

Effect of Covid-19 and Role of AI Approaches in the Context of India

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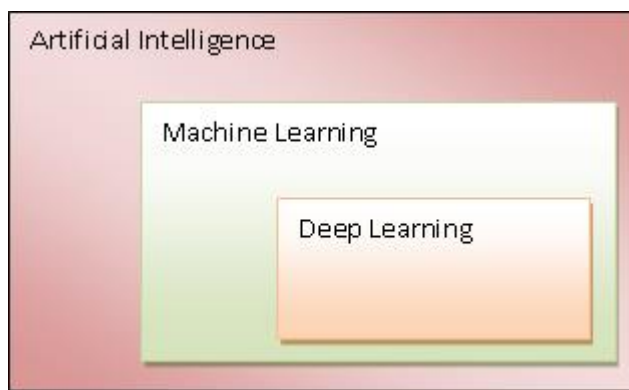
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INTRODUCTION

From few decades AI almost uses in everywhere to make a decision, in problem solving concept etc. As AI stand for Artificial Intelligence a human generated intelligence of machine which is used to solve many problems either by self learning or by human interaction. AI uses to solve complex problem using intelligences by Reasoning learning, and self-correction. Machine learning and deep learning are component of AI, ML is a algorithmic approach while Deep learning use multi layer neural networks for data analysis. Deep learning is a subset of machine learning in which huge amount of data are used to learn from multilayered neural network. Machine learning is an algorithmic approach where the performance of algorithm is increased as the amount of data increased. Machine learning belongs to the artificial intelligence as a subset. Artificial intelligence is a set of command that designed to sense, act and adapt by self learning. It is learns like a human, as human learn from their experiences, in artificial intelligence machine or algorithm learn by the earlier database. As like the human learn more as he/she became more experience similarly in this area machine and algorithm become more accurate and useful as the amount of data increases. Nowadays, deep learning used as a tool in various study areas such as speech theory, computer vision, NLP, health sector and many more [1][2].

Figure 1 Hierarchic of Deep Learning



In a research field extracting something valuable from available data using deep learning required some process in an organized way. Therefore, Deep learning include following steps to process the data:

- Clearly identify the problem.
- Is Deep learning is providing good solution for the problem.
- Collect the related data those match with given problem.
- Select the appropriate deep learning algorithm or architecture.

- Train algorithm with large amount of data.
- Test the model/algorithm against unlabeled data.

In deep learning the problem identification is also a major concern because all the data formatted according to problem and then after we have to select appropriate deep learning algorithm. After that the algorithm trained against huge amount of data this process known as training process. After the training process is completed testing is carried forward to analyze the performance of deep learning algorithm or architecture. There are several deep learning architectures available which is discussed in next section [3][4][5].

DEEP LEARNING ARCHITECTURES

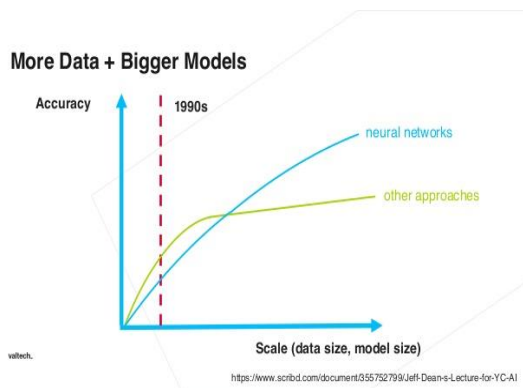
In a deep learning basically some architecture are used such as Deep Neural Networks (DNN), Deep Belief Networks (DBN), Deep Reinforcement Learning (DRL), Recurrent Neural Networks (RNN) and Convolution Neural Networks (CNN).

