The International Conference on Research Perspectives : IoT in Hybrid Grid Integrated Renewable Energy Sources
In association with International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)

A Comprehensive Study on Applications of AI Based Tools and Techniques for COVID-19

Dr. A. P. Nirmala*[1], Paramita Chandra[2]
[1]Associate Professor, Department of MCA, New Horizon College of Engineering, Bangalore, Karnataka, India
[2]Department of MCA, New Horizon College of Engineering, Bangalore, Karnataka, India

ABSTRACT
In recent times, the application of Artificial Intelligence (AI) is highly appreciated and in practice and demand.AI manages machine intelligence and builds the chance of achievement and exactness rate. It has an incredible effect in different fields like medical image processing or in analysis of data. The new technologies like Internet of Things, Text mining, Natural language processing, and their contribution towards computational biology and medicine is highly effective in this field. AI is utilized for diagnosis tasks in medical care as it is a troublesome assignment for people without the assistance of clever machines. Subsequently, AI is applied in battling against COVID 19 pandemic. This paper presents an extensive study of tools involving AI, machine learning and deep learning methods used to fight against the pandemic COVID 19 and likewise layout the data sets that are available identified with COVID 19. It likewise features the best in class of AI applications in handling the episode and spurs specialists soon.

Keywords: Artificial Intelligence, COVID-19, Machine Learning, Deep Learning.

I. INTRODUCTION

The novel Coronavirus also named as SARS-CoV-2 arose in December 2019.Soon it took a form of pandemic of respiratory disease called as COVID-19. It is a confounded disease that showed up in various structures and the force of danger differed from mild to severe. It causes a smooth self-confining respiratory package sickness outrageous reformist pneumonia, multi-organ disillusionment, and passing [3]. It has made the whole globe in an extraordinary circumstance which makes the life in all the nation a fixed state and affirmation on human lives. As the quantity of cases due to COVID 19 expands step by step and it is a genuine danger to society.

There is a need to be colossally stressed over the consequences of this viral defilement after the huge progression of the pandemic and rising number of the affirmed cases and patients who experience serious respiratory disappointment and cardiovascular diseases. Determining proper ways to deal with arrive at answers for the COVID-19 related issues have gotten a lot of consideration. Not with standing, another tremendous issue that specialists and chiefs need to manage is the large expansion in volume of the data, known as big data that challenges them during the time spent battling against the virus. This legitimizes how much Artificial Intelligence (AI) is crucial in making, implementing and updating medical services systems on a large scale.

AI has attracted expanding research endeavors towards settling the perplexing issues in various fields, including designing, medication, economy and psychology. Uniquely, medical imaging and picture preparing strategies could exploit from AI which is conceivably fit to help medical concerns. It has not been properly utilized to serve medical-care systems in their battle against Corona virus [3].

The primary concern is now to discover cure for groups who are facing COVID-19 and are at high risk. The authors in [3] showed how ANN-based strategies, like Extreme Learning Machine (ELM), Convolutional Neural Networks (CNN), Long/Short Term Memory (LSTM)and Generative Adversarial Networks (GANs) could be used. It is important to keep the registry of patients suffered or suffering from COVID-19 so that it can be used to highlight cardiovascular complications. Since it encourages the identification of the example of cardiovascular complications and promotes building up a risk model for heart complications. It helps to assist with identification and/or prediction of the reaction to various kinds of treatment methods.There are many methods and approaches has been taken into account to build arsenal platforms and tools to deal with deaths caused by COVID-19 so that more lives could be saved.

This paper examines how AI and profound learning encourages human cutoff points fighting against infections. In this paper, segment II examines the current strategies in determination and expectation of Coronavirus, area III portrays AI based AI and profound learning techniques and calculations, segment IV provides the required datasets which could be useful for Coronavirus applications and segment V talks about the devices accessible to battle against Coronavirus and segment VI gives the conclusion.

II. LITERATURE SURVEY

It is right now evident that the world necessities a catalyst and faster response for contain and tackle the further spread of COVID-19 over the world with the guide of non-clinical methodologies, for example, data mining draws near, extended insight and other man-made consciousness strategies to assuage the enormous load on the medical care system while giving the best means to patients' decision and speculation of the 2019-nCoV pandemic successfully [23]. The authors in [13] introduced a review of AI and big data and the way it helps to distinguish the applications used for battling against COVID-19, next featured difficulties and problems related with state-of-the-art solutions.

Artificial intelligence tools have shown great results in medical field issues. It gave a huge motivation to deal with COVID-19 using it. The designers in [1] gave a layout of various insight methodology and procedures which has been applied as a data for different pandemic. They ordered the current AI procedures in clinical data investigation, including neural frameworks, classic SVM method and edge significant learning. Likewise, accentuation has been made on locales that use AI-oriented cloud computing in battling different comparative viruses to COVID-19. The investigation in [1] is an endeavor to profit clinical specialists and clinical scientists in overwhelming their confronted troubles while taking care of COVID-19 big data.

The authors in [28] gave a review of ongoing investigations utilizing Machine Learning and, all the more comprehensively, Artificial Intelligence, to deal with various pieces of the COVID-19 emergency at different scales including sub-nuclear, clinical, and social applications. They likewise audit datasets, tools, and assets expected to encourage AI research. The authors talked about key contemplations identified with the operational execution of ventures, multidisciplinary associations, and open science.

