Platforms of IoT for Detection and Diagnosis covid_19 :

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Abstract. As a result of the spread of Coronavirus very quickly. The difficulty of controlling its spread. Moreover, the lack of a specific mechanism to limit the spread of the Coronavirus. The role of the Internet of Things has emerged in the fight against the Corona pandemic. This paper reviews the Internet platform, for things to diagnose and fight Coronavirus that help to control this disease with its sensors as well as various tools. that help to limit its spread also prevent human rapprochement. Furthermore, this paper discusses the most important approaches that assist in diagnosing this disease. In addition to networks, the role of the Internet in dealing with this virus is addressed at the end of this paper.  
Keywords: Internet of Things, 5G Technologies, COVID-19, PON, IoT Application.

1. Introduction

The coronavirus is a virus that affects the respiratory system and is contagious. This virus was first documented in the Chinese city of Wuhan, and it has spread maliciously around the world [1]. The cumulative number of incidents was roughly 96,218,601, including 2,058,534 deaths the number of cases reached 192,282,000 as of June 20, 2020, As reported in [1]. Moreover, the proportion of new cases on 15/01/2021 was approximately 711,218. It has added significant threats to public health since the first occurrence of the Coronavirus in China and its dissemination worldwide as mentioned in [2]. Coronavirus is a disease of high contagion that spreads very rapidly. The general signs include dry cough, tiredness, fever, stuffy nose, sore throat, diarrhea, and flu-like symptoms, which can differ from person to person. While this illness has been survived by many individuals, it is a great threat to the elderly who suffer from chronic diseases as described in [3]. The risk of the Corona virus is very high and it can affect humans and animals as illustrated in [2]. Because of its risk to people's health, it spread very rapidly. its effects are close to the flu, the incubation time lasts about 14 days. Moreover, the recovery duration varies due to the patient's age. it is important to identify the virus in the early stages of infection. The existence of asymptomatic patients who are a cause of risk in their ability to transmit the illness to others very easily is one of the most significant problems that are highly risky such as in [3],[4]. The most significant role played by the use of IoT during the Corona pandemic was to monitor the disease and reduce its dissemination and the risk of damage and infection. The role of the IoT in the field of health care is considered to enhance the quality of treatment, improve health care and assist medical staff. It has a significant role to play in supporting medical staff and compensating for the lack of medical staff in hospitals and remote areas during the Covid-19 period, in addition has a role to play in hospitals and public places, mitigating risky human encounters and leading to disease reduction. the outlines of this paper, section 1 describe IoT platform for covid-19. section 2 Presenting related work. section 3 Illustrating drone technology for IoT in covid-19. section
4 Discussing IoT with pon. section IoT with 5G technologies. section 6 Explaining IoT application for COVID-19. section 7 Defining role of IoT to fight COVID-19. the last section mentions the ongoing IoT study for this pandemic [5].

2. IoT Platform for COVID-19

IoT has become a prevalent news item and the IoT marketing movement has its origins in many previous technologies: such as omnipresent details systems, networks of cameras, and integrated computing. The word IoT machine further. To shape purpose-specific networks, IoT devices are linked together. Most of the complications in the Corona pandemic emerge from inadequate access to the disease, and it is one of the most significant problems facing the battle against this disease and is believed to be the most important vaccine production issue. The use of IoT in the Corona pandemic makes it possible to access patients, thereby treating them more quickly and reducing the dissemination of sickness and human experiences. In this part, we present the most significant IOT studies and analysis in the field of COVID-19 disease identification, diagnosis and control.

Mohammed et al. proposed a system based on smart helmet with IOT technologies was introduced to carry out the process of checking, remote monitoring and reading data in real time. When a high temperature is detected, a picture of the person is taken and the information is sent to a portable device in this study. A thermal camera, an optical camera, and a GSM system [6].

Mohammed et al. proposed presented a wearable system consisting of smart glasses integrated with IO technologies used for crowd control. Equipped with face detection and GPS positioning technology that provides real-time data reading [7].

