

Comprehensive study: machine learning approaches for COVID-19 diagnosis

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Article Info

Article history:

Received Dec 30, 2022

Revised Mar 19, 2023

Accepted Mar 28, 2023

Keywords:

Coronavirus disease 2019

Intelligent framework

Internet of things

Machine learning

Smart detection

ABSTRACT

Coronavirus disease 2019 (COVID-19) is caused a large number of death since has declared as an international pandemic in December 2019, and it is spreading all over the world (more than 200 countries). This situation puts the health organizations in an aberrant demand for urgent needs to develop significant early detection and monitoring smart solutions. Therefore, that new system or solution might be capable to identify COVID-19 quickly and accurately. Nowadays, the science of artificial intelligence (AI), and internet of things (IoT) techniques have an extensive range of applications, it can be initiated a possible solution for early detection and accurate decisions. We believe, combine both of the IoT revolution and machine learning (ML) methods are expected to reshape healthcare treatment strategies to provide smart (diagnosis, treatments, monitoring, and hospitals). This work aims to overview the recent solutions that have been used for early detection, and to provide the researchers a comprehensive summary that contribute to the pandemic control such AI, IoT, cloud, fog, algorithms, and all the dataset and their sources that recently published. In addition, all models, frameworks, monitoring systems, devices, and ideas (in four sections) have been sufficiently presented with all clarifications and justifications. Also, we propose a new vision for early detection based on IoT sensors data entry using 1 million patients-data to verify three proposed methods.

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1. INTRODUCTION

Coronavirus disease 2019 (COVID-19) is caused by a highly contagious novel virus and was first discovered in Wuhan City in Hubei, China, where the pandemic initially began. The pandemic quickly spread across China and then the entire world. COVID-19 was declared by the World Health Organization (WHO) on March 11, 2020, as a pandemic that causes people to suffer acute respiratory infection and the new virus is caused by the severe acute respiratory syndrome (SARS) covid 2 virus [1], [2]. There are general indications of the disease, including headache, dry cough, difficulty breathing, decreased smell and taste, and weakness, although the coronavirus affects all age groups, the most vulnerable group to infection are those over 30 years old, and the elderly. The symptoms are more severe and can spread among young people and children early detection of infected people is one of the most important steps in combating the virus [3]–[7]. This work aims to overview the recent solutions that have been used for early detection, and to provide the researchers a comprehensive summary that contribute to the pandemic control such artificial intelligent (AI),

internet of things (IoT), cloud, fog, algorithms. The main gap is can be summarized as: first, the methods of machine learning (ML) that have been used, second: the reliable datasets, and third: the study of the weight is the main input parameters to the models that used in AI or any other methods. The conclusion is summarizing and will give the main future ideas and plan.

Experts from the University of Amsterdam simulated a cough chain inside an elevator to determine how long the droplets lasted under different conditions. With doors open and closed regularly, droplets from coughing or talking loudly can last for about ten minutes. Talking loudly can produce up to a few hundred thousand droplets per minute while a single cough can produce a few million. If you inhale the air inside an elevator after the infected person talks or coughs, you are absorbing up to a thousand COVID-19 particles per minute in a very confined space such as an elevator; these droplets can easily hit other people who come later, especially if they get lost in the air [7].

The general director of the WHO, Dr. Tedros, had been stated on January 18, 2022, according to the WHO website [8], that Omicron may be less severe on average than the previous variables, but the narrative that it caused a mild illness is misleading, harms the general response and costs more lives. Dr. Tedros mentioned, we are concerned about the impact of Omicron on already overworked workers and overburdened health systems, and he is particularly concerned about the many countries with low vaccination rates when people are at greater risk of serious illness and death if they are not vaccinated [9]. It is important to propose an IoT-based and cloud-based healthcare model to detect COVID-19 in real-time.

In addition, AI systems are used to perform complex tasks in a way that is similar to how humans solve problems. As well ML methods are used on different levels by an AI agent. On a lower level, ML methods help to extract the relevant information from raw data. ML methods are used to classify images into different categories which are then used an input for higher level functions of the AI agent. ML methods are also used for higher level tasks. This study aims to highlight articles that used AI algorithms and, the medical IoT, fog, cloud, and ML, for real-time detection of COVID-19 this will prevent more deaths, injuries, and the collapse of health systems in the countries of the world. This work is presents a thorough overview of the work has been done before and what the next step should be.

2. METHOD

The main gap is can be summarized as: first, the methods of ML that have been used, second: the reliable datasets, and third: the study of the weight is the main input parameters to the models that used in AI or any other methods. This section consists of four dominant approaches for early detection and highlights the articles that were used to detect COVID-19. Models and ideas are described in detail based on our approaches.

2.1. Artificial intelligence algorithms approach

Iraq in [10] a profound learning-based model, i.e., Quicker regions with convolutional neural networks (Quicker RCNN) with ResNet-101, was applied to X-Beam pictures of the chest for coronavirus identification. It utilizes region proposal network (RPN) to perform discovery. By utilizing the model, this work accomplishes a recognition precision of 98%. In this way, the framework may be proficient to help clinical specialists/radiologists, to check the early appraisal of coronavirus the X-Beam pictures were gathered from various web-based accessible information hotspots for testing and preparing the model the discovery results were contrasted, and other profound learning approaches of coronavirus.

The essential target of this review [11] was to propose a mixture model that incorporates ensemble empirical mode decomposition (EEMD) and artificial neural network (ANN) for anticipating the coronavirus scourge. Constant coronavirus time series information had been utilized. On the window periods January 22, 2020 to May 18, 2020. The aftereffect of the proposed model had been contrasted and a few conventional measurable investigations the aftereffect of this examination shows our proposed model beats contrasted and conventional measurement ANN is most broadly utilized in time series expectation because of its strong equal handling and ability to gauge for essentially any capability up to a self-decisive degree of accuracy. Be that as it may, no matter what the great execution of ANN, there is still space to further develop its gauge exactness analysis.