The authors in [6] examined papers into different get-togethers that include: significant learning counts for clinical picture dealing with, data science, AI, Internet of Things (IoT), and especially deep learning, has increased uncommon advances and liberal ground in long-standing fields and strategies to fight against the pandemic. For example we can consider PC vision and games or Natural language processing (NLP). The most important advantage of Deep learning over other traditional machine learning techniques is its ability to deal with huge unstructured and different types of data, for instance text, video, image and audio data. Different endeavors, for instance equipment, vehicle, security, retail, agribusiness, clinical administrations and clinical assessment, have achieved better outcomes and points of interest by using significant learning and AI procedures. It is expected that AI models can be used to fight against the COVID-19 pandemic [6].

The authors in [7] discussed how AI gives ensured, exact and beneficial imaging blueprints in predictions and applications of COVID-19.The sharp imaging stages, clinical purpose, and initiating research are studied in detail, which covers the entire pipeline of AI-empowered imaging applications in COVID-19.The keen imaging stages, clinical conclusion, and spearheading research are surveyed in detail, which covers the whole pipeline of AI-enabled imaging applications in COVID-19. It is significant that imaging just provides data about COVID-19 patients. Here, AI will demonstrate the natural capacity to combine data from multiple sources to perform accurate and efficient diagnosis for better development. Hence, for better screening, detection and diagnosis of COVID-19 it is necessary to combine image data with both clinical and research facility examination results [7].

The authors in [8] portrayed different systems of AI that have been used in the past in the estimate, disclosure and the heads of overwhelming diseases. It is also displayed that how these contraptions are being brought into picture in the battle against COVID-19. Moreover, we besides talk about their applications in different periods of the pandemic, the central focus, obstacles and expected traps.

III. AI BASED MACHINE AND DEEP LEARNING APPROACHES USED FOR DIAGNOSIS, DETECTION AND PREDICTION OF COVID 19

AI based systems have accepted a fundamental capacity in the territory of clinical picture getting ready, PC helped end, picture interpretation, picture mix, picture selection, picture division, picture guided treatment, picture recuperation, and assessment strategies [9]. Artificial Intelligence aids in extracting information from the images and represents information effectively and efficiently. Artificial intelligence empowers and helps authorities and other clinical experts to investigate different afflictions while clearing out human screw up and accelerating and accuracy of recognizable proof. These systems overhaul the limits of experts and researchers to perceive how to separate the ordinary varieties which cause the sickness in any case.

Among various parts of AI, AI and profound learning (DL) are two critical methodologies. For the most part, ML alludes to the ability to take in and remove important examples from the information, and the presentation of ML-based calculations and frameworks are vigorously subject to the delegate highlights [13].

A very powerful role has been played by AI tools for manufacture of drugs and facilitation of COVID 19 vaccine. AI became capable to suggest necessary tools and intelligent systems or frameworks for the prediction of efficient and safe drugs or vaccines which will help to fight against COVID 19. These suggestions could be done using the datasets acquired from healthcare or Government organizations or private clinical labs and patients. These efforts will benefit both scientific as well as economic perspectives [13].

AI can give sensible ways to fight against the pandemic by a couple of novel habits. For example, AI has shown extremely powerful results in COVID detection just as infodemiology and infoveillance through Demand and Supply metrics and leveraging learning-based techniques.For example, ML and DL models for grouping, and estimation of COVID-19. Moreover, CT is an important segment in the assessment of patients who are suspected to be COVID positive or COVID contamination. In any case, CT alone may have restricted negative prescient incentive for precluding COVID-19 contamination, as certain patients may discover customary radiological issues at beginning phases of the illness. In this examination, AI has been utilized for calculations and coordinate chest CT discoveries with clinical manifestations, presentation history and research center testing to rapidly analyze patients who are COVID-19 positive [5].

A. Machine Learning

Machine learning is an automated technology for information investigation in different areas like clinical designing, budgetary area, business area, instructive spaces and other related areas. Machine learning is used to distinguish designs, dissect information through different datasets and settle on right choices with no human intervention or less human interference. Machine Learning is thoroughly orchestrated into three segments specifically Supervised learning, Unsupervised learning and Reinforcement learning [30].

Superior learning implies that the machine or model learns through multiple datasets. But in directed learning, class-level data is accessible in the preparation datasets. While Unsupervised learning implies learning of models without an instructor or at the end of the day learning algorithms adapt progressively with bunching algorithms or assistance. Supervised and Unsupervised learning strategies are blend to form Reinforcement learning [22].

a. Supervised learning

Supervised learning is a preprogrammed task which allows a function to coordinate the input output pairs. The main motto behind a supervised learning is for being able to deliver a function which is capable of mapping the input-output (the vector supervision signal) pair. The algorithm shall permit a superlative scenario to mark the acquired information correctly to determine the classes. This can be known as conceptual learning, in the terms of human psychology [11]

Support-vector Machines (SVM) is a supervised technique for utilizing regression, classifications and likewise detecting anomaly. The main purpose of Support vector is to establish hyper plane in an N-dimensional space, where N represents the quantity of features that particularly arranges the information data. After considering all the factors, SVM will be able to locate a plane where extreme separation between the data purposes of free classes is maximum. Backing vectors are data which focuses on those which are closest to the hyper plane. All these data influence the position and direction of the hyper plane [11].

