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Analyzing the impact of machine learning and artificial intelligence and its effect on management of lung cancer detection in covid-19 pandemic

Raja Sarath Kumar Boddu [a], Partha Karmakar [b], Ankan Bhaumik [c], Vinay Kumar Nassa [d], Vandana [e,*], Sumanta Bhattacharya [f]

[a] Department of CSE, Lenora College of Engineering, Rampachodavaram, Andhra Pradesh, India
[b] Government of West Bengal, Bikash Bhawan, Salt Lake, Kolkata, W.B., India
[c] Dept. of Applied Mathematics With Oceanology and Computer Programming, Vidyasagar University, Midnapore, India
[d] Department of Computer Science Engineering, South Point Group of Institutions Sonepat, Haryana, India
[e] Department of Mathematics, Dasmesh Khalsa College, Zirakpur, India
[f] Department of Science and Technology and Biotechnology, MAKAUT, India

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ABSTRACT

Cancer victims, particularly those with lung cancer, are more susceptible and at higher danger of COVID-19 and associated consequences as a result of their compromised immune systems, which makes them particularly sensitive. Because of a variety of circumstances, cancer patients' diagnosis, treatment, and aftercare are very complicated and time-consuming during an epidemic. In such circumstances, advances in artificial intelligence (AI) and machine learning algorithms (ML) offer the capacity to boost cancer sufferer diagnosis, therapy, and care via the use of cutting technologies. For example, using clinical and imaging data combined with machine learning methods, the researchers may be able to distinguish among lung alterations induced by corona virus and those produced by immunotherapy and radiation. During this epidemic, artificial intelligence (AI) may be utilized to guarantee that the appropriate individuals are recruited in cancer clinical trials more quickly and effectively than in the past, which was done in a conventional and complicated manner. In order to better care for cancer patients and find novel and more effective therapies, It is critical that we move beyond traditional research methods and use artificial intelligence (AI) and machine learning to update our research (ML). Artificial intelligence (AI) and machine learning (ML) are being utilised to help with several aspects of the COVID-19 epidemic, such as epidemiology, molecular research and medication development, medical diagnosis and treatment, and socioeconomics. The use of artificial intelligence (AI) and machine learning (ML) in the diagnosis and treatment of COVID-19 patients is also being investigated. The combination of artificial intelligence and machine learning in COVID-19 may help to identify positive patients more quickly. In order to understand the dynamics of an epidemic that is relevant to artificial intelligence, when used in different patient groups, AI-based algorithms can quickly detect CT scans with COVID-19 linked pneumonia, as well as discriminate non-COVID connected pneumonia with high specificity and accuracy. It is possible to utilize the existing difficulties and future views presented in this study to guide an optimal implementation of AI and machine learning technologies in an epidemic.

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1. Introduction

Modern artificial intelligence (AI) or ML algorithms may improve the care and treatment of individuals with cancer during the COVID-19 epidemic. In order to solve different problems, AI and ML algorithms change our life style to imitate human intelligence through a computer/machine utilizing statistical and mathematical models [1]. AI is more advanced in performing what people do but in tackling difficult issues more effectively, quickly and at lesser cost. AI has the potential, in fact, to offer an unmistakable upper hand in clinical decision-making. ML, an AI subset, can find variations from enormously large data sets to become more specific and reliable when interacting with training data, thus

* Corresponding author.
E-mail address: vaggarwal2584@gmail.com (Vandana).

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enabling individuals to gain an unparalleled understanding of early disease exploration, drug discovery, diagnosis, healthcare processes, variability of treatment and results. AI/ML algorithms can combat COVID-19 on many counts. This includes identifying those at greatest risk with multi variable clinical or populational data, identifying patients, identifying naturally occurring interactions among predictors or identifying risk cluster, developing drugs more quickly, finding medicines that can help, predicting the disease spread, and understanding virus [2].Figs. 1 and 2.

During the epidemic physicians had a difficulty to determine whether lung change is due to COVID-19 in cancer patients or whether it is caused by some other virus or by the side-effects of cancer therapy. Immunotherapy and radiation are employed in certain malignancies to manage a patient. In many instances these therapies may, however, frequently have very similar adverse effects, such as cough, weakness and abnormalities in CT scans to those observed in COVID-19 infection. The main goal of this research is to utilize AI to determine the degree to which alterations in chest scans are caused by corona virus or by the adverse consequences of cancer therapy. The second objective is to utilize AI to detect the slight shifts in the return of lung cancer sooner to be managed more adequately. The study will utilize clinical and imagery data using ML methods to differentiate lung alterations due to corona virus from those induced by immunotherapy and radiation treatment. A distinction is extremely significant with regard to the therapeutic option: for instance, lung inflammation associated with cancer therapy is often addressed with steroids and greater immune suppression not suitable for use in individuals with COVID-19 [3].