Huang *et al.* [12] proposed a novel deep neural network (DNN) system to estimate the coronavirus episode. The coronavirus 19Net system consolidated 1D CNN, 2D CNN, and bidirectional gated intermittent units. The outcomes confirmed that was prominently more precise than different models. The mean outright rate blunder produced by coronavirus 19Net was, 1,801 for Italy, 1,447 for Germany, which was extensively better compared to those of different models information was gained from the everyday circumstance reports unveiled by the WHO and data in the GitHub site the expectation results gained from Coronavirus 19Net were contrasted with those got utilizing a CNN, gated recurrent units (GRU), and CNN-GRU as shown in Figure 1.

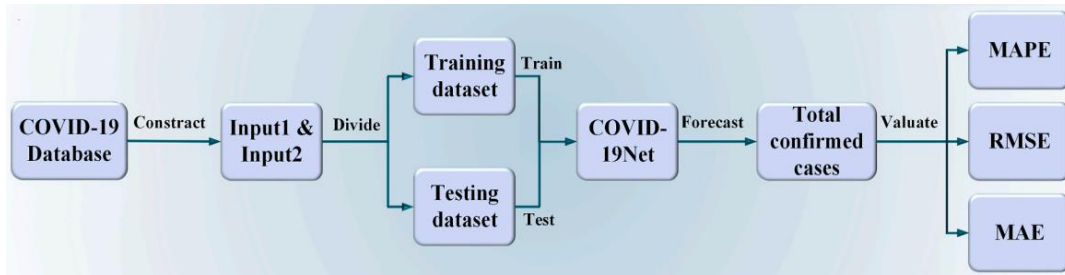


Figure 1. Overview of COVID-19 Net model experiment process [12]

This study [13] zeroed in on proposing another system that depended on profound learning calculations for perceiving coronavirus cases, generally out in the open spots. The calculations incorporate foundation deduction for extricating the closer view of warm pictures from warm recordings created by warm cameras through the warm imaging process and the convolutional brain organization for recognizing individuals tainted with the infection. The proposed framework can distinguish the shortcoming in turning hardware precisely, procuring a 95% and 91.67% exactness rate. CNN numerous techniques were proposed and carried out to distinguish the infection as it was important to track down the patients to forestall further contamination. These strategies were tried on individuals generally voyagers who have a high possibility of being infected. Air terminals, being the biggest center point for individuals going from various districts, first places to start the screening tests.

In [14] ever-evolving examination of the new distributions up to November 2020, connected with man-made intelligence approaches towards dealing with the difficulties of coronavirus contamination was made. For patient analysis and screening, CNN and support vector machine (SVM) were comprehensively applied for arrangement purposes. Besides, DNN and homology displaying were the most utilized severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) medication reusing models. They utilized text information and the quantity of everyday tainted cases from the centers for disease control (CDC) a group of specialists anticipated the dispersal and size of the SARS-CoV-2 pandemic utilizing ML-based models.

In this study [15] two lightweight models were presented, specifically CovParaNet for sound (hack, discourse, and breathing) characterization and CovTinyNet for picture (X-beams, computerized tomography (CT) examines) grouping. The got consequences of the five freely prepared unimodal models were coordinated by a clever dynamic multimodal irregular woodland classified. The lightweight CovParaNet and CovTinyNet models accomplish a most extreme precision of 97.45% and 99.19% individually even with a little dataset. The proposed dynamic multimodal combination model predicts the eventual outcome with 100% exactness, accuracy, and review. The hack sound dataset (289 sound examples altogether) was increased from two distinct sources specifically check and Coswara and GitHub. In this review, crude X-beam and CT pictures were acquired from two different open web-based sources. The chest X-beam dataset consists of 125 coronavirus positive examples and 500 typical examples.

In [16] this exploration proposed an enhanced k-nearest neighbor (KNN) calculation enhanced KNN, which did not arbitrarily pick the worth of k. Not with standing, it utilized a numerical capability of the dataset's example size while deciding the k-worth. The enhanced KNN calculation eKNN investigated 7 benchmark coronavirus datasets of various sizes, which had been accumulated from standard information billows of various nations (Brazil, Mexico, and so forth).

Results showed that the enhanced KNN classifier alongside the element determination system performed way better compared to enhance KNN without highlight determination. All the datasets were retested in the greater part of the cases, the k-worth was picked arbitrarily and this paper endeavors to conquer this disadvantage results demonstrated that for dataset 1, when k was picked haphazardly ($k=37$), the acquired precision was just 75.6%. Be that as it may, by the utilization of eKNN, where k was picked as 2 N (for this situation $N=5,000$, so $k=71$), the got precision expanded to 87.9%.

Abdulkareem *et al.* [17] planned to propose a model based on ML and the IoT. To determine whether patients have coronavirus in shrewd clinics three ML models, in particular, naive Bayes (NB), random forest (RF), and SVM. Methods were prepared and tried, because of research facility datasets SVM model got the most significant conclusion execution (up to 95%).

This study utilized a research facility dataset of patients with coronavirus in the Israelite Albert Einstein Medical clinic in Sao Paulo, Brazil. The patient examples were gathered to distinguish who was contaminated by coronavirus toward the start of the year 2020. The SVM classifier accomplishes great outcomes since it was broadly utilized in illness expectation and information groupings, particularly when information incorporates a period series.

In [18] this examination planned to create a dependable CNN model for the grouping of coronavirus from chest X-beam sees. In addition, it was meant to forestall predisposition issues because of the data set. A move learning-based CNN model was created by utilizing an amount of 1,218 chest X-beam pictures CXIs comprising 368 coronavirus pneumonia and 850 other pneumonia cases by pre-prepared structures, including DenseNet-201, ResNet-18, and Crush Net. The chest X-beam pictures were obtained from freely accessible information bases, CNN model based on the DenseNet-201 design beat the others with the most noteworthy exactness, accuracy, review, and F1-scores of 94.96%, 89.74%, 94.59%, and 92.11%, separately.

In [19], a brilliant arrangement was proposed for the early recognize coronavirus patients utilizing IoT innovation. The proposed framework had taken clinical information, for example, internal heat level, hack sound, and pulse utilizing IoT sensors. A cell phone was utilized to gather other well-being information about coronavirus patients. All gathered information will be put away and examined in the cloud. The arbitrary timberland calculation gives the best result for our expectation model among 1,000 occurrence irregular woodland model accurately predicts 941 cases that is mean the grouping rate is 94.1%. The primary test of this work involved irregular qualities for cases to assemble our model.