In India variety of regression models have been used for COVID-19 data analysis. It depends on information given away by Kaggle from1stMarch 2020 to 11th April 2020. Here, we have used six regression analyses on the basis of different models namely quadratic, 3rddegree, 4th degree, 5th degree, 6thdegree, and exponential polynomial with respect to the datasets of COVID-2019 [22].

In statistics, the logistic regression is being utilized to display the likelihood; each of the examples are assigned with a likelihood between 0 and 1. It tends to extend few of the event classes in request to show control for instance of different objects in a picture. Rather than CNN, the logistic regression likewise might be applied in the inside and out investigation of the cause of COVID-19. The logistic regression was applied to values that were received from ROC analysis at the point of investigation of clinical and

CT which indicated the seriousness of COVID-19 was discussed. It was discovered from the logistic regression that the clinical factors relating to serious/basic COVID-19 pneumonia, or the patients of age more than 50 years established chest pain, breathlessness, comorbidities and cough [11].

The authors in [15] aims to perform the future prediction on different factors like on the basis of passing rate, the number of confirmed infected cases in last few days on daily basis, and the number of recuperation cases in the next 10 days. Four ML moves have been taken which are suitable for the forecasting. At first, the dataset was preprocessed for this examination to end the global statistics of confirmed cases, recoveries and deaths on daily basis. The dataset that was taken into account in the investigation contains day to day time arrangement rundown tables, along with the number of recoveries, confirmed cases and deaths in the last few days due to which the pandemic occurred. Four regression models have been utilized for the investigation of COVID-19 future forecasting and those are Linear Regression (LR), LASSO Regression, Exponential Smoothing (ES) and Support Vector Machine (SVM) [29]. The dataset utilized in this prediction has been obtained from different sources 5and one of them is GitHub archive provided by the Center to Systems Science and Engineering, Johns Hopkins University.

b. Unsupervised learning

Unsupervised learning has been successfully utilized in the investigation of COVID-19. Unsupervised learning looks for previously undetected models or prototypes in an information stream without pre-existing marks and insignificant human intercession as compared to Supervised Machine learning. It helps to show the densities of likelihood on the sections. This algorithm makes it conceivable to identify irregular pieces of information which doesn't compare to any gathering [23]. It is applied in the field of estimation of the density in statistics. The k-means clustering is a vector quantization algorithm under unsupervised learning that is utilized for COVID 19. It segments n perceptions into k clusters where every comment fills in as of the cluster and has a place in the cluster with neighboring mean [11].

Unsupervised learning has the advantage of not requiring named information to even now prepare itself; it makes an extraordinary possibility for any sort of clinical application inside AI. We decided to actualize the Self-Organizing Feature Map (SOFM) algorithm for its capacity to be proficiently deployed for consistent and real-time learning. Our objective with this examination is to show that a SOFM is a compelling method to cluster an information set of COVID-19 chest x-ray pictures while additionally extracting which highlights caused the clustering of every characterization [25].

c. Reinforcement Learning

The progressing flare-up of the Covid infection 2019 (COVID-19) has immediately gotten a pandemic. It requires for brief activity in distinguishing suspected cases at a beginning phase through danger prediction. To stifle its further spread, we misuse the social connections between cell phones in the Social Internet of Things (SIoT) to help control its proliferation by dispensing the restricted defensive assets to the inertial alleged high-degree people to stem the tide of hastened spreading. The C-LOR (co-found item relationship of SIoT projects the geographic area and the SOR (social article relationship) measures the contact intensity and these are valuable for distinguishing the danger of infection in people. The proposed procedure in [30] is famously reasonable for disease control and avoidance by depending on the early distinguishing proof of COVID-19 cases.

B. Deep learning

As of late, deep learning based man-made reasoning (AI) innovation has exhibited huge accomplishment in the field of clinical information investigation because of its ability of separating rich highlights

from various clinical datasets. Already, deep learning was produced for diagnosing and recognizing bacterial and viral pneumonia from thoracic imaging information. Furthermore, endeavors have been made to identify different chest CT imaging highlights [26].

A pitifully supervised deep learning system for quick and completely mechanized detection and order of COVID-19 infection utilizing reflectively removed CT images from multi-scanners and multi-focuses. It can likewise pinpoint the specific situation of the sores or irritations brought about by the COVID-19, and in this manner can likewise possibly give exhortation on understanding seriousness to direct the accompanying emergency and treatment [26].

Deep learning is the center innovation of the rising man-made reasoning and has revealed huge demonstrative exactness in clinical imaging for programmed detection of lung diseases. This paper's main objective is to improve the acknowledgment of worldwide deep learning model utilizing cutting-edge information, and put in itself from such information to make better acknowledgment of COVID-19 victims dependent on registered tomography (CT) cuts. Also, the reconciliation of blockchain and unified taking in innovation gathers the information from various hospitals without releasing the protection of the information. Initially, we gather genuine COVID-19 patients' information open to the examination network. Also, we utilize particular significant learning models such as DenseNet, VGG, AlexNet, Capsule Network, MobileNetand ResNetto see the models through COVID-19 patients' lung screening [21].

