI in contact tracing,
- AI in monitoring of COVID-19 cases,
- AI in early diagnosis,
- AI in reducing the burden from medical practitioners & healthcare staff,
- AI in protein structure prediction,
- AI in development of therapeutics,
- AI in development of vaccines.

1. Advantage of AI:

Moreover, it realizes the prediction of response to different treatment modalities because it can predict the pattern of cardiovascular complications. Hence, considering their properties and multiple advantages, ELMs are recommended for such problems. 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.

VII. ARTIFICIAL INTELLIGENCE BASED TECHNIQUES

The present area centers around the presentation of some pertinent artificial intelligence based techniques that can support existing standard strategies for managing COVID-19 in medical care frameworks around the globe. With the point of foregrounding the improved adequacy of these methodologies and procedures, their arrangement has been educated by and dependent on the latest man-made intelligence related distributed clinical updates just as the most recent reports on COVID-19.

Accordingly, this segment presents thoughts that can upgrade and accelerate ANN-based strategies getting cycle to improve treatment techniques and wellbeing the board just as acknowledgment and analysis. Be that as it may, the ideal viability of man-made intelligence apparatuses during COVID-19 pandemic relies upon the degree of human info and coordinated effort in various jobs people play. The knowledge of abilities and impediments of artificial intelligence, be that as it may, remains with data researchers who assume a significant job just on the grounds that they are the ones who hub man-made intelligence frameworks.

VIII. CATEGORY OF ALGORITHMS

In machine learning, classification is a supervised learning approach which can be thought of as a means of arranging or classifying some unknown items into a discrete set of classes. Classification attempts to become familiar with the relationship between a set of highlight variables and an objective variable of interest. The objective property in classification is a straight out factor with discrete values. Given a set of preparing information points alongside the objective labels, classification determines the class mark for an unlabeled test case. here are numerous types of classification algorithms and machine learning, such as decision trees, naive bayes, linear discriminant analysis, k-nearest neighbor, logistic regression, neural networks, and support vector machines. There are many types of classification algorithms in machine learning, such as-

1. K-Nearest Neighbors Algorithm (KNN):

The K-Nearest Neighbors is a calculation for supervised learning and is a classification calculation that takes a lot of named points and uses them to figure out how to name different points. This calculation classifies cases based on their similarity to different cases. In K-Nearest Neighbors, information points that are close to one another are said to be neighbors. K-Nearest Neighbors is based on this worldview. Thus, the distance between two cases is a measure of their dissimilarity.

2. F1-Score (Confusion Matrix):

This matrix shows the corrected and wrong predictions, in comparison with the actual labels. Each confusion matrix row shows the Actual/True labels in the test set, and the columns show the predicted labels by classifier. A good thing about the confusion matrix is that it shows the model's ability to correctly predict or separate the classes.

3. Decision Tree:

Decision trees are built using recursive partitioning to classify the data, i.e., by splitting the training set into distinct nodes, where one node contains all of or most of one category of the data. A decision tree can be constructed by considering the attributes one by one:

4. Naïve Bayes:

Naïve Naïve Bayes classifier is a supervised calculation which classifies the dataset on the basis of Bayes hypothesis. The Bayes hypothesis is a standard or the numerical idea that is used to get the likelihood is called Bayes hypothesis. Bayes hypothesis requires some free assumption and it requires autonomous variables which is the basic assumption of Bayes theorem. Naïve Bayes is a simple and incredible calculation for prescient

modeling. This model is the most viable and proficient classification calculation which can deal with massive, muddled, non-linear, subordinate information. Naïve comprises two section to be specific naïve and Bayes where naïve classifier assumes that the presence of the specific element in a class is disconnected to the presence of some other element.

5. Logistic Regression:

Logistic regression is a classification calculation for unmitigated variables. Logistic regression is analogous to linear regression, however tries to foresee a clear cut or discrete objective field, such as 0 or 1, yes or no, and so forth., instead of a numeric one. Subordinate variables should be continuous. In the event that clear cut, they should be sham or marker coded. This means we need to transform them to some continuous worth.

6. Support Vector Machine:

Support Vector Machine (SVM) is a supervised calculation that can classify cases by isolating an informational index into at least two classes using a separator. SVM works by: Mapping information to a high-dimensional component space so that information points can be sorted (kernelling), in any event, when the information are not otherwise linearly separable. A separator between the categories is found; at that point the information is transformed in such a manner that the separator could be drawn as a hyper plane. Following this, characteristics of new information can be used to anticipate the gathering to which another record should have a place.