In [20] most of medical services applications with distributed computing utilize the centralization transmission interaction of different furthermore, tremendous volumes of data which make the protection. Furthermore, security of individual patient information simple for hacking. Moreover, the customary engineering of the cloud showed numerous shortcomings like idleness and low constant execution. The work was to utilize discrete wavelet transform (DWT) and principal component analysis (PCA) and different energy following techniques like Teager-Kaiser energy operator (TKEO), Shannon wavelet entropy energy (SWEE), log energy entropy (LEE) for preprocessing the dataset. The trial consequences of the CNN model guarantee the elite exhibition of the proposed framework in ordering the coronavirus, pneumonia and ordinary cases with 97% of precision, 100% of precession, 97% of review, the vast majority of F1-score, and 98% of area under curve (AUC). In our trial and error, a free huge dataset that contains 6,432 X-beam pictures removed from Kaggle vault.

In [21] a model is intended to decipher chest X-ray (CXR) pictures and keenly measure the seriousness of coronavirus lung diseases utilizing a novel DNN. The proposed DNN utilizes multi-scale inspecting channels to extricate dependable and clamor invariant elements from an assortment of picture patches. Tests were directed on five freely accessible information bases, including COVID, coronavirus radiography, coronavirus XRay-5K, coronavirus CXR, and coronavirus chests-beam, with characterization exactness of 96.01%, 99.62%, 99.22%, 98.8%, and 100%, and testing seasons of 0.541, 0.692, 1.28, 0.461, and 0.202 s, individually. The proposed structure was contrasted and fourteen existing methodologies by using four notable grouping measurements viz., F1-score, review, accuracy, and exactness.

In [22], the fundamental point of the review was the proposition of a system for the prior discovery and estimating of the coronavirus infection contamination among individuals to keep away from the spread of the illness across the world by embracing prudent steps. As indicated by this structure, there were four phases for the proposed work. This incorporates the assortment of fundamental information followed by the characterization of the gathered data which was then taken during the time spent mining and extraction and in the end finishing with the course of choice demonstrating. The expectations are consequently acknowledged by utilizing the transient RNN. The model at long last gives powerful results in the effectiveness of order, unwavering quality, forecast practicality; and so forth. In the proposed model, reenactments were finished in ideal circumstances confirmed with three provincial datasets gained from a specific area.

Mohammedqasem *et al.* [23] fostered a profound learning streamlining framework that can work with imbalanced datasets to work on the grouping of patients. An engineered minority oversampling procedure is applied to tackle the issue of lopsidedness, and a recursive component disposal calculation was utilized to decide the best highlights after information equilibrium and extraction of highlights, the information was parted into preparing and testing sets for approving all models. The trial prescient outcomes show great soundness and similarity of the models with the information, giving the most extreme exactness of 98% and accuracy of 97%. At last, the created models were shown to deal with information predisposition and accomplish high characterization exactness for patients with coronavirus as shown in Figure 2.

Alassafi *et al.* [24] proposed a deep learning (DL) approach that incorporates recurrent neural network (RNN) and long short-term memory (LSTM) networks for foreseeing the plausible quantities of coronavirus cases. The LSTM models showed 98.58% accuracy exactness while the RNN models showed a 93.45% accuracy precision. Additionally, this review looked at the quantity of COVID-19 cases and the quantity of coming about passing's in, Saudi Arabia Morocco, and Malaysia from there on, we anticipated the quantity of affirmed coronavirus cases and passing for the resulting 7 days this work had been utilized the public datasets gave by the European place to sickness counteraction and control for fostering an expectation model for the spread of the coronavirus episode through Saudi Arabia, Morocco, and Malaysia RNNs cause

the vanishing of the disappearing slope point blunder which prompts the improvement of a clever model called the LSTM that can deal with this issue as shown in Figure 3.

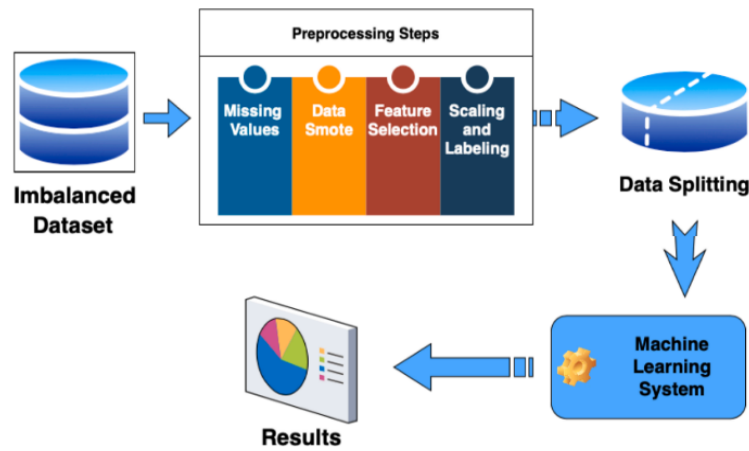


Figure 2. ML flowchart for COVID-19 models [23]

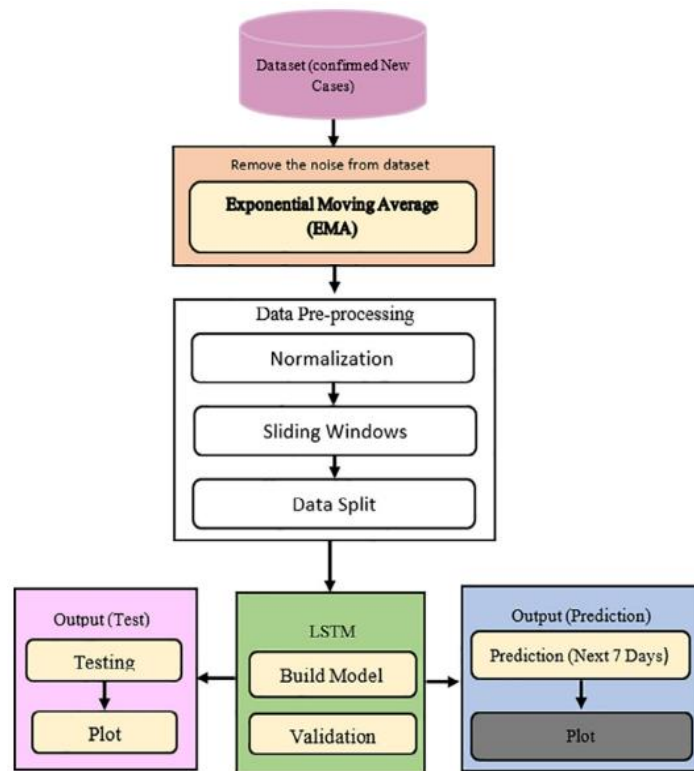


Figure 3. Framework of the LSTM model proposed in this study [24]

