An Overview of Detection of COVID -19 in Medical Imaging using Machine Learning Methods

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Abstract - *Covid-19 was foreign to us and now spreading its routes well in India. It is noticed that lock-down and isolation are the important techniques to prevent the spreading of the disease. The Ministry of Health and family Welfare, Government of India and ICMR (Indian Council of Medical Research) has formulated guidelines, advisories for social distancing protocol, diagnosis, management, do's and don'ts and other reliable material. In this paper we study the effect of some prevention techniques on the spread of Covid-19 in India. This review briefly covers the introduction, possible mode of transmission, definitions, some basic advices, diagnosis, treatment and management protocol being followed right now in India. We all need to join forces to get this virus under control and by all we mean human and machines both. Technology is crucial to get us through this and a special role for machine learning is to be expected. In this paper we reviewed how can ML support us in this fight against COVID-19. It means ML provide to help us diagnose patients fast and accurate. we discuss the current methods for diagnosis of COVID-19 and investigate the possible role of machine learning.*

Key Words: Disease, COVID-19, machine learning, diagnosis, AI, India.

1. INTRODUCTION

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people, and those with underlying medical problems like cardiovascular disease, diabetes, chronicillness People may be sick with the virus

for 1 to 14 days before developing symptoms. The most common symptoms of corona virus disease are fever, tiredness and dry cough. More rarely the disease can be serious and even fatal older people and people with other medical conditions such as asthma, diabetes or heat disease may be more vulnerable to become ill [1].

The topic of Novel Corona virus is huge to cover it entirely in every aspect on a single page, and so is its impact across the world. But the basic things and protocols remain same everywhere. However subjected to change in due course of time as is the number of cases and mortality. The health care personnel are doing their job perfectly and so is the Government, but what is important for everyone being a citizen of India is to maintain social distancing and follow advisories strictly from time to time so that we can make way for our own lives and lives of our dear ones. We study the effect of these prevention techniques on the spread of Covid19 using machine learning techniques which will be used in India. This prediction is very much required to prepare medical set-ups and proceed for future plan-of-action. A new model for constrained scenario is proposed for Covid19 spread. It is proved by the analysis and available results that there is no community spread in the India so far, i.e., majority of people are not infected or spreading the disease because of lock-down or quarantined. An approximate prediction of new cases can be performed easily by using the proposed methods of machine learning. It is evident from the results that lock-down plays an important role to control the spread of the diseas [2].

How does COVID-19 spread

The new corona virus is a respiratory virus which spreads primarily through droplets generated when an infected person coughs or sneezes, or through droplets of saliva or discharge from the nose. The outbreak was identified in Wuhan in China in December 2019 decleared to be a Public Health Emergency of international concern on 30 Janaury 2020 and reconized as a Pandemic by WHO on 11th of March 2020. As of 14 April2020, more then 1.92 million case of Covid-19 have been reported in 210 countries and territories [3].

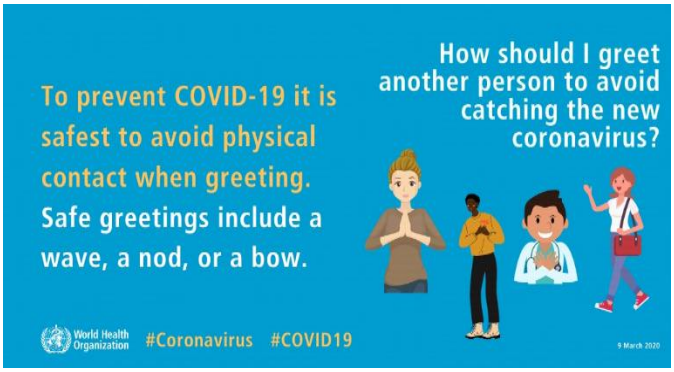


Fig -1: Prevention ofCOVID-19

The virus can survive on surface more then 72 hrs. It is most contagious during the first 3 days after onset of symptoms.