A Convolutional Neural Network (CNN) is an algorithm of Deep Learning which accepts a picture as an input and assigns study loads to different objects or highlights in the picture to have the option to separate one picture from the other [11]. Coronavirus Net is a deep convolutional neural organization which have customized configuration for the detection of COVID-19 cases from CXR images. It is open source and accessible to the overall population. Moreover, we examine how COVID-Net make the predictions using a logic strategy that tries to not add deeper experiences into basic variables related with COVID cases, which can help medical authorities in improved screening. It is settling on decisions dependent on applicable data from the CXR images in COVID-Net [14].

The AI based CNN could be actualized as a quick analytic instrument to signal the suspected COVID-19 infected patients when CT images as well as lab data are accessible and radiologists may survey these speculated cases recognized by AI tools with a greater need [5]

The authors in [16] show how move getting from significant learning models can be utilized to perform COVID-19 recognizable proof utilizing pictures from three most generally utilized clinical imaging modes X-Ray, Ultrasound, and CT examine. The point is to give over-focused on clinical experts a second pair of eyes through keen deep learning picture grouping models.

Chest X-Rays of COVID-19 patients have end up being a significant elective pointer in COVID-19 screening. In any case, once more, exactness relies on radiological ability. An analysis framework that can help the specialist to inspect the lung images of the patients will reduce the symptomatic weight of the specialist. Four diverse deep CNN models were explored on images of chest X-Rays for conclusion of COVID-19 [17][18].

The authors in [18] present a computerized reasoning method dependent on a deep convolutional neural organization (CNN) to identify COVID-19 patients utilizing genuine world datasets. Our framework inspects chest X-beam images to distinguish such patients. Our discoveries demonstrate that such an investigation is important in COVID-19 finding as X-beams are advantageously accessible rapidly and at low expenses.

In [19], the authors approve and adjust a deep CNN for the characterization of COVID-19 chest X-beam images which is also called as DeTraC (Decompose,

Transfer and Compose). It uses a class Decomposition instrument to manage and examine any abnormalities in the image datasets. The trial outcomes indicated the capabilities of DeTraC in detection and prediction of COVID-19 cases from dataset of images which are collected from hospitals all over the globe.

The technique Rubik's solid shape Pro is a self-supervised learning method [20] which was proposed to extricate facts of negative CT volumes and COVID-19. Two types of delicate marks (i.e., 'trouble' and 'variety') are produced for each negative sample at that point by figuring the earth mover's division (EMD) between the highlights of COVID-19 records. The information about the 'estimation' of negative samples can be quantitatively assessed from the delicate marks. A pre-set number of negative samples were chosen dependent on the joint positioning of 'trouble' and 'variety', and took care of to the neural organization for preparing the COVID-19 records along with that.

This paper proposes the AI based characterization of Pneumonia patients and COVID-19 patients based onthe different deep learning element that utilizes ResNet152 on chest X-beam images. It also helps to adjust the imbalanced information of normal patients and COVID-19 victims. This non-intrusive and early prediction of novel corona virus is done by dissecting reports of chest X-beams and the spread of the infection in asymptomatic patients [24].

The detection of Corona virus from X-beam images of chest presents a difficult issue because of the abnormalities and the restricted accessibility of commented on cases. Another CNN model, which is also known as Self Supervised Super Sample Decomposition for Transfer learning (4S-DT) model has also been used. It has been relied upon to acclimate to such testing issues by changing a self-guided model weakening way to deal with oversee produce pseudo-names for the social affair of unlabeled chest X-shaft pictures as an affection learning task. 4S-DT has additionally the capacity to manage information inconsistencies by a class-decomposition adjusted in its downstream learning segment. 4S-DT has shown its adequacy and proficiencyin datasets with its inconsistent distribution in detection and prediction of COVID-19 cases [27].

IV. DATASETS USED FOR COVID 19 APPLICATIONS

The initial step is collection of data for creating machine learning techniques for COVID-19 applications. Despite the fact that there is huge availability of public CT or X-beam datasets for lung infections, both CT and X-rays checks for COVID-19 applications are not widely accessible. This enormously hinders and effects the improvement and research of AI strategies. As of late, a few take at COVID-19 data collection have been accounted [7]. These datasets helps to provide an efficient depiction of the applications.

A. Novel Coronavirus Visual Dashboard 2019

It is has been taken by the Johns Hopkins University Center for Systems Science and Engineering (JHU CSSE). The data was acquired from 18 sources, for example, the WHO or other organization like CDC and other government organizations, accumulated and shared them as an intuitive guide of the COVID-19 circumstance map. The database incorporates the quantity of every day tainting, dynamic, recuperation and demise. It additionally included the area, state or country or longitude and latitude or any province, occurrence rate, number of individuals tried and hospitalization rate [11].