It isn't very simple in the midst of the epidemic, cancer patients, diagnostic tests or therapeutic treatments, really, it's quite difficult, while its possible COVID-19 contact may be dangerous or even lethal. Also, owing to several circumstances, the clinical manifestations of COVID-19 and diagnosis of this illness in cancer patients is problematic. Cancer's patients may have atypical x-rays, or such individuals may have x-rays comparable to those of an infection with SAR-CoV-2, which may be perplexing and deceptive. Diagnosis of COVID-19 may be postponed since the indications of this disease comparable to the underlying disorder, especially in patients with lung cancer and with pulmonary metastases may be identical. A COVID-19 appearance in cancer patients may also conceal some clinical and biochemical characteristics [4].

2. Diagnostic applications based on artificial intelligence and machine learning

As technological assistance for early identification and diagnosis of infections, AI & ML's primary emphasis was proposed. A recent research has shown that a more precise diagnostic may be made using a computer model built on vast clinical information. By using ML to reconsider COVID-19 data, a relationship between

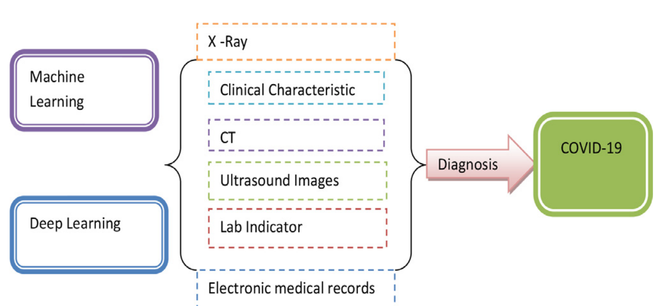

Fig. 1. Artificial Intelligence (AI) for Covid-19 Diagnosis.

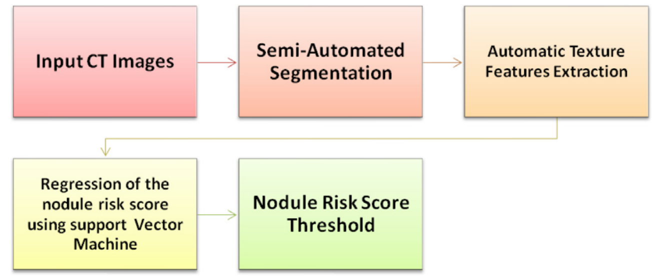

Fig. 2. Computer vision for lung cancer detection and cancer risk estimation:

men and higher blood lymphocyte and the neutrophil levels was found [5]. Patients COVID-19 may be divided into three clinically meaningful subgroups based on serum immune cell counts, gender and symptoms reported. A responsiveness of 92,5% and a precision of 97,9% was obtained by applying a computational classification model to distinguish COVID-19 sufferers from influenza patients. Another research showed that at the time of fever clinic admissions, early diagnosis may be done using an AI & ML model based on clinical signs without CT scans. 18 COVID-19 diagnostics markers were closely related to a meaningful COVID-19 diagnosis by the use of AI screening which enhanced clinical diagnosis reliability. ML random forest model utilized to identify clinical kinds of COVID-19, achieving >90% prediction accuracy. Model AI & ML trained on information. This model produced excellent precision with just eight binary functions. A mixture of seven ML algorithms was developed based on UCLA Health System data in the US to diagnose COVID-19 in the hospital environment. The integrated model obtained good diagnostic measures relative to RT-PCR in the test set (n = 392) [6]. Developed five ML death prediction systems on a scenario dataset. For mortality prediction, specificity and sensitivity surpassed 90%, while the regions underneath the curves (AUC) reached 96%.

Chest CT was utilized to assess SARS-CoV-2 probable individuals. The AI system was as sensitive as a veteran thoracic radiologist. Radiologists with less know-how in chest imaging need AI-assisted screening. In a test group of 279 cases, 68 percent were properly indicated by an AI algorithm integrating Chest CT, whereas Radiologists categorized all these individuals as COVID-19 negatives [7].