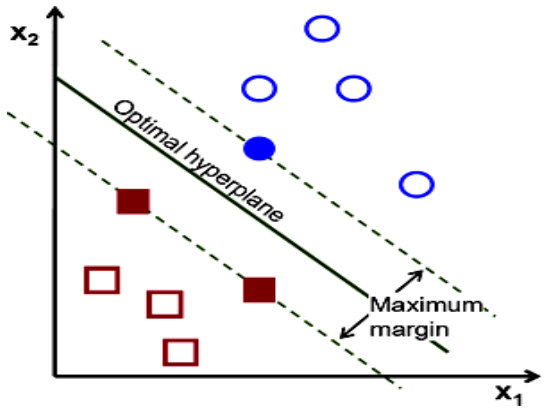

Fig 3. Support vector machine.

Kernel function is the mathematical function used for mapping data into a higher dimensional space, in such a way that can change a linearly inseparable dataset into a linearly separable dataset, and can be of different types, such as linear, polynomial, Radial Basis Function, or RBF, and sigmoid.

- Take a 1D linearly inseparable dataset (x)
- Define a function to map to 2D, ϕ(x) = [x,x2]

One reasonable decision as the best hyperplane is the one that represents the largest separation or edge between the two classes. Information points closest to the hyperplane are support vectors. It is instinctive that lone support vectors matter for accomplishing our objective. What's more, thus, other slanting examples can be overlooked. We attempted to discover the hyperplane in such a manner that it has the greatest distance to support vectors. The hyperplane is gained from preparing information using an improvement method that maximizes the edge. What's more, like numerous different problems, this streamlining issue can also be solved by angle descent, which is out of scope of this video.

The two main advantages of support vector machines are that they're: accurate in high-dimensional spaces and use a subset of training points in the decision function called, support vectors, so it's also memory efficient

IX. DEEP LEARNING ALGORITHMS

Deep learning (otherwise called deep organized learning) is important for a more extensive group of AI strategies dependent on artificial neural networks with representation learning. Learning can be regulated, semi-administered or unaided.
Deep learning models, for example, deep n

eural networks, deep conviction networks, repetitive neural networks and convolution neural networks have been applied to fields including PC vision, machine vision, discourse acknowledgment, normal language processing, sound acknowledgment, informal community separating, machine interpretation, bioinformatics, drug plan, clinical picture analysis, material examination and table game projects, where they have delivered results similar to and sometimes awe- inspiring human master execution.

In deep learning, a convolution neural network (CNN, or ConvNet) is a class of deep neural networks, most

ordinarily applied to investigating visual imagery.[1] They are otherwise called move invariant or space invariant artificial neural networks (SIANN), in view of their mutual loads engineering and interpretation invariance characteristics.[2][3] They have applications in picture and video acknowledgment, recommender systems,[4] picture classification, clinical picture analysis, normal language processing,[5] and monetary time series.[6]

CNNs are regularized forms of multilayer perceptrons. Multilayer perceptrons normally mean completely associated networks, that is, every neuron in one layer is associated with all neurons in the following layer. The "completely connectedness" of these networks makes them inclined to overfitting data. Average methods of regularization incorporate including some type of extent estimation of loads to the misfortune function. CNNs take an alternate methodology towards regularization: they take favorable position of the progressive example in data and gather more mind boggling designs utilizing more modest and easier examples. Hence, on the size of connectedness and unpredictability, CNNs are on the lower extraordinary.

Convolutional networks were motivated by natural cycles in that the availability design between neurons looks like the association of the creature visual cortex. Individual cortical neurons react to boosts just in a confined area of the visual field known as the responsive field. The open fields of various neurons halfway cover with the end goal that they spread the whole visual field.
CNNs utilize generally little pre-processing contrasted with other picture classification calculations. This implies that the network learns the channels that in customary calculations were hand-designed. This autonomy from earlier knowledge and human exertion in include configuration is a significant favorable position.

X. CONCLUSION

The tiny sample size is one of the limitations of an AI-based study. Despite the encouraging outcomes of utilizing the AI model to screen patients for COVID-19, further data gathering is necessary to see whether the AI model can be applied to other patient populations. Working together to collect data may make it easier to improve the AI model. The small sample size creates challenges for model training as well. This research reviews an AI-based method for detecting the Cobid-19 disease. The CNN approach to deep learning is more conducive to accurate detection than others. ML-based method research is also expanding quickly.

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