Table I. An analysis of different approaches used in prediction, examination and detection of COVID 19 with datasets

References	Machine learning	Deep learning	Type of Dataset	Datasets	Prediction	Diagnosis	Detection
[15]	Regression models (Linear Regression, LASSO Regression, Support Vector Machine, Exponential Smoothing)		patient stats dataset	GitHub repository	√		
[22]	Regression analysis methods		Date and confirmed cases-COVID19	Kaggle and World Health Organization (WHO) website	√		
[23]	Decision tree, support vector machine, naïve Bayes, logistic regression, random forest, and K-nearest neighbor algorithms		Epidemiological dataset	Kagge Website	√		
[25]	Unsupervised learning- Self-Organizing Feature Maps (SOFM)		Chest X-Ray	Cohen, Morrison, and Dao's database of COVID-19			√
[24]	Logistic Regression (LR), k-Nearest Neighbour (kNN), Decision Tree (DT), Adaboost and Naive Bayes (NB), XGBoost	Synthetic minority oversampling technique (SMOTE)	Chest X-Ray Images	Publicly available datasets: Chest X-Ray Images (Pneumonia) and COVID-19 public dataset from Italy	√		
[14], [17]		Convolutional Neural Network	Chest X-Ray	GitHub repository	√	√	
[16]		VGG19 model	X-Ray, Ultrasound and CT scans	Publicly available COVID19			√
[18]		PA, ARIMA, and LSTM VGG16	Chest X-ray	Kaggle database	√	√	
[19]		DeTraC (deep CNN)	Chest X-ray	Japanese Society of Radiological Technology (JSRT)			√
[20]		Self supervised Learning	CT scans	2,675 3D volumetric non-contrast thoracic CT exams from 2,595 patients acquired at over 10 medical centers		√	√
[21]		VGG, DenseNet, AlexNet, MobileNet, ResNet, and Capsule Network	CT scans	CC-19			√
[26]		Supervised deep learning	CT images	Open dataset (TCIA dataset)			√
[27]		deep convolutional neural network - Self Supervised Super Sample Decomposition for Transfer learning (4S-DT) model.	Chest X-Ray	COVID 19 dataset			√

B. Twitter dataset for COVID-19

This dataset is a collection of increasing tweets IDs related with COVID-19. These types oftweet IDs included"Pandemic", "Coronavirus" and "COVID-19" etc. The data mainly focused on the tweets from January 28, 2020. They followed certain records and patterns which were similar to the way of WHO and other organizations like HHSGov and CDCgov [11].

C. COVID-CT

The image data collection for Corona virus was done by gathering clinical pictures from sites and distributions, and at present 123 frontal view X-rays are available. The CT dataset for COVID [10] incorporates 288 CT slices for affirmed cases of COVID 19. It is gathered from more than 700 preprinted writing on COVID-19 from medRxiv and

bioRxiv. Likewise, the CT division for COVID-19 dataset (medicalsegmentation.com/covid19/) contains 100 axial CT slices from 60 patients and they were manually segmented, as JPG images. Similarly, the confirmed instances of COVID-19 cases are available on the site (coronacases.org). Presently, it incorporates 3D CT images of 10 affirmed COVID-19 cases. It is significant that the current public datasets still have a predetermined number of pictures for preparing and testing of AI calculations and the nature of datasets isn't adequate [7].

D. CORD-19

CORD-19 dataset is freely available and downloadable and every week it gets updated. Presently, the collection contains more than 128,000 publications (out of which 59,000 of them have full content starting at 26 May 2020) on COVID-19 infection or content related to this. It is essential source of inspiration to the AI community and to develop AI techniques to create new insights to aid the battle against COVID-19 [4].

E. COVIDx Dataset

The dataset used to prepare and configure the proposed COVID-Net includes a total of 13,975 CXR images across 13,870 patient cases which will be eluded as COVIDx. The open access to the COVIDxdatase is very significant with respect to the amount of positive cases of COVID-19, according to the best author's data [14]. CC-19, identified with the most recent family of coronavirus for example COVID-19. The dataset contains 34,006 CT filter slices (pictures) having a place with 89 subjects [21].

V. AI BASED TOOLS

AI using significant learning advancement has indicated unimaginable achievement in the clinical imaging zone as a result of its high capacity of feature extraction. It's also been made to perceive diverse imaging features of chest CT. Chest X-pillar and CT are commonly used in the screening and finding of COVID-19. In particular, to distinguish and separate bacterial and viral pneumonia based on chest radiographs, deep learning was applied. Endeavors have additionally been made to identify different imaging highlights of CT of chests [7].A couple of investigation bundles have begun hoping to automated thinking (AI) as a gadget for examining and stalling X-radiates and enrolled tomography (CT) yields, and supporting the screening, predicting and diagnosing of COVID-19.

A. COVNet

COVNet is a 3D profound learning structure built for the identification of COVID-19. It can separate both 2D and 3D neighborhood worldwide delegate highlights. The structure ofCOVNetcomprises of RestNet50 as the spine, which takes a CT cuts progression as information and produces highlights for the comparing cuts. By a maximum pooling activity, the separated highlights from all cuts are then joined. A completely associated layer and softmax enactmentcapacity was formed from the last component. It helpsto produce a same score for each kind CAP, non-pneumonia and COVID-19 [12]. To test the strength of the model sweeps of network obtained from other non-pneumonia lung diseases and CAP pneumonia were also included.

B. qXR AI-Based Chest X-ray Interpretation Tool

2.5 million Chest X-rays datasetshave been used to train qXR. In qXRthe AI naturally sees 20 lung variations from the norm and utilizations those discoveries to recognize likely instances of tuberculosis and other ailments related respiratory systems. Once the COVID-19 emergency started, the organization quickly pondered growing qXR to likewise screen for discoveries that are firmly reminiscent of that infection [2].