Malik et al. proposed sensors based on IOT, which is a thermal sensor to know the person’s temperature, as well as a sound sensor to sense the person’s voice if he suffers from abnormal fluctuations and sends an alert to the authorities [8].

Cacovean et al. proposed a bracelet designed with a temperature sensor and a sensor. to track heart rate and also a GPS position sensor, based on IOT technologies. Using the learning machine algorithm, the program predicts individuals suffering from COVID-19 [9].

Singh et al. proposed a wireless isolation Q- band based on the IoT. that helps detect the escape of people under quarantine. The device is fitted with a battery and is wirelessly linked to a mobile app using Bluetooth [10].

At Media Lab, Massuehcest. Scientists at the Institute have developed a technology focused on sensor technologies called face preservation. that helps combat the disease by alerting people who are about to touch their faces. This technology senses the convergence of the face and has two modes Recording mode Warning mode. The recording mode enables users to wake up from the habit of touching the face and the alert alarms them directly through alarm and vibration [11].

Mohammed et al. proposed UAV technology fitted with virtual reality technology. has been used to monitor the process of video scanning using a VR screen. Two types of optical and thermal cameras have been fitted with an updated device. based on GSM technology that gives information to a mobile phone application. The headset has sensors that can detect the position of the head where the user can move his head to control the plane, and it is also controlled through a connected application to create a flight path [12].

Rane et al. proposed A system composed of three subsystems has been developed to detect Coronavirus. the robot system has three main capabilities as instructional capability, decision-making capability of movement capability and scans to decide whether he is infected with Coronavirus, he is not able to enter and if he is not infected, he is allowed to enter the Speaker system [13].

3. Related work

A collection of literary studies by a group of scholars was discussed in this section. They discussed a number of topics and proposed some real alternatives to them. During the Coronavirus phase. That swept the world frighteningly so as quickly. There were also other facets of their research,
including scientific and medical aspects, which could be illustrated by artificial intelligence, deep learning, CNN algorithms, Moreover the use of CT-Scan and X-rays. In addition to other methods.

Nour, M et al. proposed Five convolution layers and three machine learning algorithms are used by a proposed CNN-based method. to detect coronavirus using X-ray) k-nearest neighbour, support vector machine, decision tree Hyperparameter optimization for machine learning models is achieved using Bayesian Optimization Algorithm. The best percentage obtained using SVM, precision was 98.97 percent, sensitivity was 89.39 percent [14].

Toraman, S et al. To detect the coronavirus, a capsule model was suggested. The network was educated using dynamic routing. The activation feature of ReLu was used for all capsule layers. the data here was broken into 9 parts for preparation and 1 section for research. An accuracy of 97.24% was obtained by the model [15].

Chandra, T et al. proposed concept for the automatic identification of Coronavirus using x-rays to identify patients with normal, suspected and COVID-19 infections. The Gray wolf optimization approach was used to select the most important and useful features, to train the model using five supervised classification algorithms, namely decision tree (SVM) (KNN) (NB) and (ANN). The suggested method uses two-phase classification methodology (normal vs. irregular and nCOVID-19 vs. pneumonia) the outcome of phase-1 (ACC = 98.062 percent, AUC = 0.977, and MCC = 0.956) and phase-II (ACC = 91.329 percent, AUC = 0.914 and MCC = 0.831) using the validation collection [16].

Hasan, A et al. proposed research that focused on CT Scan and the LSTM network, is used to identify these chosen characteristics into three groups (COVID-19, pneumonia, and safe), and Q-Deformed Entropy Function 70% of CT scans are used for the training process, and the remaining 30% of CT scans are used to test the final classification output System Accuracy 100%isQDE–DF 99.68 and TP 100% COVID-19 is 100 [17].

Pinter, G et al. proposed hybrid machine learning. to predict the Coronavirus. and hybrid MLP-ICA approach has been developed as a robust hybrid algorithm for generating a platform for predicting the COVID-19 cases and mortality rate in Hungary ICA [18].