- DNN is an Artificial Neural Network (ANN) technique with multiple layers neural network. Multiple hidden layers exist between input and output layers which consist similar type of component like neuron, base, weight, synapses etc. DNN used to construct a model for complex non linear relationship. DNN data flow from input layer to output layer hence it is an example of feed forward Network.
- RNN is also an ANN technique where directed graph is used to connect the nodes. RNN basically have two classes of network one for finite impulse and another for infinite impulse. A finite impulse is represented by a DAG(directed acyclic graph) that can be unrolled and replaced with a strictly feed forward neural network, while in infinite impulse class of recurrent network is be unrolled. The finite impulse and infinite impulse classes of networks exhibit temporal dynamic behavior.

RNN suffer from two problems due to its short term memory, if it is a feed forward then short term memory is a concerning problem. If sequence is large enough then most probably the information is lost from carrying it from earlier to later time stamp. During back propagation, RNN suffer from the problem of vanishing gradient (to modify the weight of the network, gradient value is used). On the other hand the gradient is shrinks as it back propagates through time. It is generally known as vanishing gradient problem. If a gradient value becomes too small then it is not good in learning process and machine can't learn more. Therefore, some other type of RNN is introduces to deal with these problems such as Long Short-Term Memory LSTM and Gated Recurrent Units (GRU) [3][4][5][6][7].

- CNN: CNNs are variants of multi-layer perceptions inspired by biological work of neurons. It is a type of artificial neural network often used in image processing. They have an ability to recognize various visual patterns hidden in unprocessed image pixels. But in rare case it required some minimal preprocessing before put images as input to CNNs. These deep networks deal with a receptive field to make a decision using multiple layer neurons and shared weights in each convolution layer. CNN is inspired by human brains visual system to make computer capable to view the world like human [7][8].

Figure 2 Performance Graph of Deep Learning



APPLICATION OF DEEP LEARNING

Deep learning an algorithmic approach that used according to identifies relevant relationships in datasets. Deep learning also generally used to solves complex problems in the domain of machine learning, AI, and data science. There are several application of area of deep learning techniques that are currently used. These include Restricted Boltzmann Machines (RBMs), auto-encoders, Deep Belief Networks (DBNs) and Deep Convolution Neural Networks (CNNs). In recent years, some direct application of deep learning become more popular such as visual Recognition, Healthcare, Automatic game playing, self driving car, Fraud detection, Adding sounds to silent movies, Automatic Machine Translation, Language Translations, Pixel Restoration etc [8][9].

ADVANTAGE OF DEEP LEARNING

Nowadays, deep learning widely used in various areas due to some ability of its such as Deep learning provide high accuracy due to huge amount of training data it become more precise. On the other hand it also works with unlabeled data which reduce time required for labeling. Hence the deep learning algorithm needs huge amount of data it is quit time consuming process. Also, for labeling of data the judgments of highly skilled experts may require, and that why it is expensive to receiving high-quality training data. It also used for unstructured data and provide best results. It also eliminates the requirement of feature engineering. To identify the features which is correlated, algorithm scans the data and combine them to promote the faster learning[3][5][7][8][9].

DISADVANTAGES OF DEEP LEARNING

Deep learning has number of advantages along with performance but regardless of its ability. It has some boundaries, which are limiting its application especially in clinical field. Deep learning architecture used large quantity of dataset for training, in some cases such amount of data collection are very hard. Another problem is the computational power required in deep learning. The lack of computational power cause of time consumption increases to train the network. Deep learning required both the CPU and GPU processing capability because in image processing graphical processing is essential. These are some common and well known problem of deep learning [7][8][9].