C. qScout

qScout had been planning to track tuberculosis which is in application stage, has now been extended to incorporate COVID-19.Icolung, utilized clinically for measurement of lung pathology on chest CT checks in conceded COVID-19 victims [2]. qScout incorporates an AI-based following segment that keeps up secure patient data about starting and proceeding with singular wellbeing status or an electronic clinical record (EMR), so medical systems can give customized care; and tracks more broad epidemiological and topographical information, which can help wellbeing associations do contact following and start proper moderation endeavors [2].

D. WellAI

For cross examination of the CORD-19 dataset,Well AI has built up a Machine Learning (ML) search and examination device fusing the total rundown of NIH clinical classes Unified Medical Language System (UMLS) semantic sorts. The Well AI COVID-19 application utilizes NLP neural organizations to 'learn' from the CORD-19 dataset to sum up existing information. Significantly, they manage synonymy, and by including the entirety of the equivalent words, the quantity of ideas from UMLS expanded to 4,224,512! , out of which only 60,892 ideas are utilized in the Well AI model for COVID-19, gathered into 69 classifications (or UMLS semantic sorts). A progression of Well AI neural organization models have been used to learn connections between clinical ideas [4].

E. SciSight

SciSight is a tool which is used to explain the association and relationship between the appearing visualizing concept of the emerging network around COVID 19 and CORD-19 datasets. It is a visualization tool powered by AI. There are four types of search options under this one are used to visualize the research growth and ties of COVID-19 and it is known as “Network of Science” search. The other two options falls under scientific concepts and which is considered as an important factor in study of COVID-19. Those two search options are “Diseases/chemicals” and “Proteins/genes/cells”. The last search option is “Faceted search” [4].

F. Contact tracing

In the age of digitalization where almost everything is transformed into digital, the contact tracing can be achieved and integrated in an application with the help ofdatasets and diagnostic test results. Contact tracing app has been deployed in Singapore asTraceTogether. The app uses a smartphone’s Bluetooth network to notify every TraceTogether user, who are present within the range of 2 meters for more than 30 mins and found to be COVID 19 positive [4].

G. α-Satellite

A model of an AI-based framework, to be specific **α**-Satellite, is proposed to evaluate the irresistible danger of a given geological region at network levels. The framework gathers different kinds of enormous scope and ongoing information from heterogeneous sources, for example, number of cases and passings, segment information, traffic thickness and web-based media information, e.g., Reddit posts [31].

H. ACEMod (Australian Census based Epidemic Model)

ACEMod (Australian Census based Epidemic Model), recently utilized for flu pandemic reenactment for demonstrating the COVID-19 pandemic across Australia after some time. The ACEMod is adjusted to demonstrate particulars of the COVID-19 pandemic dependent on key illness transmission boundaries. A

few intercession procedures including social separating, school terminations, travel boycotts, and case detachment are then assessed utilizing this adapted model. The outcomes from the tests show that a blend of a few procedures is expected to relieve and smother the COVID-19 outbreak. The best methodology recommended by the model is to consolidate global appearance limitations, case separation and social removing in at any rate 13 weeks with the consistence level of 80% or above [32].

VI.CONCLUSION

This paper focused on the applications of machine learning and deep learning techniques supported in the battle of COVID-19 outbreak. In the face of overstretched health care networks, we must work on our health systems to make it stronger enough so that it could sustain services beyond the control and management of COVID-19. This paper featured cutting edge advances help in battling against the pandemic and how it very well may be utilized to battle future pandemics. The examination empowers medical services policymakers to set up their nation against the flare-up of the illness and settle on very much educated choices.

VII. REFERENCES

[1]. Adedoyin Ahmed Hussain, OunsBouachir, Fadi Al-Turjman And MoayadAloqaily, "AI Techniques for COVID-19", A. A. Hussain et al.: AI Techniques for COVID-19, 128778, VOLUME 8, 2020.

[2]. Leslie Mertz, "AI-Driven COVID-19 Tools to Interpret, Quantify Lung Images", IEEE Pulse, Digital Object Identifier 10.1109/MPULS.2020.3008354, Date of current version: 17 August 2020.

[3]. Mohammad(Behdad) Jamshidi, Ali Lalbakhsh, JakubTalla, FarimahHadjilooeiPedramLalbakhsh, MortezaJamshidi, Luigi La Spada, MirhamedMirmozafari, MojganDehghani, AsalSabet, SaeedRoshani, SobhanRoshani, NimaBayat-Makou, BahareMohamadzade, Zahra Malek, AlirezaJamshidi, Sarah Kiani, HamedHashemi-Dezaki, And WahabMohyuddin, "Artificial Intelligence and COVID-19: Deep Learning Approaches for Diagnosis and Treatment", M. Jamshidi et al.: AI and COVID-19: Deep Learning Approaches for Diagnosis and Treatment, 109582 VOLUME 8, 2020.

[4]. Larry J. Kricka1, Sergei Polevikov, Jason Y. Park, Paolo Fortina, Sergio Bernardini, Daniel Satchkov, ValentinKolesov, Maxim Grishkov, "Artificial Intelligence-powered search tools and resources in the fight against COVID-19", Artificial Intelligence-powered search tools and resources in the fight against COVID-19, eJIFCC2020Vol31No2pp106-116.