Ozturk, T et al. proposed study The Darknet model was used as a system classifier. as it forms the foundation for a real-time object identification system called YOLO. The Dark COVID-19 net model is trained to identify these x-ray images into three groups: COVID-19, Pneumonia, or No-Findings. The model provided a 98.08 percent classification accuracy for binary classes and 87.02 percent for multi-class instances [19].

Toğacar, M et al. proposed study using the Deep Learning The dataset that was used is made up of three groups: COVID-19, pneumonia, and normal. Pre-processing the input images was done using the Fuzzy Color technique and stacking technique. Deep learning models used MobileNetV2 and Squeeze Net SVM was used for classification. The 100% success was achieved in the classification of COVID-19 data, and 99.27% success was achieved in the classification of Normal and Pneumonia images [20].

Jaiswal, A et al. proposed study a chest CT was used. And A DenseNet201 based deep transfer learning as a classifier. This model describes the chest CT-scans accuracy as 99.82%, 96.25%, and 97.4%, respectively [21].

| Study                | Method      | Activities                | Type of Images                 | Accuracy       |
|----------------------|-------------|---------------------------|--------------------------------|----------------|
| Mohammed, M N, et    | Machin learning | Detection and diagnosis  | Thermal and optical            |                |
| M N Mohammed et al.  | Machin learning | Detection and diagnosis  | Thermal and optical            |                |
| Malik, M.,           | Deep learning | Detection and diagnosis   |                                |                |
| Cacovean, D          | Machine learning | Detection and diagnosis  |                                |                |
| Singh, Vibhutesh, et al. |           |                           |                                |                |
| Authors                  | Methodology          | Detection and Diagnosis       | Technology Used                        | Accuracy     |
|-------------------------|----------------------|-------------------------------|----------------------------------------|--------------|
| Mohammed, M, et al.     | Machine learning     | Detection and diagnosis       | Thermal and optical scan               |              |
| Rane, Kantilal P        | CNN                  | Detection COVID-19            | X-ray images                           | 98.97 %      |
| Nour, M., Cömert        | Convolutional capsnet| Detection and diagnosis       | X-ray images                           | 79.24 %      |
| Toraman, S, Alakus      | Majority vote        | Detection and diagnosis       | X-ray images                           | 98.062 %     |
| Hasan, A M              | Deep learning & QDE  | Detection and diagnosis       | CT Scan                                | 99.68 %      |
| Pinter, G, Felde        | Hybrid Machine learning | Prediction of covid-19          |                                        |              |
| Ozturk, T, Talo         | Darknet              | Diagnosis                      | X-ray images                           | 98.08 %      |
| Toğaçar, M, Ergen       | Deep learning        | Detection and diagnosis       | X-ray images                           | 99.27 %      |
| Jaiswal, A, Gianchandani| Deep learning        | Detection and diagnosis       | CT Scan                                | 99.82 %      |

In this research paper, we focus on the platform that we will provide to detect Covid-19. We will create an IoT-based system that is based on Machine Learning. Using the thermal camera sensor to measure the temperature from long distances. In addition, the system contains a hand detection that measures the heart rate and oxygen. Which helps make a preliminary diagnosis of covid-19.

**4. Drone Technology for IoT in COVID-19**

The use of drones during the Coronavirus pandemic contributes greatly to minimizing human contact, and also plays an important part in remote crowd monitoring. Around 100 drones were deployed in China to track crowds as well as to recognize persons who do not wear masks. They may also be used to broadcast audio to warn persons to return to their homes to avoid the dissemination of the disease, and to quarantine them. It has been used to calculate social distances, produce control room statistics, analyze data, and remotely take thermal images of individuals as stated in [22],[23].

**5. IoT with PON in COVID-19**

Access to COVID-19 patients is one of the most important problems in the Coronavirus pandemic. With IoT with PON, it became possible and easy to reach patients and send their information directly. As it is considered one of the most powerful tools that allow the exchange of information from the patient and service providers. Provides automated transfer of data across the network either for people's monitoring or recording events or an automatic device. During the conflict with the COVID-19 pandemic, one of the important problems facing us is to provide data security to protect privacy, because it is really important for the patient and whether or not this information can be secure as mentioned in [24] (see figure 1).