2.2. Articles based on IoT-IoMT-fog-cloud

In The second approach, all IoT, internet of medical things (IoMT) ideas, and contributions are described and presented in detail. Ashraf *et al.* [25], a savvy edge reconnaissance framework was powerful in remote checking, preemptive guidance, and location of an individual’s fever, heart beat rate, cardiovascular circumstances, and a portion of the radiological elements to distinguish the contaminated (dubious) individual utilizing wearable brilliant devices. The proposed system gives a consistently refreshed map/example of the correspondence chain of coronavirus tainted people that might traverse around our public local area.

The proposed COVID-19 thought individual reconnaissance component helps continuous qualities by sensors through wearable and non-wearable devices. It will be utilized to know about the clinical wellbeing status and to follow the chain of all areas of interest. The COVID-19 thought casualty steps as shown in Figure 4 presented the steps clearly.

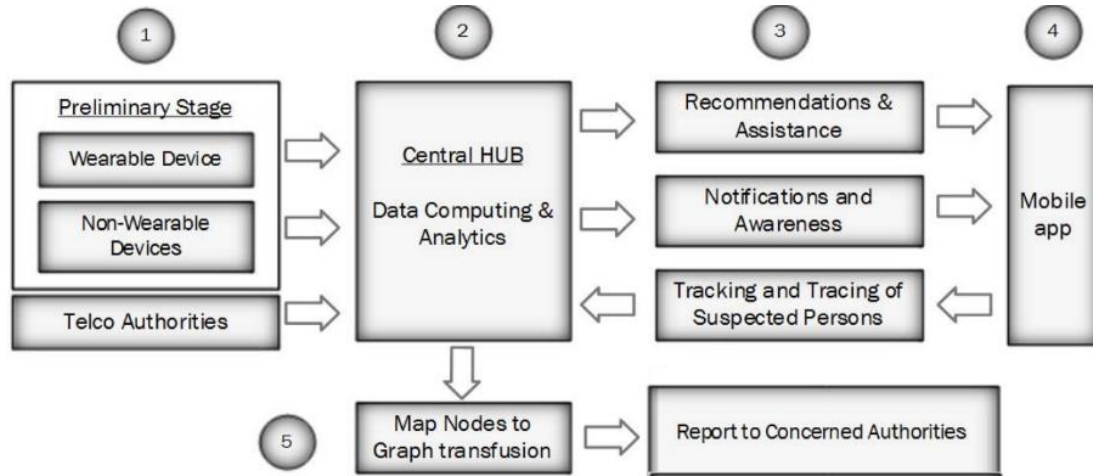


Figure 4. Block diagram of proposed system framework [25]

In [26] this examination zeroed in on the improvement of heartbeat oximetry packs by using IoT innovation as devices that can be utilized to perform remote checking of coronavirus patients through cell phones about concerning physical and social separating conventions. The plan and advancement of versatile heartbeat oximetry unit items that were furnished with global positioning system (GPS) and it is joining with IoT innovation that is large-scale manufacturing is the principal focal point of this exploration because of information got from news, broad communications, and studies in well-being offices (Faskes) in Banyuwangi, the aftereffects of this examination can be finished up. Assurance of the base furthest reaches of disintegrated O₂ levels in the blood that have been done in the research and preliminary stage.

Al-Shalabi [27] introduced a plan and reenactment of the coronavirus symptoms monitoring mechanism (CSMM) in light of IoT and remote sensor organizations to screen individuals during the quarantine; particularly the oldest who experience the ill effects of ongoing sicknesses and safe lack, subsequently they were bound to foster difficult disease. The component relies upon remote observation of the patient well-being information. The observing system should be possible by the specialist or clinical supplier. This framework can be effectively used to distinguish a dire or strange case, for example, when there is a high fever or trouble is relaxing. Thus, the framework can give caution to the specialist or clinical supplier by sending critical SMS including the time and patient condition to mediate and save the patient existence immediately

Singh and Kaur [28], a fog-helped IoT based nature of the administration system was introduced to forestall and safeguard against coronavirus. It gives ongoing handling of clients' well-being information to foresee the coronavirus disease by noticing their side effects and quickly creates a crisis alert, clinical reports, and huge insurances for the client, their watchman as well as specialists/specialists. It gathers delicate data from the emergency clinics/quarantine covers through the patient IoT gadgets for making essential moves/choices. Further, it produces an alarm message to the public authority well-being organizations for controlling the flare-up of persistent disease and for failing rapidly and at opportune as shown in Figure 5.

In [29] proposed fuzzy cloud-based (FCB) coronavirus finding colleague plans to distinguish the patients as affirmed, suspects, or dubious of coronavirus. It classified the patients into four classifications gentle, moderate, serious, or basic as patients were enrolled online on the FCB coronavirus diagnosis assistant (DA) continuously, it makes the information base for something very similar. This information base assists with working on symptomatic precision as it contains the most recent updates from certifiable case information. A group of specialists, specialists, experts were incorporated with the FCB coronavirus DA for better discussion and counteraction. A definitive point of this proposed hypothesis of FCB coronavirus DA is to assume command over the coronavirus pandemic and de-speed up its pace of transmission among the general public as presented in Figure 6 shown.

In [30] the point was to analyze coronavirus before and to work on its therapy by applying clinical innovation, the “Coronavirus Keen Determination and Treatment Aide Program (nCapp)” because of the IoT. Terminal eight capabilities can be executed continuously online correspondence with the “cloud” through the page choice key. As indicated by existing information, surveys, and check results, the determination was consequently created as affirmed, thought, or dubious of 2019 novel COVID (2019nCoV) contamination. It characterizes patients with gentle, moderate, serious, or basic pneumonia. nCapp can likewise lay out a web-based coronavirus constant update data set, and it refreshes the model of determination progressively founded on the most recent certifiable case information to work on indicative exactness.