[5]. Xueyan Mei, Hao-Chih Lee, Kai-yueDiao, Mingqian Huang, Bin Lin, Chenyu Liu, ZongyuXie, Yixuan Ma, Philip M. Robson, Michael Chung, Adam Bernheim, Venkatesh Mani, Claudia Calcagno, Kunwei Li, Shaolin Li, Hong Shan, JianLv, Tongtong Zhao, Junli Xia, Qihua Long, Sharon Steinberger, Adam Jacobi, Timothy Deyer, Marta Luksza, Fang Liu, Brent P. Little, Zahi A. Fayad and Yang Yang, "Artificial intelligence–enabled rapid diagnosis of patients with COVID-19", Nature Medicine | VOL 26 | August 2020 | 1224–1228 | www.nature.com/naturemedicine.

[6]. ThanhThi Nguyen, "Artificial Intelligence in the Battle against Coronavirus (COVID-19): A Survey and Future Research Directions", Nguyen, T. T. (2020). Artificial intelligence in the battle against coronavirus (COVID-19): a survey and future research directions. Preprint, DOI:10.13140/RG.2.2.36491.23846/1.

[7]. Feng Shi, Jun Wang, Jun Shi, Ziyan Wu, Qian Wang, Zhenyu Tang, Kelei He, Yinghuan Shi,

DinggangShen, "Review of Artificial Intelligence Techniques in Imaging Data Acquisition, Segmentation and Diagnosis for COVID-19", DOI 10.1109/RBME.2020.2987975, IEEE Reviews in Biomedical Engineering.

[8]. AgamBansal, RanaPrathapPadappayil, ChandanGarg, Anjali Singal, Mohak Gupta and Allan Klein, "Utility of Artificial Intelligence Amidst the COVID 19 Pandemic:A Review", Springer, Journal of Medical Systems (2020) 44: 156, Published online: 1 August 2020.

[9]. Jiaying Liu, Xiangjie Kong, Feng Xia, XiaomeiBai, Lei Wang, Qing Qing And Ivan Lee, "Artificial Intelligence in the 21st Century", J. Liu et al.: AI in the 21st Century, 34404 VOLUME 6, 2018.

[10]. JunaidShuja, EisaAlanazi, WaleedAlasmary, AbdulazizAlashaikh, "Covid-19 Datasets: A Survey And Future Challenges", medRxiv preprint doi: https://doi.org/10.1101/2020.05.19.20107532, May 26, 2020.

[11]. YoussoufaMohamadou, AminouHalidou, PascalinTiamKapen, "A review of mathematical modeling, artificial intelligence and datasets used in the study, prediction and management of COVID-19", A review of mathematical modeling, artificial intelligence and datasets used in the study, prediction, Applied Intelligence https://doi.org/10.1007/s10489-020-01770-9, Springer, Published online: 06 July 2020.

[12]. Lin Li, Lixin Qin, ZeguoXu, Youbing Yin, Xin Wang, Bin Kong, JunjieBai,Yi Lu, Zhenghan Fang, Qi Song, Kunlin Cao, Daliang Liu, Guisheng Wang, QizhongXu, Xisheng Fang, Shiqin Zhang, Juan Xia, Jun Xia, "Using Artificial Intelligence to Detect COVID-19 and Community-acquired Pneumonia Based on Pulmonary CT: Evaluation of the Diagnostic Accuracy", Radiology: Volume 296: Number 2—August 2020.

[13]. Quoc-Viet Pham, Dinh C. Nguyen, Thien Huynh-The, Won-Joo Hwang And Pubudu N. Pathirana, "Artificial Intelligence (AI) and Big Data for Coronavirus (COVID-19) Pandemic: A Survey on the State-of-the-Arts", Q.-V. Pham et al.: Artificial Intelligence and Big Data for Coronavirus Pandemic, VOLUME 4, 2020.

[14]. Linda Wang, ZhongQiu Lin1, and Alexander Wong, "COVID-Net: A Tailored Deep Convolutional Neural Network Design for Detection of COVID-19 Cases from Chest X-Ray Images", arXiv:2003.09871v4, eess.IV], 11 May 2020.

[15]. FurqanRustam, Aijaz Ahmad Reshi, ArifMehmood, SaleemUllah, Byung-Won On, WaqarAslam, And Gyu Sang Choi, "COVID-19 Future Forecasting Using Supervised Machine Learning Models", F. Rustam et al.: COVID-19 Future Forecasting Using Supervised ML Models, 101490 VOLUME 8, 2020.

[16]. Michael J. Horry, SubrataChakraborty, Manoranjan Paul, AnwaarUlhaq, BiswajeetPradhan, ManasSaha, And NageshShukla, "COVID-19 Detection Through Transfer Learning Using Multimodal Imaging Data", M. J. Horry et al.: COVID-19 Detection Through Transfer Learning Using Multimodal Imaging Data, VOLUME 8, 2020 149809, August 25, 2020.

[17]. RachnaSethi and Monica Mehrotra, DhaarnaSethi, "Deep Learning based Diagnosis Recommendation for COVID-19 using Chest X-Rays Images", Proceedings of the Second International Conference on Inventive Research in Computing Applications (ICIRCA-2020) IEEE Xplore Part Number: CFP20N67-ART; ISBN: 978-1-7281-5374-2.