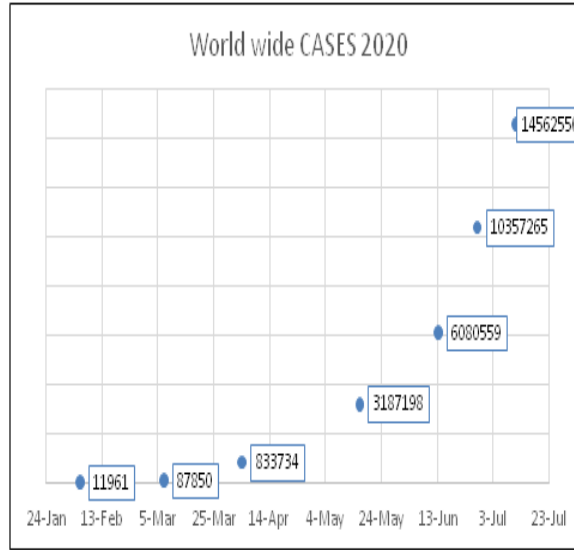
COVID-19 AND ITS VARIANT:

Viruses related to Corona are engulfed as RNA viruses that are positive strands varying from approx in diameter from sixty to one forty nm with impale like prognostication [10].

Effect of Covid-19

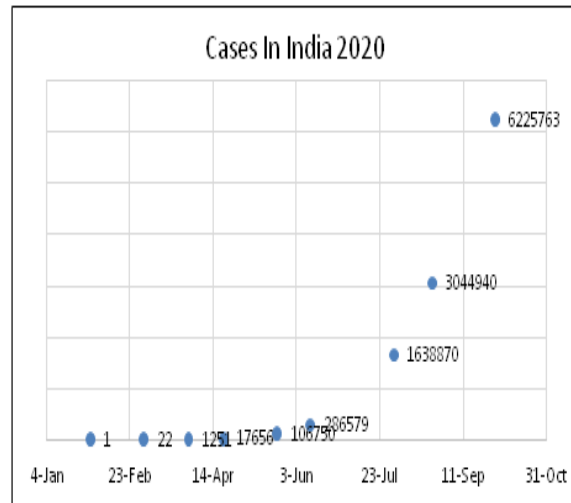
The 2019 Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2 is expeditiously spreading from its origin. It have been in dissemination in homo sapiens and mostly cause linnet respiratory disease. Virus, designated as severe acute respiratory syndrome corona virus affected 8422 people mostly in China [11]. In 2012, MERS-CoV, emerged in Saudi Arabia [12].Cases increase exponentially and modeling was delineated an epidemic doubling time of 1.8 d [13].Every age group were susceptible. Large droplets which are generated while coughing and sneezing causes Infection through transmission [14]. The WHO declared Pandemic on January 5, 2020 reporting that multiple cases of pneumonia of undetermined etiology in Wuhan [15].On march 11 2020, Around all the world approximate 41 cases was there in Jan 2020 on Feb-March it increased exponentially and become 87850 at the rate of 2142% approximately. At the beginning of July it is raised and reached up to 14562559 in 6 month this exponential increment outbreak results the pandemic.

Figure 3: Worldwide Covid cases 2020



In India on 30 January, the first case was confirmed in Kerala's Thrissur. In India On 8 may, 2020, reported positive cases are 56,342. India faced difficulty in managing and controlling the transmission. In Chhattisgarh, 19 march 2020 first confirmed case of corona virus was reported [16].

Figure 4 Covid cases 2020 in India



Variant of Covid-19

As viruses are revealed to environments conditions, by mutation and evocation variant generates that may inflate cynicism. The issues with this are that new variants may cause transmission reinfection severity and effectiveness of vaccine. The facility to swiftly obtain new genetic characteristics allows viruses to emanate [17].

Table 1.1: Variants of Covid-19

Variants of Covid-19

Name	Location of emergence
Alpha(B.1.1.7)	Britain
Beta(B.1.351)	South Africa
Gamma(P.1)	Brazil
Delta(B.1.617.2)	India
Epsilon(B.1.427,B.1.429)	California
Zeta(P.2)	Brazil
Eta(B.1.525)	New York
Theta(P.3)	Philippines
Lota(B.1526)	New York
Kappa(B.1.617.1)	India
Lambda(C.37)	Peru

Variant Originated In South East Area (Kappa And Delta)

“Double mutant virus B.1.617” has spread exponentially across India, this variant is highly transmissible. B.1.617.2 or Delta variant has a growth rate advantage that has allowed for it to become the dominant subtype found in much of India.