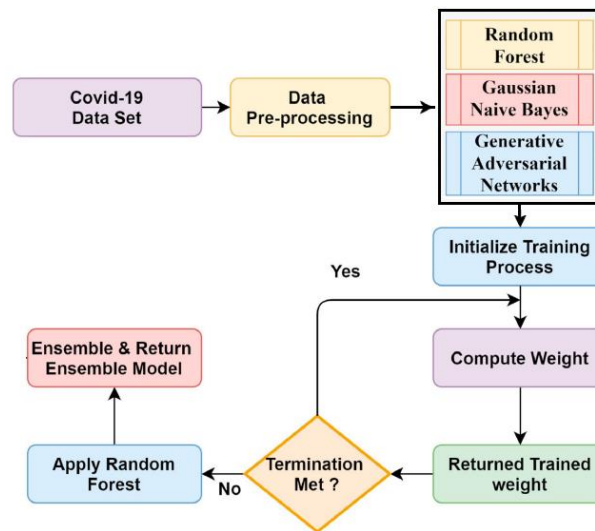


Figure 5. Working of ensemble framework [28]

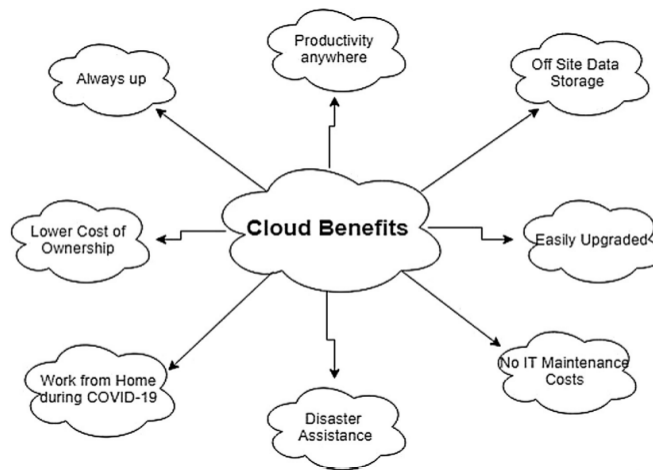


Figure 6. Cloud computing benefits [29]

Karmore *et al.* [31], the emphasis was on fostering a medical diagnosis humanoid (MDH) which was a financially savvy, well-being basic portable mechanical framework that gives a total symptomatic test to check regardless of whether an individual is tainted by coronavirus. How much information was produced inside a period, time expected to prepare a model was saved consistently for 8 hours and dissected by utilizing AI calculations for computing accuracy after the examination of the multitude of variables engaged with the conclusion, for example, internal heat level, pulse, beat rate, breathing rate, blood tests, and X-beam reports, the regular language handling calculation and feebly directed profound learning calculation which makes an investigation of the multitude of elements and identifies regardless of whether the patient is positive for the infection.

The best outcome from transient convolution organizations. The capacity of worldly brain networks recommends that they can make the best forecasts by learning the fleeting setting of info successions. As continuous sensor information was utilized as illustrated in Figure 7.

The work [32] proposes a constant IoT system for early determination of thought coronavirus patients by utilizing group profound exchange learning. Proposed system offers constant correspondence and analysis of coronavirus thought cases. The proposed IoT system outfits four profound learning models InceptionResNetV2, ResNet152V2, VGG16, and DenseNet201. E Clinical sensors were used to acquire the chest X-beam modalities and analyze the contamination by utilizing the profound gathering model put away on the cloud server proposed profound outfit model was contrasted and six notable exchange learning models over the chest X-beam dataset.

A similar examination uncovered that the proposed model can help radiologists to effectively and conveniently analyze the coronavirus through patient's dataset. E dataset is gathered by integrating four different existing datasets. The first dataset is gotten from medical clinics in São Paulo, Brazil. Moreover, two openly accessible tuberculosis datasets of Shenzhen, China, and Montgomery region, USA, are additionally acquired from the U.S. Public Library of Medication National Institutes of Health (NIH). E Shenzhen, the proposed profound group model shows a precision of 99.2%. For the pneumonia class, the general exactness of the proposed profound troupe model is 99.4%. E tuberculosis class has had been gotten precision of 99.1% proposed model accomplishes the incredible by and large characterization with a general exactness of 99.3%. The proposed model was very little impacted by the over fitting issue)

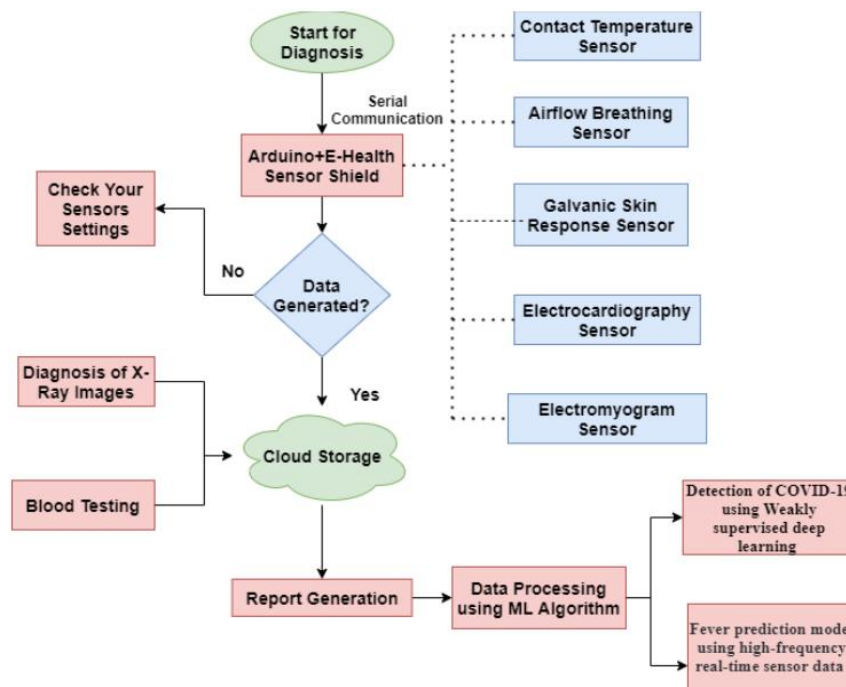


Figure 7. Flowchart representation for working identification and diagnosis system [31]

In [33], The proposed framework encompasses the benefits of IoMT sensors and extensive data analysis and prediction. A framework for dynamic patient monitoring, patient tracking, quick disease diagnosis, remote treatment, and prevention from spreading the virus to others. This work is also discussed the potential challenges faced in adopting and applying big data technologies to combat COVID-19. The findings in this work are illustrated in Figure 8.