3. Applications in clinical pulmonary medicine

AI, especially deep- and machine-learning patterns, have many potentials uses in pulmonary medicine, whatever it in picture interpretation, strategic planning or predictions. In this part, we offer instances of how AI & ML are also utilized in medical imaging for computer vision, prescriptive analytics using machine learning and in combating the new epidemic SARS-CoV-2 [8].

3.1. Computer vision for identification of lung cancer and risk of cancer prediction

Computer vision is a type of deep learning where things are immediately recognized by pure pixels. Specialists identify each picture with the proper diagnostic for what is regarded as the fundamental reality. Computer vision concentrates on picture identification and video identification to perform given tasks such as classifying, detecting and interpreting objects to classify preset results [9]. CNNs create deep learning techniques to analyses input pictures and attach significance to numerous elements in order for one image to be distinguished from another [10]. In accordance with a Hierarchic model which provides a funnel-like structure to offer a completely linked layer in which all neurons are linked and output processed, the structural design of the CNNs is similar to the connection patterns in the human brain [11]. The latest computer vision efficiency has been favorably matched to human accuracy in object grading tasks of historical relevance. The research was predicated on the large-scale optical identification dataset of Image Net. Professional efficiency was also obtained in diabetes retinopathy investigations, the categorization of skin lesions and metastatic identification of lymph nodes. In the National Cancer Institute national lung screening test, low-dose computerized tomography (CT) monitoring has demonstrated a 20 percent reduction in mortality. Studies compare the efficiency of experienced radiologists with the use of chest imaging deep-learning algorithms [12].

3.2. Lung cancer diagnostic computer intelligence and molecular authentication

Due to the large inter - observer difference even amongst professional radiologists, identification of diagnostic guidelines for radiographic assessment of a fibrotic lung illness continues difficult. Deep-learning methods developed by many researchers' categories the use of high-resolution computed tomography (HRCT) images for fibrotic lung illnesses Deep learning on the basis of the Fleischer Society's and other worldwide pulmonary recommendations for the computerized categorization of HRCT fibrotic lung disease. The research utilized a data set of 1157 individuals with diffuse fibrotic lung disease with anonymous HRCTs. The method was evaluated with 91 professional thoracic radiologists' majority voting. The median reliability of thoracic radiologists was 70.7% comparing to 73.3% of method efficiency. The technology and the professional assessments were well inter observed. Deep learning system to categories Fleischner Society's suggestions for the HRCT scans of 105 instances of pulmonary fibrosis and to evaluate results with the readings of two radiologists. Inter - observer approvals were only to balance between the technique and the views of the radiologists [13].

Machine training was utilized in various research in the development of a method dependent on genetic information from surgical biopsy samples to identify molecular markers for common interstitial pneumonia (UIP). The signatures were consistent with the histopathology identification of transbronchial biopsy-generated tissues. In one research, data from trans bronchial biopsy samples were utilized to teach and verify the machine-learning method in the whole transcriptome ribonucleic acid sequence [14].

4. Medical data preparation suggestions during the covid-19 epidemic

Our work is exceptional in that it includes doctors, machine learners, mathematicians and radiologists. Based on our personal experiences and the results of our literature review. In Table 1 we offer basic guidelines for the assessment of medical systems throughout the COVID-19 period [15].Table 2.

Table 1
Basic guidelines for the assessment of medical systems.

Authentic information source.	The sources of publicly information sources are frequently unclear thus their reliability or appropriateness for inclusion in model building is difficult to establish. Such samples are also improbable to reflect the target audience of a model, making it less likely to generalize the effectiveness of a model when deployed. Training using high-quality data which is representative of the target community with independently generated information validation gives the best approximation of the effectiveness of a system.
Recognize the issue of little information.	It is challenging to get significant quantities of labelled data for healthcare applications, particularly when they are related to a new pathogen. To address this tiny issue, models should be modified. Although this is a continuing field of research, many methods have been demonstrated to improve efficiency in tiny or poorly labelled information, such as semi- and self-monitored education, weight transfer and the limitation of the number of workable components
Working as a cross-disciplinary team.	Several additional researches have been conducted without healthcare professional feedback. This has led to the creation of models to find solutions that do not inherently bring significant health efficacy. For example, chest X-rays have a far more important role in diagnosis of COVID-19 than CT scans in the UK, but previous ones concentrated mostly on CT diagnosis. It is hard to adapt to local medical practices without working with health professionals.
Flexibly acquire and process information	High-quality data gathering is always a problem in machine learning, especially data on a new pathogen, although planning may facilitate collection of information. Researcher should be aware of local guidelines on the use and distribution of patient information and it is important to provide preventive procedures for the collection, anonymization and safe storing of information especially for future epidemics. The present situation has shown that information collected may be significantly postponed without these preemptive procedures. Equally essential is the development of efficient and possibly semi-automated processes for preparing information to provide fast access to high-quality, well-cured data sources. The public availability of these methods also guarantees that various organizations do not have to spend time curing the same information.
Maintain health norms and enhance them	In healthcare and machine learning, there exist gaps in research standards and additional study is needed to address these discrepancies. The RQS and the Assessment for Artificial Intelligence in Medical Imaging should be known to machine learning scientists, standardized procedures for assessing the models utilizing radiomic characteristics. Evaluating the danger of bias of a model using standards such as PROBAST is also important and reporting findings following principles such as straightforward presentation of a multi variant prediction model for individualized forecasting or diagnosis (TRIPOD). In contrast, medical standards should be modified to enable profound learning methods. The request for an upgraded TRIPOD-ML and the associated SPIRIT-AI and CONSORT-AI submission standards is a step in right process.

