ARTIFICIAL INTELLIGENCE: AN APPLICATION IN COVID-19 BATTELING

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ABSTRACT:-

AI has contributed to dealing with the coronavirus disease (COVID-19) pandemic, which has been happening around the globe. This paper presents a survey of AI methods being used in various applications in the fight against the COVID-19 outbreak and outlines the crucial roles of AI research in this unprecedented battle. Artificial intelligence play important role in preventing, detecting, and monitoring epidemics in covid-19 pandemic. The Artificial Neural Network systems (ANN) are being developed to predict relationships within the data. Machine learning and Deep learning are also being used to study different parameters of machines and modulate them accordingly to get the desired output. AI can also be used for predicting the chances of recovery or mortality in COVID-19 and to provide daily updates, storage and trend analysis and charting the course of treatment. Here, we utilize the WHO framework of a pandemic evolution to analyze the various AI applications. Artificial intelligence helps pharmaceutical companies find patients for clinical trials. AI in healthcare system also play crucial role i.e test positivity or negativity, the AI also show Severity in that it may be mild, moderate or severe condition . Artificial intelligence (AI) applied on multiple fronts to overcome the pandemic. However, many obstacles prevent greater implementation of these innovative technologies in the clinical arena. It can help in developing proper treatment regimens, prevention strategies, and drug and vaccine development. It provides opportunities to improve quality of care and accelerate the evolution of precision medicine.

KEYWORDS: Artificial intelligence, COVID-19, Artificial Neural Network System.

INTRODUCTION:-

Artificial Intelligence (AI) is commonly known for its ability to have machines perform tasks that are associated with the human mind – like problem solving. However, what's less understood is how AI is being used within specific industries, such as healthcare. Artificial Intelligence is wide ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence. AI is an interdisciplinary science with multiple approaches. it can be amazingly useful in managing data and presenting results that promote better decision making and help saving human effort ,cost and time. According to the father of Artificial Intelligence, John McCarthy, it is *"The science and engineering of making intelligent machines, especially intelligent computer programs"*[1,5]. As most of the world has now gone into lockdown, the entire scientific research community has gone into overdrive trying to understand the nature of the COVID-19 virus, as well as the way that it spreads, and finding a vaccine[1,2]. Colloquially known as coronavirus, the SARSCoV-2 that causes the COVID-19 is a contagious virus that belongs to the family of coronaviridae. A little publicized fact is that progress is being made with a little help from technology. In particular, Artificial Intelligence (AI) has from the very beginning, been busily working behind the scenes assisting the limitations of human knowledge in this massive endeavor. In covid-19 Pandemic some pharmaceutical industries developed their own vaccine with the help of very expensive software program[21]. In Covid-19 Pandemic Artificial intelligence helps pharma companies find patients for clinical trials. The artificial intelligence (AI) community is in a unique position to aid in these efforts by developing or repurposing technological innovations that can support human decision making [13]. While AI can be used to make sense of clinical trials data, another use of artificial intelligence in the pharmaceutical industry is to find the patients to take them.[1,8] Artificial Intelligence is a way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think[17].

Goals of AI In Covid-19 Pandemic:-

AI provides are inevitably one of many factors in the slow growth and acceptance of big data analytics and AI. Value in the Pharmaceutical industry is a multi-dimensional sequence consisting of research and discovery, successful clinical development, regulatory success, manufacturing and supply chain, launch and commercial success, and post-market surveillance and patient support. This chain is characterized by long cycle times and little robust intermediate insight into how well an innovative approach is fundamentally working. To demonstrate clear significant value and enhance broad adaptation across the value chain, AI needs to demonstrate improvement on many of these factors above already existing technology. In Covid-19 Pandemic AI create expert system which exhibit intelligent behavior, learn, demonstrate, explain, and advice its users. And also to implement human intelligence in machines like creating system that understand, think, learn, and behave like human. Artificial Intelligence is a way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think.[21] AI approaches