Aman *et al.* [34] gives helpful bits of knowledge into explicit IoMT architecture models, arising IoMT applications, IoMT security estimations, and innovation heading that apply to numerous IoMT frameworks inside the clinical climate to battle coronavirus depending on the information assortment given by the Johns Hopkins COVID-19 asset center.

The repetitive brain organization model was the best of the AI strategies utilized in the examination the erroneous determination of a conclusion model for coronavirus can be costly for clinical associations, especially when there is an enormous requirement for a more solid and quick finding model. An adaptable

full inclusion approach assists them with testing and looking at the scope of coronavirus indicative models and choosing the determination of a model that fits the requirements of a well-being establishment and decreases time and cash by involving a thorough system for the determination of ML models as shown in Figure 9.

In [35] on computerized reasoning innovation and IoT stop the infection structure from spreading at the beginning phase. this work, centers on interfacing a few sensors to cooperate as a framework that can find individuals tainted with COVID-19 from a distance, this will diminish the spread of the illness. The proposed framework comprises a few gadgets called savvy clinical sensors, for example, beat, warm checking, and blood sensors. The framework was working consecutively beginning with a heartbeat sensor and finishing with blood sensor including a calculation to deal with the information given by sensors.

This survey [36] is compactly given creative grapheme furthermore its subsidiary based-IoT coordinated electrochemical biosensor for precise and high-level high-throughput testing of SARS-CoV-2 in proof of concept (POC) setting meaning of IoT for coronavirus sickness the board during this pandemic, screening, observing, and finding of coronavirus are the need of great importance. In such a manner, telemedicine or versatile well-being is very much considered to find patients and forestall the quick spreading of COVID-19. In the cutting-edge pattern, cell phones helped POC gadgets exploit cell phones as middle people for handling and communicating signs into computerized and coherent structures. Such POC gadgets created by joining cell phones with biosensors make them cheap, hand-held, furthermore, a wearable that modernizes the analysis also, simplicity of examination and speedy location make the IoT-incorporated electrochemical biosensor quite possibly of the most conspicuous analytic devices for coronavirus the board. Such benefits help in the proficient well-being of the executives during the coronavirus pandemic on a worldwide scale.

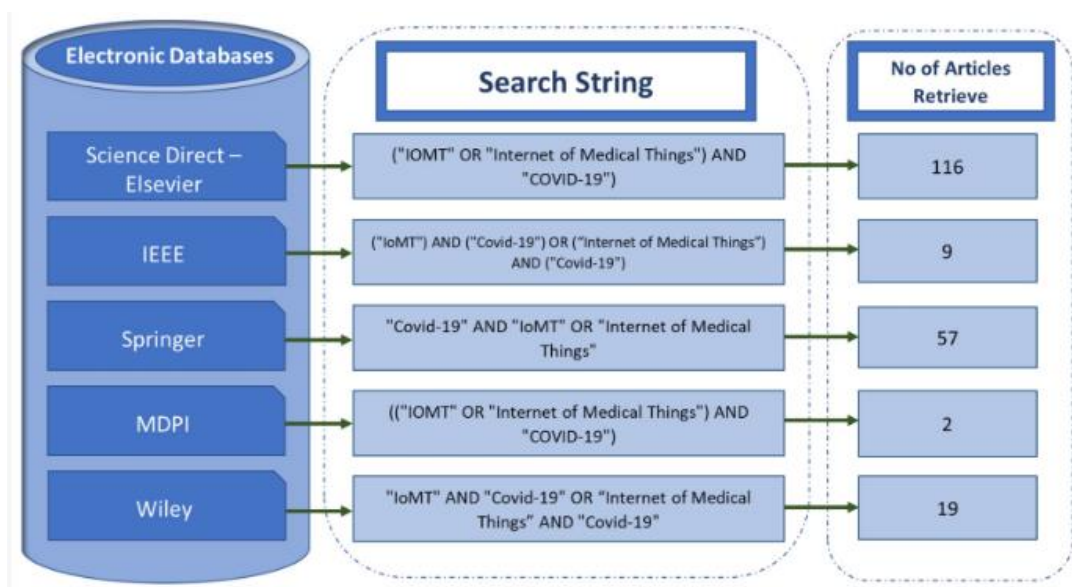


Figure 8. Findings of work in ref [33]

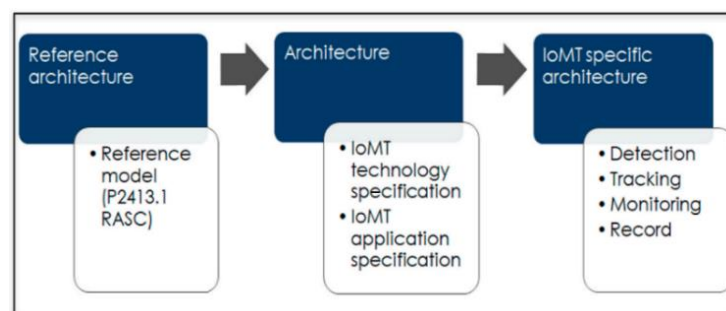


Figure 9. IoMT framework guidance [34]

In [37] presents a high-level IoT-based POC gadget for constant direct opposite record circle interceded isothermal enhancement examination to distinguish SARS-CoV-2. The positive outcomes are gotten utilizing three preliminary arrangements of SARS-CoV-2 with a restriction of identification of 2×10^1 genome duplicates/ μL , and the clinical example of SARS-CoV-2 was effectively dissected with high responsiveness and exactness. The stage could give a high-level sub-atomic demonstrative instrument to test SARS-CoV-2 whenever and anyplace. As per the production convention, an EzWay direct PCR lysis cushion required a high temperature ($95\text{ }^\circ\text{C}$) for 15 min to lyse the infection particles. For the fast on-chip viral location, the lysis time was from 15 to 10 min, and improved the lysis productivity with a high-recurrence vibrator (10,000 RPM) for 30 s each 1 min.