2020 CORONA VIRUS LOCKDOWN IN INDIA

On 24th March 2020,the Government of India under Prime Minister Narendra Modi ordered a nation wide lockdown for 21days, limiting movement of entire billion population of India as a preventive measure against the 2020 Covid-19 Pandemic India. On 7th April, reports said that the state government and other advisory committees recommend external lockdown on 9th April and 10th April, the state government of Odisha and punjab extended the lockdown in their States to 1st May Maharashtra, karnatka, west Bengal, Telangana followed suit. On 14th of April 2020, Prime Minister of India Narendra Modi extended the on going lockdown till 3rd of May 2020, with a conditional relaxation after 20 April for regions where spread have been contained or prevented [4].

Fig -2: Protection of CORONA

CURRENT SCENARIO IN INDIA

The first case of COVID19 in India was reported on 30 January 2020 originating from China. As of 26th March, the Indian Council of Medical Research and Ministry of Family Welfare has confirmed a total of 649 cases (subjected to change in due course), 42 recoveries, 1 migration and 13 deaths in the country. The infection rate of COVID-19 in India is reported to be 1.7, which is remarkably lower than in the worst affected countries [5]. The outbreak has been declared as an epidemic in more than a dozen states and Union Territories, where provision of the Epidemic Diseases Act, 1897 have been invoked, and educational institutions and many commercial establishments have been shut down. India has suspended all tourist visas, as a majority of cases were linked to other countries [6] The Govt. has also issued lockdown of 75 districts across the country where confirmed COVID-19 cases have been reported till 31 March [7]

Janta Curfew was observed on 22nd March 2020 in the wake of pandemic from 7 am to 9 pm as advised by Prime Minister Narender Modi [8]. He urged all Indians to stay at home for the next few weeks and if possible work from home [9]. The formation of the COVID-19 Economic Response Task Force was announced during the live address to the nation [10]. In the following Image 1 shows that distribution cases across various ststes and India. Image 2 has shown that ststewise distribution of Covid-19. For both the images source taken from Ministry of Health care and Family Welfare andwikipedia.

Do's	Don'ts
1.Wash your hands regularly for 20sec with soap and water. 2. Use sanitizer	1.Don't touch your eyes, nose, mouth if your hands are not clean. 2. Don't go outside without mask

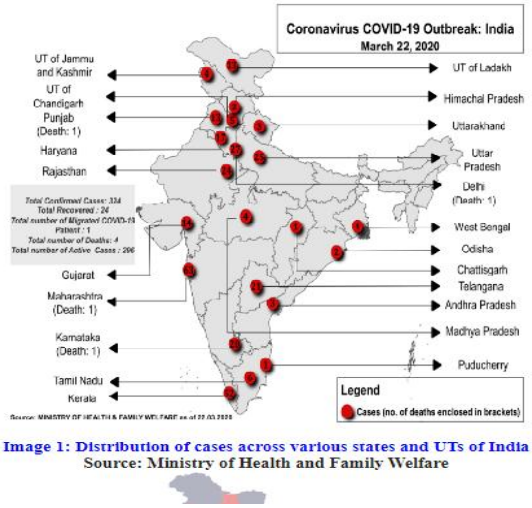
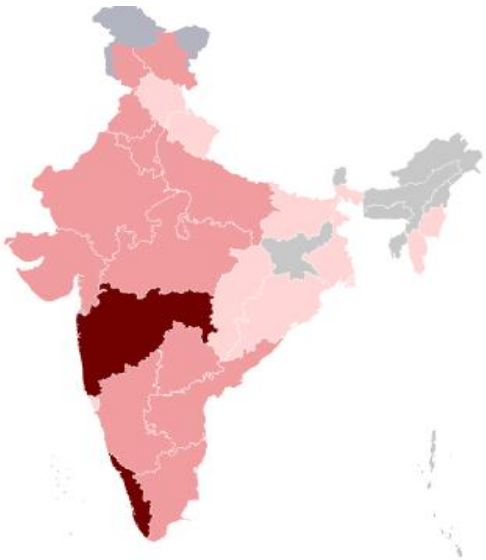


Image 1: Distribution of cases across various states and UTs of India
Source: Ministry of Health and Family Welfare



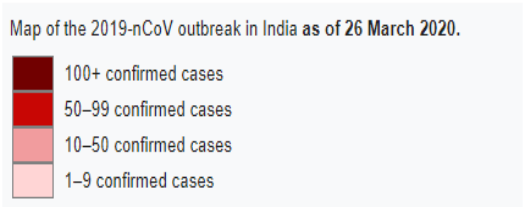


Image 2: Statewise distribution of Covid19 in India as on 26th March 2020
Source: Wikipedia. [9]

ICMR initiates study to predict the rate of Covid-19 infections in India

The Indian Council of Medical Research (ICMR) will use mathematical modelling to figure out how many cases India could be grappling with in the next few months. RR Gangakhedkar, chief epidemiologist at ICMR, said the research body through the modelling process will know the best-case and worst-case scenarios.