are adopted to manage the effects of the disease. We try to organize the research based on the applications. The applications include clinical applications, processing covid-19 related images, pharmaceutical studies and epidemiology. We also organize the research based on the AI approaches they have adopted. The main categorization is based on applications; however, for the same application, the research are subdivided based on the AI approaches they have employed. Examples of AI approaches include Deep learning, machine learning, Artificial Neural Networks and evolutionary algorithms. Machine learning-based technologies are playing a substantial role in the response to the COVID-19 pandemic [21]. Experts are using machine learning to study the virus, test potential treatments, diagnose individuals, analyze the public health impacts, and more[20]. Below, we describe some of the leading efforts and identify data protection and ethical issues related to machine learning and COVID-19, with a particular focus on apps directed to health care professionals that leverage audio-visual data, text analysis, chatbots, and sensors. Based on our analysis, we recommend that AI app developers:

- Improve the fairness of the data;
- Code check the apps;
- Validate the models of existing systems; and
- Improve confidence in recommendations

Health Information Management in Covid-19 :-

Coronaviruses (CoV) are a large family of viruses that cause illness ranging from the common cold to more severe disease such as middle east respiratory syndrome (MERS-CoV) & severe acute respiratory (SARS-CoV) a novel coronavirus (nCoV) is a new strain that has not been previously identified in humans. Common signs of infection include respiratory symptoms, fever, cough, shortness of breath and breathing difficulties. In more severe cases, infection can cause pneumonia, severe acute respiratory syndrome, kidney failure and even death. These all are causes of the spread of the compassion virus and are known to be cause by artificial intelligence[2].

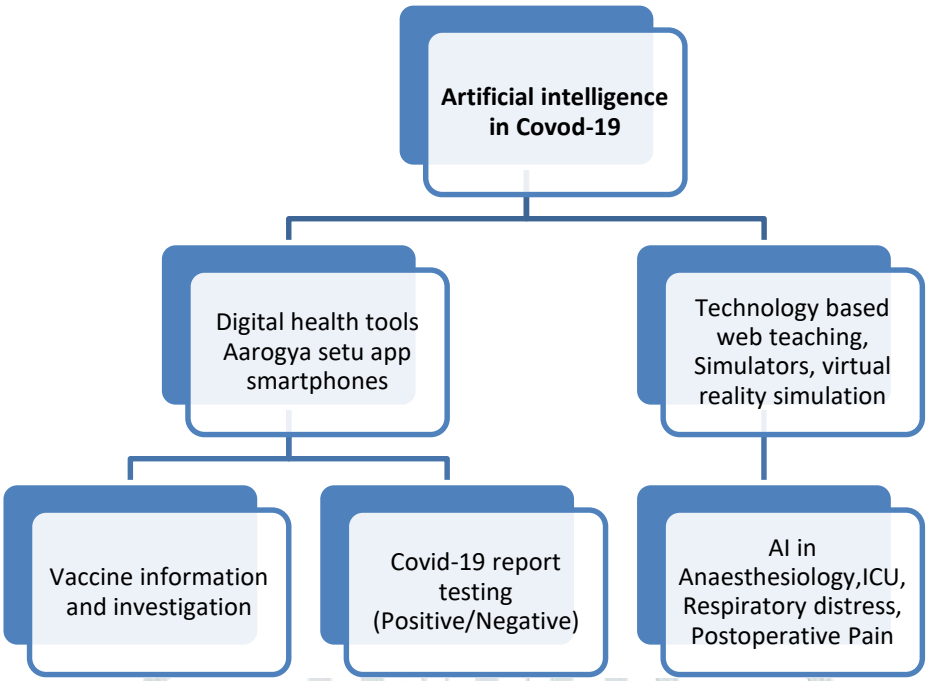

Fig.1 Use of AI in Covid-19 health care system

In the Fig.1 AI play important role on basis of testing and diagnosis also. In AI digital health tools agrogya setu app smartphones follow the vaccine information and covid-19 report testing Positive/Negative. In technology based web teaching, simulators, virtual reality simulation follows AI in Anesthesiology, ICU, Respiratory distress, postoperative pain.