[18]. MoutazAlazab, AlbaraAwajan, AbdelwadoodMesleh, Ajith Abraham, VanshJatana, Salah Alhyari, "COVID-19

Prediction and Detection Using Deep Learning", International Journal of Computer Information Systems and Industrial Management Applications ISSN 2150-7988 Volume 12 (2020) pp. 168-181, Published: 29 May, 2020.

[19]. Asmaa Abbas, Mohammed M., Abdelsamea and Mohamed Medhat Gaber, "Classification of COVID-19 in chest X-ray images using DeTraC deep convolutional neural network", medRxiv preprint doi: https://doi.org/10.1101/2020.03.30.20047456.this version posted May 18, 2020.

[20]. Yuexiang Li, Dong Wei, Jiawei Chen, Shilei Cao, Hongyu Zhou, Yanchun Zhu, Jianrong Wu, LanLan,Wenbo Sun, TianyiQian, Kai Ma, HaiboXu, YefengZheng, "Efficient and Effective Training of COVID-19 Classification Networks with Self-supervised Dual-track Learning to Rank", JOURNAL OF LATEX CLASS FILES, VOL. 14, NO. 8, AUGUST 2015, DOI 10.1109/JBHI.2020.3018181, IEEE Journal of Biomedical and Health Informatics.

[21]. Rajesh Kumar, Abdullah Aman Khan, Sinmin Zhang, WenYong Wang, YousifAbuidris, Waqas Amin , and Jay Kumar, "Blockchain-Federated-Learning and Deep Learning Models for COVID-19 detection using CT Imaging", arXiv:2007.06537v1, eess.IV], 10 July 2020.

[22]. Ramjeet Singh Yadav, "Data analysis of COVID-2019 epidemic using machine learning methods: a case study of India", Int. j. inf. Tecnol, Springer, Published online: 26 May 2020.

[23]. L. J. Muhammad, Md. Milon Islam, Sani Sharif Usman and Safal Islam Ayon, "Predictive Data Mining Models for Novel Coronavirus (COVID-19) Infected Patients' Recovery", SN Computer Science (2020) 1:206, Springer, Published online: 21 June 2020.

[24]. Rahul Kumar, RidhiArora, VipulBansal, Vinodh J Sahayasheela, HimanshuBuckchash, Javed Imran, Narayanan Narayanan, Ganesh N Pandian and Balasubramanian Raman, "Accurate Prediction of COVID-19 using Chest X-Ray Images through Deep Feature Learning model with SMOTE and Machine Learning Classifiers", medRxiv preprint April 17, 2020.

[25]. Bayley King, SiddharthBarve, Andrew Ford and Rashmi Jha, "Unsupervised Clustering of COVID-19 Chest X-Ray Images with a Self-Organizing Feature Map", IEEE Xplore, September 23,2020.

[26]. Shaoping Hu , Yuan Gao , ZhangmingNiu , Yinghui Jiang , Lao Li , Xianglu Xiao, Minhao Wang , EvandroFei Fang , Wade Menpes-Smith , Jun Xia , Hui Ye , and GuangYang, "Weakly Supervised Deep Learning for COVID-19 Infection Detection and Classification from CT Images",.

[27]. Asmaa Abbas, Mohammed M. Abdelsamea and Mohamed Medhat Gaber, "4S-DT: Self Supervised Super Sample Decomposition for Transfer learning with application to COVID-19 detection", medRxiv preprint doi: https://doi.org/10.1101/2020.06.22.20137547, June 23, 2020.

[28]. Joseph Bullock, Alexandra Luccioni, Katherine Hoffmann Pham, Cynthia Sin Nga Lam and Miguel Luengo-Oroz, "Mapping the landscape of Artificial Intelligence applications against COVID-19", arXiv:2003.11336v2 cs.CY] 24 April 2020.

[29]. Dr. A. P. Nirmala, Paramita Chandra, "An analysis on Applications of Machine Learning Algorithms to predict COVID-19", International Journal of Future Generation Communication and Networking, Vol. 13, No. 4, (2020), pp. 2461–2470, ISSN: 2233-7857 IJFGCN, Published on 1 December 2020.

[30]. Bowen Wang, Yanjing Sun, Trung Q. Duong, Long D. Nguyen and LajosHanzo, "Risk-Aware Identification of Highly Suspected COVID-19 Cases in Social IoT: A Joint Graph Theory and Reinforcement Learning Approach", B. Wang et al.: Risk-Aware Identification of Highly

Suspected COVID-19 Cases in Social IoT, 115656 VOLUME 8, 2020, July 2, 2020..

[31]. Yanfang Ye, ShifuHou, Yujie Fan, YiyueQian, Yiming Zhang, Shiyu Sun, QianPeng and Kenneth Laparo, "α-Satellite: An AI-driven System and Benchmark Datasets for Hierarchical Community-level Risk Assessment to Help Combat COVID-19", arXiv:2003.12232v1 cs.SI] 27 March 2020.

[32]. Sheryl L. Chang, Nathan Harding, Cameron Zachreson, Oliver M. Cliff1 and Mikhail Prokopenko, "Modelling transmission and control of the COVID-19 pandemic in Australia", arXiv:2003.10218v3 q-bio.PE], 3 May 2020.