India's top health research body has initiated a study that is expected to predict the rate of Covid-19 infections in the country in the coming months. Epidemiologists conducting mathematical modelling of the SARS-CoV-2 virus will help estimate the transrates of the Covid-19 virus, as well as the variance of transmission rates over time, he said. For example, Indonesia has done geometric sequencing and found that the number of confirmed Covid-19 cases could reach between 11,000 and 71,000 by the end of April. The study may also suggest early detection of patients with the illness and a strategy to prevent transmission. According to the experts, the data and modelling will be important in the long run to understand which control measures work [11].

By using machine learning how we face the corona virus problem.

1. **AI temperature checking system:** Hospital are equipped with an automatic temperature warning system temperature tracking is also been used in public places like subways, offices, building it is facial recognition to locate one's forehead then detects body temperature remotely through infrared thermography in just one sec to avoid cross infection. The device can measure the temperature in real time and also show it to wear up a way of thermal imaging up to 100 people can be screened within 2 minutes.

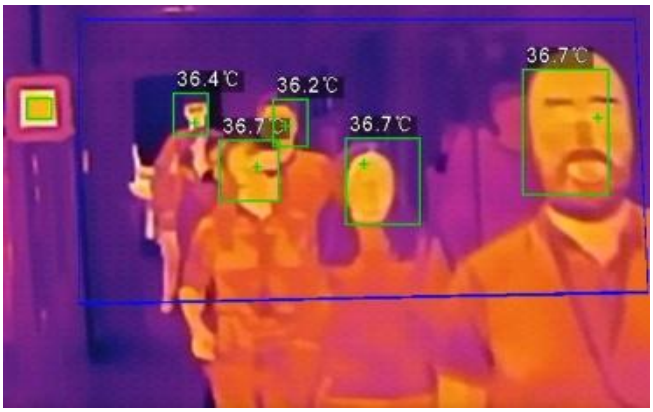


Fig -3: Temprature checking system

2. **Condusting follow up visists:** Using big data on speech recognition and semantics understanding technolog.

Fig -4: Applications

3. **Online diagnosis:**Uneless is absolutely urgent one feather stay away from hospitals during the viral outbreak but what it's unit strikes AI can lend a helping hand in a shope of online doctor it takes only 1 minute from 1 state to another connecting with the patient with inappropriate doctor it can also offer basic treat device health manage.

Fig -5: Online Medical diagnosis

4. **Technology for CT Image Analysis:**
This technology for CT image analysis, powered by deep learning algorithms, was trained on 5000 CT volumes and has been tested in hospitals throughout China. The process of CT Image Analysis training includes training and analyzing. It learns the differences between COVID-19 pneumonia, common pneumonia, and other situations. It is able to predict the probability of COVID-19 pneumonia

and common pneumonia based on the input CT images. This CT Image Analysis technology can also output the lesion masks and affected lung volume ratio, helping doctors to effectively measure the development or treatment of COVID-19 patients [12].

Fig -6: CT Image analysis-I

Fig -7: CT Image analysis-II

As we have collectively tested millions of people, some test results take more than a week. Testing of coronavirus remains among the most pressing problems with America's response to the pandemic. Patients suspected of COVID-19 are in urgent need of diagnosis and proper treatment

Quick and accurate coronavirus diagnostics: As such, scientists across the globe are on the search for a more reliable assessment. As COVID-19 is a respiratory disease, it can cause a range of breathing problems. This caused a lung infection in which the alveoli are inflamed and doctors can see signs of respiratory inflammation on computed tomography. (CT) scan. CT imageries provide high-quality 3D images of our lungs, useful for detecting the presence of COVID-19. With most scans only take just a few minutes, healthcare workers and researchers can acquire a large volume of these high-quality imageries. A 3D CT imagery contains 200–400 slices of images; this can take a long time for a specialist to diagnose. As COVID-19 has similar characteristics of other types of pneumonia, it would take a very experienced doctor at least 10 minutes to diagnose one patient. Thus an AI-assisted diagnosis using computer vision is highly desired [13].