The contribution of artificial intelligence to the search for a cure:-

The first application of AI expected in the face of a health crisis is certainly the assistance to researchers to find a vaccine able to protect caregivers and contain the pandemic. Biomedicine and research rely on a large number of techniques, among which the various applications of computer science and statistics have already been making a contribution for a long time. The use of AI is therefore part of this continuity. The predictions of the virus structure generated by AI have already saved scientists months of experimentation. AI seems to have provided significant support in this sense, even if it is limited due to so-called "continuous" rules and infinite combinatorics for the study of protein folding. The American start-up Moderna has distinguished itself by its mastery of a biotechnology based on messenger ribonucleic acid (mRNA) for which the study of protein folding is essential. It has managed to significantly reduce the time required to develop a prototype vaccine testable on humans thanks to the support of bioinformatics, of which AI is an integral part.

Similarly, Chinese technology giant Baidu, in partnership with Oregon State University and the University of Rochester, published its Linearfold prediction algorithm in February 2020 to study the same protein folding. This algorithm is much faster than traditional algorithms in predicting the structure of a virus'

secondary ribonucleic acid (RNA) and provides scientists with additional information on how viruses spread[13].

Artificial intelligence to assist healthcare personnel:-

AI is getting increasingly sophisticated at doing what humans do, but more efficiently, more quickly and at a lower cost. The potential for both AI and robotics in healthcare is vast. Just like in our every-day lives, AI and robotics are increasingly a part of our healthcare eco-system. The healthcare industry is ripe for some major changes. From chronic diseases and cancer to radiology and risk assessment, there are nearly endless opportunities to leverage technology to deploy more precise, efficient, and impactful interventions at exactly the right moment in a patient's care. Given its highly infectious nature and easy transmission of COVID-19 through human contact or exposed surfaces, the use of robots and AI can help greatly reduce the potential of coronavirus transmission by reducing human contact, protecting frontline healthcare workers, administrative staff and the public at large.

Fig.2 here We highlighted four ways that showcase how this transformation is currently underway.

Contributions of AI when used in the healthcare industry is further important to search out patients that are suitable for the clinical studies. AI due to its fast-tracking systems is further effective in reducing the workload of radiologists, since it is capable of reading the radiological reports through deep learning and machine learning systems. These scans can be stored for some time and are available when required in order to train the AI systems. AI through its fast-tracking quality, allows cost and time effective functions by quickly

analyzing a number of scans resulting in providing better treatment to patients.in this fig.2 we have mention some example of AI and robotics are transforming healthcare. We will see their each branch in details.

AI In Diagnosis of Covid-19:-

In order to be able to effectively control the virus, the first step is to know who has it, who has already overcome it (and what symptoms they did or did not present with), and who has never been infected. It is difficult to even imagine the sheer scale of testing that is required for such a mission. The most notable application of AI in the COVID-19 crisis is its role in diagnosis. AI tools quickly identify irregular patient symptoms or 'red flags' among hospitalized cases thereby instituting faster decision making in positive cases . Approximately, 15% of positive patients progress to have severe pneumonia, of which, 5% develop serious complications such as acute respiratory distress syndrome, sepsis, and multiple organ failure . The utilisation of AI technologies in this context helps to foresee patient deteriorations and advance decision-making processes (32).