2.3. Other methods to detect COVID-19

Barnawi *et al.* [38], the work was to propose an IoT-unmanned aerial vehicle-based plan to gather crude information utilizing locally available warm sensors. The warm picture caught from the warm camera was utilized to decide the expected individuals in the picture (of the monstrous group in a city), which might have coronavirus, in light of the temperature recorded. An effective mixture approach for a face acknowledgment framework was proposed to distinguish individuals in the picture having high internal heat level from infrared pictures caught in a constant situation. Likewise, a facial covering location conspire was presented, which identifies regardless of whether an individual had a veil on the face.

The plans' exhibition assessment had been utilized utilizing different AI and profound learning classifiers. We utilize the edge registering framework (installed sensors and actuators) for information handling to decrease the reaction time for continuous examination and expectation. The proposed plot had a typical precision of 99.5% involving different execution assessment measurements demonstrating its viable materialness progressively situations this work had been involved the "Marked Countenances in the Wild" dataset in a dataset of face pictures of individuals expected for settling the undertaking of unconstrained face acknowledgment. The dataset involves more than 13,000 pictures of human countenances as shown in Figure 10.

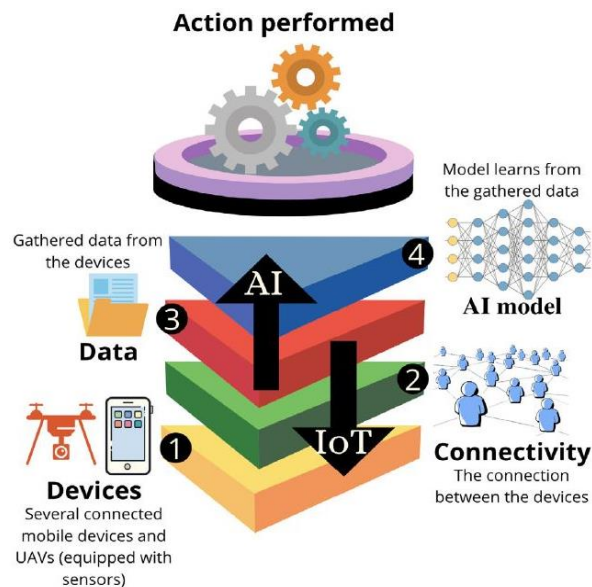


Figure 10. Information flow by the combination of AI and IoT in the proposed work [38]

In [39] the point of this exploration was to order the different hack hints of coronavirus ancient rarities in the signs of changed genuine conditions. The brought model thinks about two significant stages. The initial step was the change stage from sound to picture which is enhanced by the scalogram procedure. The subsequent step includes highlight extraction furthermore, arrangement because of six profound exchange models (GoogleNet, ResNet18, ResNet50, ResNet101, MobileNetv2, and NasNetmobile). The dataset utilized contains thousand four hundred and fifty-seven (seven hundred and fifty-five coronavirus and seven hundred and two solid) wave hack sounds. Although our acknowledgment model plays out the best, its precision just reaches 94.9% because of the study group on data management (SGDM) analyzer.

The results showed that ResNet18 was the steadiest model to group the hack sounds from a restricted dataset with responsiveness of 94.44% and explicitness of 95.37% and a correlation of the examination with a comparative investigation was made. It is seen that the proposed model was more dependable furthermore exact than any ongoing models.

In [40] investigated accessible writing and propose a moral structure for the utilization of advanced innovations fixated on moral practices. The proposed system features the compromises likely jobs and coordination of various partners associated with the turn of events and execution of computerized advancements, from different social and political settings in Zimbabwe. The work was proposed that straightforwardness, customary commitment, and support of potential clients were probably going to help public trust. In any case, the possible infringement of moral qualities, unfortunate correspondence, and hurried execution of advanced advancements will probably subvert public trust, and thusly, risk their reception and adequacy

Chen *et al.* [41] proposes another profound learning calculation for the robotized determination of coronavirus, which just requires a couple of tests for preparation. In particular, this work utilizes contrastive figuring out how to prepare an encoder that can catch expressive component portrayals on enormous and freely accessible lung datasets and embrace the prototypical organization for characterization this work approves the adequacy of the proposed model in examination with other contending techniques on two openly accessible and clarified coronavirus CT datasets. Our outcomes show the unrivaled exhibition of our model for the exact determination of coronavirus in light of chest CT pictures this work assessed our proposed model utilizing two freely accessible explained Coronavirus CT cuts datasets: i) coronavirus CT3 and ii) a dataset given by the Italian Culture of Clinical and Interventional Radiology 4 and preprocessed by MedSeg5. It is worth mentioning that there was no cross-over between coronavirus CT and MegSeg various nations. While isolating the help and inquiry sets for arrangement our model accomplished altogether further developed exhibition while utilizing four shots contrasted and a single shot and beat ResNet-50, however, no undeniable fur-their improvement was seen while utilizing over five shots. These outcomes demonstrate that the pre-prepared encoder caught the highlights from obscure pictures to further develop the order execution.

The study [42] presented a novel unsupervised DL-based variety auto encoder (UDL-VAE) model for coronavirus location furthermore, grouping. The UDL-VAE model included an adaptive wiener filtering (AWF) based preprocessing strategy to improve. Moreover, beginning v4 with the Adagrad method was utilized as a component extractor, furthermore a solo VAE model was applied for the grouping system.ve the picture quality to check the unrivaled indicative exhibition of the UDL-VAE model, a bunch of examinations were completed to feature the powerful result of the UDL-VAE model. The got exploratory qualities exhibited the efficacious aftereffects of the UDL-VAE model with higher precision of 0.987 and 0.992 on the double and different classes separately.