Diagnosis Techniques For Covid-19

The Corona virus imposed expeditiously development of highly authentic diagnostic methods. Rapid antigen or antibody tests, immune enzymatic serological tests and molecular tests based on RT-PCR [37-39].Rapid tests have been developed to detect viral antigens or anti-SARS-CoV-2 human [30,31] . RT-PCR-based methods is found to be more rapid and does not require the technical man power [41]. Viral culture is also a fundamental method for identification of SARS-CoV2 [42]. To obtain a viral culture in vitro, viral isolates play vital role on finding viral infections [43].

TREATMENT IN COVID

Table 2: Treatment of Covid-19

S.No	Name	Treatment type
1	Remdesivir	antiviral agent[35]

2	Hydroxychloroquine and chloroquine	Antiviral[42][43]
3	Lopinavir/ritonavir	combo therapy[45]
4	Ivermectin	anti-parasitic [46]
5	Convalescent Plasma	plasma therapy[47][48]
6	Casirivimab and Imdevimab	Antibody[49]
7	Sotrovimab	Antibody

According to WHO data from January 2021 to December 2021 of South East Asia, weekly detail of vaccination, Covid-19 infected person, death etc. are recorded. According to that after the vaccination death ratio going down [50]

Figure 5 : Weekly Report of First COVID-19 dose per 100 population (South East Asia data, from WHO)

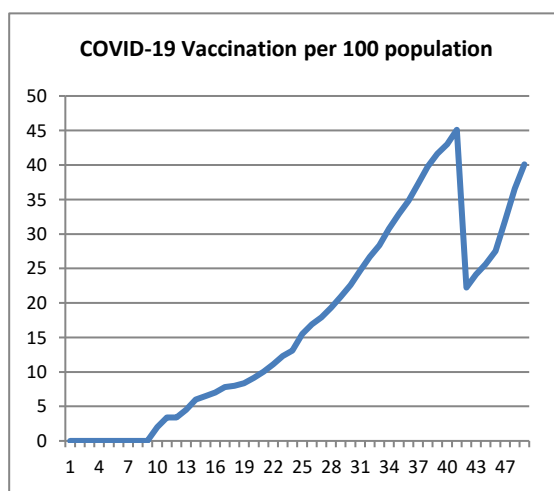


Figure 6 : Weekly Report of Death (South East Asia data, from WHO)

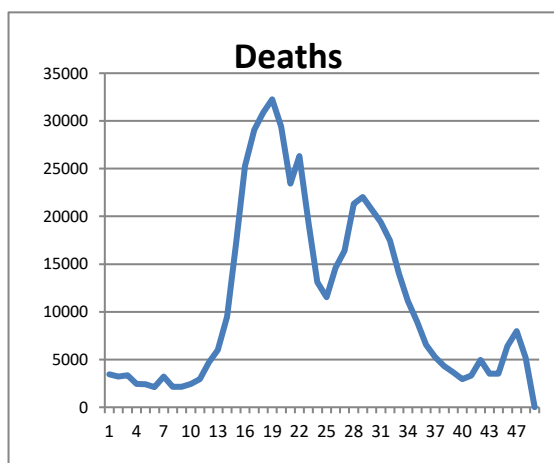
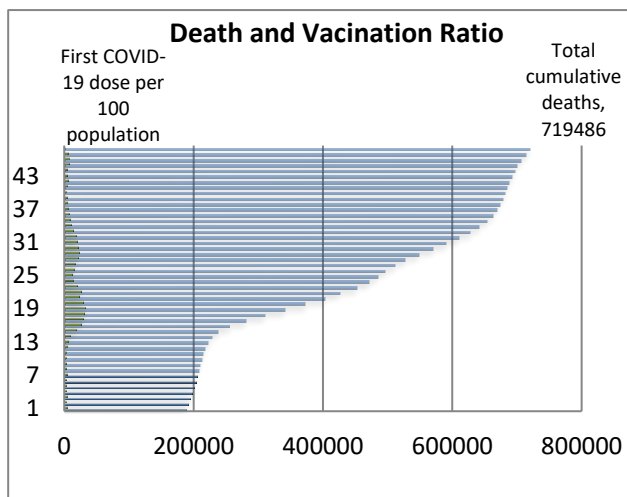