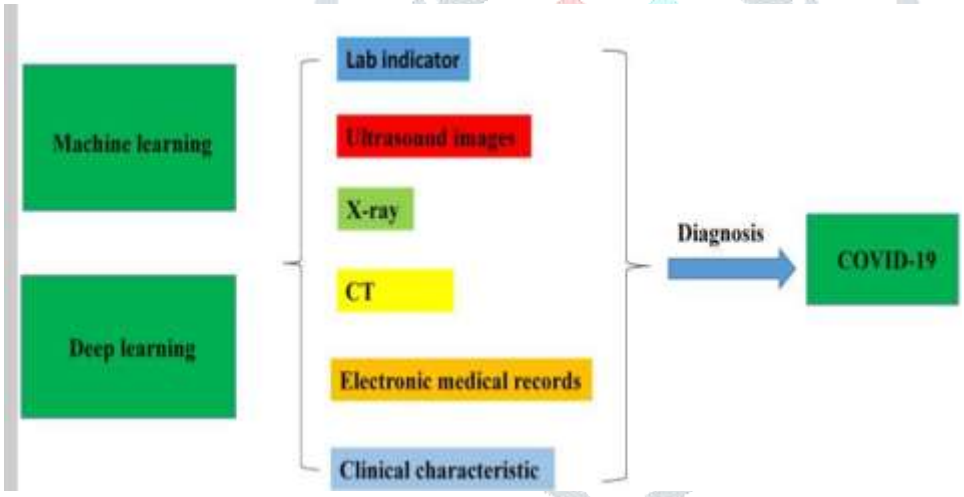

Fig.3 with the help of Machine learning & Deep learning we can diagnose Covid-19.

Among the principal diagnostic imaging modalities, both chest x-ray and CT have quickly produced a large amount of data on COVID-19, enabling the development of machine learning algorithms, a form of artificial intelligence (AI). Well before the COVID-19 pandemic, enthusiasm around machine learning-based technology in medical imaging had notably increased. Now, huge datasets emerging from China, and increasingly from European countries, have generated numerous publications reporting AI applications in COVID-19. Machine learning-based CT analysis has also been suggested as a promising screening tool for COVID-19, and in at least one study outperformed viral realtime PCR testing. However, these results need to be interpreted cautiously. Studies done during a pandemic are inherently hampered by artificially high disease

prevalence and the selected nature of participants, whose disease severity warranted hospital admission and CT evaluation. Ideally, algorithms need to be trained on the full spectrum of disease, including asymptomatic and early-stage cases, if CT interpretation by machine learning can be applied to real-world data with confidence. Furthermore, a consensus must be reached on what the best data labelling strategy might be: are only patients with positive real-time PCR considered to be infected with SARS-CoV-2? Should data labelling incorporate multidisciplinary information such as the presence of a cough or fever? How does a study participant's exposure to an infected relative or household member alter algorithm training? In most cases, machine learning algorithms will be developed on retrospective, clinically indicated data that are often imperfect. However, rather than invalidate model training, incorporating all the statistical noise associated with real-world clinical data in model training might improve an algorithm's clinical applicability [34].

AI in Treatment of Covid-19:-

Artificial intelligence had already been in use by hospitals, but the unknowns with Covid-19 and the volume cases created a frenzy of activity around the United States. Models sifted through data to help caregivers focus on patients most at-risk, sort threats to patient recovery and foresee spikes in facility needs for things like beds and ventilators. But with the speed also came questions about how to implement the new tools and whether the datasets used to build the models were sufficient and without bias. Rapidly developing, powerful, and innovative AI and network medicine technologies can expedite therapeutic development[10]. These type of treatments provides a strong rationale for using AI-based assistive tools for drug repurposing medications for human disease, including during the COVID-19 pandemic. Researchers used AI to identify which daily changing clinical parameters best predict intervention responses in critically ill COVID-19 patients. While the AI model was used on a retrospective cohort of patient data collected during the pandemic's first wave, the study demonstrates the ability of AI methods to predict patient outcomes using routine clinical information used by ICU medics. On the basis of treatment AI use some robotic for the performance of Healthcare professionals. The medical scenario has transformed drastically in the past century – from modernised equipment in OPDs to the dawn of Robotic-Assisted Surgeries we now live in a tech-driven world. Artificial intelligence-enabled computer vision and data analytics have transformed health robotics, expanding capabilities into many other areas of healthcare. During the Covid-19 pandemic, hospitals and clinics started to deploy robots for a much wider range of tasks to help reduce exposure to pathogens[15]. As a result, it is now clear that the operational efficiencies and reduced risk levels offered by robotics in healthcare offer value in many areas. Robots are now used not only in clinical settings to support health workers and enhance patient care but also in the operating rooms[18].