Rapidly, research groups are demonstrating deep learning-based proof-of-principles or building prototype AI-algorithms that can help detect COVID-19 on chest CT scans. For example, the work of Gozes et al., published at the 10th of March 2020, reports a sensitivity of 98.2%, but also an impressive specificity of 92.2% for their deep learning-based thoracic CT algorithm. While there are initiatives focusing on the segmentation and quantification of lung infection regions many target mainly the findings related to pneumonia which is often present in COVID-19 patients. This is also the case for a range of initiatives set up by companies. For example, the software made available by Infervision is based on their CT Pneumonia tool. As pneumonia findings are strongly related to COVID-19, such tools will come in handy for sure, but how to differentiate between COVID-19 and a pneumonia with different causes?

Applications of Machine Learning to the Coronavirus [14].

1. Predict the structure of proteins and their interactions with chemical compounds to facilitate new antiviral drugs/vaccines or recommend current drugs.
2. Deep Learning Based Drug Screening for Novel Coronavirus 2019-nCov .
3. Predicting commercially available antiviral drugs that may act on the. novel coronavirus (2019-nCoV), Wuhan, China through a drug-target interaction deep learning model.
4. Deep learning used available data from GISAid and their AlphaFold library to predict the protein structures of Covid-19 virus.
5. Forecast infection rates and spread/patient prognosis to enable hospitals/health officials to better plan resourcing and response.
6. Prediction of criticality in patients with severe Covid-19 infection using three clinical features: a machine learning-based prognostic model with clinical data in Wuhan: the authors describe using a XG-Boost model to predict if a patient infected with Covid-19 would survive the infection based on age and other risk factors. This is useful for forming recommendations about who should isolate themselves from the disease the most.
7. Finding an Accurate Early Forecasting Model from Small Dataset: A Case of 2019-nCoV Novel Coronavirus Outbreak:
8. Data-Based Analysis, Modelling and Forecasting of the COVID-19 outbreak.
9. Using Kalman Filters to predict spread of Coronavirus.
10. Help diagnose if a medical image like a X-Ray or CT shows coronavirus.
11. Deep learning-based model for detecting 2019 novel coronavirus pneumonia on high-resolution computed tomography: a prospective study (Chen et al) Here the authors used a UNet++ to extract relevant features from the CT scans and classify them.
12. A deep learning algorithm using CT images to screen for CoronaVirus Disease (COVID-19).

13. Deep Learning System to Screen Coronavirus Disease 2019 Pneumonia .
14. Mine social media data to better estimate spread/symptoms and general public perception.

CONCLUSION

COVID-19 was firstly encountered at Wuhan region in China and have been threatening the public health, trade and world economy. The virus shows the partially similar behaviours with other viral pneumonia. Therefore, the spreading rate of the virus made the situation difficult to be under control. Hence we can help people and our Government with computer technology to raise the number of Corona infected people with respect to non-infected person.This will help to keep the track of patients and will not cross other people to get infected. we have try to shown COVID-19 spread in india in practical scenario. In India.the effect of lockdown and social distancing plays an important role to prevent from this disease. AI learning and Big data has been played a vital role in Medical Field to help our Droctors and officers to detect 'n' number of people at a time.

Machine Learning and Deep Learning technologies for research and analytical processes enables the improvement of research in various fields of knowledge and science in this current (April 2020) difficult period for many companies and home quarantine and restrictions on moving in public places. Also research and analysis in the field of virology, during which large data sets are analyzed can be improved by the above-mentioned technologies. Machine learning is an important tool in fighting the current pandemic. If we take this opportunity to collect data, pool our knowledge, and combine our skills, we can save many lives — both now and in the future.
Stay Safe …….Stay Healthy!!

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