Figure 7 : Death and Vaccination(first dose) Ratio (South East Asia data, from WHO)



USE OF DEEP LEARNING IN COVID-19

In this painful time of covid-19 entire world face so many problem one of them is lack of rapid test and report generation. Countries like India where population is a big issue, suffer from this problem where the numbers of test not feasible with respect to the suspected patient due to over population. Consequently, more and more people getting affected by covid-19. The limitation imposed by our current medical services not capable to change this scenario. Therefore, automated diagnosis techniques for speeding up the process while maintaining accuracy and reducing the computational requirements are essential. In health industry the deep learning as an application is incredibly excited and endowed with the ease.. but RT-PCR has become the gold standard for COVID-19 testing as it is more accurate [17][51].

RT-PCR

According to Dr. Hanan Balkhy from WHO website “the PCR testing, which the NAAT is testing or that tests the nucleic acid of the virus itself, are the most sensitive ones. And it will take more time to provide a test report. In such situation where infection spread very fast and so many people getting affected, then in the testing in large scale is not feasible because it requires much time and resource for testing and report generation. For fast result antigen test will be considered but accuracy of this test is not good as required. Antigen testing is less expensive and time consuming than RT PCR because it does not need hi-tech laboratories to conduct them but Antigen is less reliable than RT PCR. In COVID pandemic like situation it has a very important value as one of the tools to address the COVID pandemic.

CT and X-ray

From the picking time of covid-19, various fast and effective techniques were searched and researched as find a better way according to the different variant of covid-19. In which the research community considered CT and X-ray imagery as alternatives. It is very effective to point out the infection of the lungs it uses various classification methods which provide more than 90% accuracy rate. Some researchers are successful to distinguish the covid-19 infection from some other infection by using X-ray image only. For training they were used previously collected CT or X-ray report of some other diseases as well as covid-19 [17][51].

Lung Ultrasound

In this type of pandemic scenario for rapid testing and fast report generation, computer based diagnosis must be required. It is fast and cost effective than other diagnosis method and massive screening is feasible with this method. Such as lung ultrasound testing is easy, portability is possible, low cost and trouble-free disinfected way to identify lung infection. Lung Ultrasound inspection of the lungs is helpful to evaluate the progression of the disease, from a focal interstitial pattern up to a "white lung" with evidence of subpleural consolidations. Using Deep learning techniques for the examination of ultrasound report of lung give a potential way to diagnosis the COVID-19 infection. The InceptionV3 network used by J. Diaz-Escobar et. al. and provide a promising predictive result identification of covid-19 [17] [51].

SUMMARY

In this study, AI concepts such as machine learning, deep learning, its applications, pro and cons were explored. In modern era researcher inclined towards health care, health care industries has a rich biomedical data related to different domain of health problem. The availability of biomedical data in huge amount brings massive opportunities as well as challenges. Deep learning has so many aspects which could be supportive in health care sector, such as its performance and ability of handling complex and multi-modality data and so on. To escalate these efforts, the deep learning research field as a whole must address several challenges. COVID-19 pandemic has massive impact on patients and medical systems worldwide. In this, Covid variants, its effect diagnosis techniques and some treatments were discussed. Deep learning helps in a predictive fashion, forecasting time to clinical improvement. AI technique such as deep learning is helpful in numerous fields. It could be possible to diagnosis the COVID-19 by deep learning. Research shows that it provides good results. Deep learning obtains great accuracies in several areas. The deep learning models have image processing capacity and by using image scanning it find out unusual pattern on the images which is used to make deep networks capable of demarcate the images correctly.

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