On the basis of medication therapies A team of researchers from the National University of Singapore (NUS) has utilised a ground-breaking artificial intelligence (AI) platform to derive an optimal combination of

available therapies against SARS-CoV-2, the cause of COVID-19. Their results showed that the optimal drug therapy was a combination of the drugs remdesivir, ritonavir, and lopinavir at specific doses. Remdesivir is a broad antiviral medication that was recently approved by the United States Food and Drug Administration as a treatment for COVID-19. The team showed that a combination of remdesivir with ritonavir and lopinavir led to a treatment that was 6.5 times more effective than the limited effects of remdesivir alone. Ritonavir and lopinavir are drugs used to treat patients with human immunodeficiency virus (HIV), but according to the NUS team's study, and clinical trials in China, Europe, and United States, the two drugs showed little effects on their own against COVID-19. The team also showed that hydroxychloroquine and azithromycin, which are drugs considered as promising treatment options at the time of the team's experiments conducted in April of this year, were relatively ineffective as treatment options for COVID-19[38].

AI in Covid-19 Research:-

In Covid-19 pandemic various types of research takes place regarding structural identification of SARS-CoV-2, development of vaccines also[9] . So research regarding variant identification in that structural identification such as alpha, beta, gamma, delta and recently added new structure is Delta plus variant.

In that Development of a vaccine generally involves years of research. First, we need a vaccine candidate that is evaluated in animals for its safety and efficacy. After a vaccine candidate passes a pre- clinical trial, it enters the clinical trial phase. While scientists have worked round the clock in the laboratory, even regulatory approvals which used to take several months have been fast tracked. AI helped eliminate all the time lapses between the pre-clinical and clinical trial stages. Earlier, the vaccine development involved a series of steps, but in the case of the coronavirus vaccine, the scientists and regulators worked in tandem, accelerating the whole process without compromises on any protocols and any step. Understanding population genetic heterogeneity is crucial for vaccine design, in particular, as it concerns the individual variability of the major histocompatibility complex (MHC-I and MHC-II) proteins, encoded by the *HLA* gene, which present SARS-CoV-2 epitopes to the immune system. Such individual variability, coupled with the importance of cellular immunity in the severity of the response to the infection, makes the identification of actionable targets for COVID-19 vaccines a challenging endeavor. AI models for COVID-19 vaccine development focus on the prediction of potential epitopes by using a variety of techniques, such as deep docking , long short-term memory networks , extreme gradient boosting , as well as approaches that account for different *HLA* alleles by combining several existing machine learning tools . A recent survey of AI-based approaches to COVID-19 vaccine design suggests that the most popular candidate is the SARS-CoV-2 spike protein, which initiates the interaction with the host through the attachment to the ACE2 receptor[37] .

Role of AI In End Of Life Care :-

Since December 2019, the Coronavirus disease-19 (COVID-19) pandemic has affected more than 110 million patients and led to more than 2.4 million deaths worldwide. Unfortunately, global cases continue to rise, with many countries facing additional waves of infection, some of which are even more worrisome than the first. Healthcare systems have been challenged but have also shown remarkable adaptability. Some of these changes will be transformative and will impact how we provide critical care, even after the pandemic is over[25].

In End of life care AI play crucial role i.e effective epidemiological registries, Agile randomized control trial, digital transformation, expandable ICU staffing pool, safe ICU design, Restructuring multidisciplinary rounds, more focus on well-being of ICU-Staff, Expandable ICU bed capacity and batter end of life care . The COVID-19 pandemic has disrupted the grief process for families and friends who have experienced the passing of a loved one from COVID-19. Family visits are usually limited or prohibited, and funerals and burials are held remotely. Complicated grief, secondary traumatic stress, and moral distress is to be expected.[4] We must also bear in mind that families may have had multiple losses and may be in social isolation from self-quarantine. Maladaptive psychological processing will likely exacerbate post-loss bereavement, exacerbating depression, anxiety, anger, blame, and helplessness. It will be especially important to connect families to resources and self-care practices that they will need[41].

CONCLUSION:-

Artificial Intelligence has potential to help in all the stages of healthcare, from surveillance through to rapid diagnosis test and faster drug development. It also provides an upper hand undoubtedly over traditional analytics and clinical decision-making techniques. AI not only helpful in the treatment of Covid-19 infected patient but also for their proper health monitoring . it also help in developing proper treatment regimens, prevention strategies drug and vaccine development. AI also deliver intelligent medical technology has played an important role in fight against covid-19.

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