5. Difficulties and viewpoint

AI has tremendous promise and the capability to analyses huge quantities of data quickly. It has been helpful in preventing the emergence of COVID-19. AI models may be as successful to diagnosing COVID-19 as professional radiologists [16].

It is important noting that even though some COVID-19 individuals are asymptomatic, they may become communicators of the virus. While per may verify the virus, COVID-19 individuals with signs of pneumonia may exhibit chest X-ray or CT pictures that are only somewhat typical in physicians. People who are presently contaminated with COVID-19 but are asymptomatic are difficult to detect. The data transmission of COVID-19 is calculated to identify

Table 2
Machine-based learning difficulties and viewpoints of Diagnosis in COVID-19.

Difficulties	Viewpoints
Minimize the false negative percentage of diagnosis	Gives the benefits of fast COVID-19 diagnosis for CT and X-ray imaging data.
Enhance AI diagnosis reliability	Integrate chest imaging with medical signs, background of exposures and laboratory testing in COVID-19 identification.

infected individuals with low false negatives rates reliably. Proper management of fake positives may meantime prevent needless patient isolation and thus significantly decrease the healthcare system load.

Biomedical imaging (x-ray thesis, CT scans, ultrasound pictures, etc.) allows visualization of pneumonia signs. Image processing methods for bio medicine and cancer detection are promising. It is widely recognized that the diagnosis of biomedical images based on AI is an outstanding success. ML and DL techniques have become useful instruments to identify different illnesses. Some individuals have already been infected with SARS-Cov-2, for example, yet they display normal chest CT scans. The negative predictive power of Chest CT scans is thus restricted and does not rule out infections entirely. The diagnosis of solitary AI remains disputed. Ai techniques are thus needed to integrate chest imagery with the clinical symptoms, background of exposure and laboratory testing in the identification of COVID-19 in order to satisfy clinical requirements [17].

Fake negative rates in laboratory testing, such as RT-PCT nucleotides, are typically high. Medical image screening may be utilized as a helpful diagnostic technique for COVID-19 to give an appealing and reliable diagnosis. In some epidemic nations, such as China and the Us, an AI model has been employed in initial outbreaks to detect negative CT responsiveness. This novel approach offers the benefits of fast COVID-19 diagnosis for CT and X-ray imaging scans.

6. Conclusion

The AI model may be as effective as professional doctors for COVID-19 diagnosis. The difficulties and prospects of ML and DL in COVID-19 are discussed in this paper as well as the need for additional study. The clinical use of AI in COVID-19 diagnosis is encouraging and more comprehensive study is needed. Deep and machine learning techniques show excellent precision for distinguishing COVID-19 from non-COVID-19 chest pneumonia. These methods have made it easier to assess these pictures automatically. Deep learning techniques nevertheless suffer from the lack of openness and applicability, since the precise imagery characteristic used to create the result cannot be identified. Since no method is capable of distinguishing between all pulmonary illnesses on the basis of imagery on chest CT scans, the use of interdisciplinary solutions to overcome diagnostic difficulties is recommended.

CRediT authorship contribution statement

Raja Sarath Kumar Boddu: Investigation, Writing – original draft. **Partha Karmakar:** Conceptualization, Writing – review & editing, Supervision. **Ankan Bhaumik:** Formal analysis, Data curation. **Vinay Kumar Nassa:** Conceptualization. **Ankan Vandana:** Writing – review & editing. **Sumanta Bhattacharya:** Conceptualization, Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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