In study [43], digital technologies had played a vital role in fighting SARS-CoV-2 transmission. The health officials succeeded in optimizing and maintaining a strategy to moderate the spread of the virus via different digital technologies, like machine learning, artificial intelligence, and mobile health applications. The work was directed up to September 2021 to document the experience of using digital health technology platforms (DHTPs) in Saudi Arabia. This work is also presents the summarize the experience of optimizing digital health technologies in Saudi Arabia as well as to discuss capabilities and opportunities during and beyond the COVID-19 pandemic. The work is also considered any data or press briefings by the Ministry of Health (MOH) in Saudi Arabia.

In studies [44], [45] an added substance utility presumption-based approach for a multi-criterion decision support system (MCDSS) with an exact assumption for recognized risk factors on specific obvious information boundaries was proposed. And approved experimentally utilizing the standard susceptible-exposed-infected-removed (SEIR) model methodology (vulnerable, uncovered, tainted, and recuperated). The results recollected comparative assessment for even design with beforehand existing ways of managing frame the ability of the proposed approach including the limits, for example: accuracy, review and, f-score.

In [46] clinical benefit conveyance because of the IoT innovation upheld by the haze cloud worldview was an effective and time-delicate answer for far-off quiet reconnaissance, an extensive system because of radio frequency identification device (RFID) and body-wearable sensor advances upheld by the haze cloud stage was proposed for the ID and the executives of coronavirus patients. The J48 choice tree is utilized to survey the disease level of the client because of related side effects. RFID was utilized to distinguish temporal proximity interactions (TPI) among clients. Utilizing TPI evaluation, fleeting organization investigation is utilized to examine and follow the ongoing phase of the coronavirus spread.

The factual exhibition and precision of the structure were surveyed by using artificially produced information for 250,000 clients. Because of the relative examination, the proposed system obtained an upgraded proportion of characterization exactness, and responsiveness of 96.68% and 94.65% separately. Additionally, critical improvement had been enrolled for the proposed haze cloud-based information examination concerning transient defer adequacy, accuracy, and f-measure.

2.4. Machine learning approach

This study [47] applies a better numerical model to examine and foresee the development of the scourge. An ML-based superior model had been applied to foresee the expected danger of coronavirus in nations around the world. This work shows that by involving iterative weighting for fitting summed up reverse Weibull dissemination, a superior fit can be gotten to foster an expectation system. This was conveyed on a distributed computing stage for the more exact and continuous expectations of the development conduct of the scourge. An information-driven approach with higher precision here can be extremely valuable for a proactive reaction from the public authority and residents the dataset utilized for this situation study is our reality in information by [48]. The dataset is refreshed every day from the WHO circumstance reports. More insights concerning the dataset are depicted exhaustively in [48].

In [49] the significant commitments of the paper were as per the following: it audits the work that had been finished utilizing AI for coronavirus analysis, division, and expectation. It presents the utilization of IoT for coronavirus. It features the job of AI for IoT based COVID-19 observing systems. This work will engage the specialists in additional work on developing extra answers to the battle coronavirus. It was observed that ML is a proficient and strong computer-based intelligence innovation that can be utilized for reliable coronavirus location and finding from X-beam and CT pictures and it tends to be a possible technique for conclusion in the radiology office. What is more, ML can be utilized for segmentation and expectation purposes for coronavirus. Besides, ML can uphold drug revelation methods and can diminish clinical disappointments. Difficulties in involving ML for coronavirus to make effective ML frameworks a gigantic plan of data is required involving ML in coronavirus. One of the primary research difficulties of involving DL in conclusion coronavirus is the absence of standard information likewise, the lopsidedness in the dataset tests is another difficult issue as presented in Figure 11.

In [50] the proposed forecast model addresses a hybridized approach between AI, a versatile neuro-fluffy derivation framework and improved bug radio wires search swarm insight metaheuristics. The upgraded insect receiving wires search is used to decide the boundaries of the versatile neuro-fluffy deduction framework and to work on the general execution of the expectation model. The upgraded calculation was tried and approved against a more extensive arrangement of benchmark works and demonstrated that it significantly outflanks unique execution. A short time later, the proposed crossover strategy for coronavirus cases expectation was assessed and then utilized the World Wellbeing Association's true information on the coronavirus flare-up in Chinacks of its unique rendition. The proposed technique had been looked at against a few existing cutting-edge moves that were tried on the equivalent datasets.

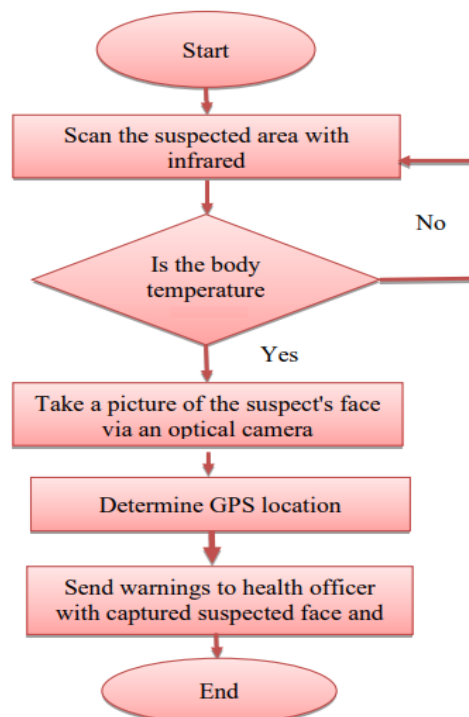


Figure 11. Flowchart of the system [49]

3. CONCLUSION AND FUTURE VISION

As known, COVID-19 is caused a large number of death since has declared an international pandemic in December 2019 and it is spreading all over the world (more than 200 countries). The need for early detection is in high demand because not all the proposed solutions that have been presented had better results. In addition, all models, frameworks, monitoring systems, devices, and ideas (in four sections) have been sufficiently presented with all clarifications and justifications based on time sequence towards managing the challenges. This study is the first to overview and summarizes all ML and IoT models with their data set that have been used for early identification since COVID-19 had announced.




As a future plan, our data have been provided for one million patients from European Commission (EC), this data set will be considered as a data sensor coming to the proposed system. Next step will be the data pre-processing from outliers, then the feature selection to prepare the dominant parameters of COVID-19, which are (cough, fever, sore throat, breath, and headache). Third step is data modeling and visualization. The upcoming work (our team) is working on three methods: XGboost, random forest (RF), and the new logistic regression. After this, evaluation and analysis step.

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