**6. IoT with 5G Technologies**
As the Internet of Things is an integrated network of computers, the efficiency of this network is thus highly dependent on network and communication technologies. IoT networks have evolved enormously with the passing of time, so that 4G and 3G cannot keep pace with this massive proliferation of IoT devices and the growing number of devices, nor can they have smooth communication and protection. The biggest problem during the Corona pandemic was to classify, locate, track and control the sick. Moreover, that the conventional communication system was unable to handle the huge flow of information produced in the IoT devices. during the Coronavirus pandemic, 5G technology has become one of the world's most successful innovations and can work to help IoT technologies run more successfully throughout (see figure 2). the Coronavirus timeframe to have a quicker and easier delivery. 5G technology will also be used to create an effective system for remote casualty control. Via the mMTC service, 5G allows for direct network convergence with heterogeneous IoT applications. without extra IoT gateways or WiFi. It also has a 10x battery life. Since remote patients control necessitates the integration of a variety of low-power equipment. 5G networks may be used to provide an efficient online patient management infrastructure. as mentioned in [25],[26],[27].

Figure 1. IoT with pon in COVID-19

Figure 2. IoT with 5G Technologies

7. IoT Application to Fight COVID-19

The IoT's integrated nature has made it a suitable network for medical applications. in terms of tracking and monitoring patients and delivering real-time information, especially in the sense of the Coronavirus pandemic. For remote tracking, diagnosis, and other things. IoT is used. It is used for careful monitoring, glucose measurement, heart rate, and respiratory rate monitoring. Table 2, Below is an illustration of the use of IoT for various applications as mentioned in [28],[29],[30],[31],[32].

Table 2. Respiratory rate monitoring of the use of IoT for various applications table.

| Application                                | Description                                      |
|--------------------------------------------|--------------------------------------------------|
| Internet of Health Things and Digital Telehealth | Remote patient monitoring.                      |
| IoT enabled ambulances                      | Helping the medical staff and providing medical procedures. |
| Smart health monitoring gadgets             | It is used for health and clinical self-monitoring |
| Rapid COVID-19 screening                   | Proper diagnosis is allowed automatically when cases are first identified. For example, from an interconnected smart network and connected devices. |
| Automated treatment process                | IoT deployment will increase the effective handling of cases by means of Phase of automation. |
| Internet base hospital system              | The usage of IoT to strengthen the war against the pandemic of COVID-19 Full network incorporation within the premises of the hospital includes. |
Accurate forecasting of virus

The use of certain predictive approaches will also help forecast the situation in the coming period on the basis of the available data study. Oh, moments. It would also help to prepare for a healthier working atmosphere for the community, clinicians, academicians, etc.

8. Role of AI to fight COVID-19

Artificial intelligence is considered one of the most important methods in confronting the Corona pandemic, with its capacity to detect and forecast. With e CT imagery, its algorithms were used in addition to its use of prediction used to monitor Covid-19 disease through time and space. manifestations of COVID-19 to diagnose infection and accelerate the function of doctors as well as with Chest X-ray Image and its predictions. obtained a high rate of accuracy in predicting and diagnosing the Coronavirus. also, During crowd management and thermal scanning work with them in public areas. Moreover, establishing social distance controls. it also plays a significant role in the development of vaccines and treatments. not just in the process of Coronavirus, although it has contributed to different diseases as stated in [33],[34],[35],[36],[37].

9. Ongoing IoT Study to Overcome the Problems of COVID-19

9.1. Empowering and implementing steps of social distancing by the use of smart cities and the related IT services

A secure networking unit, cloud data storage, and billing, advanced computers, a mobile computing platform, and smart users are included in the IT infrastructure for smart cities. There are many smart devices that support Bluetooth technology. that helps interpret data during the Corona pandemic, such as smartwatches, smartphones, and GPS tracking devices, as well as data analysis and measuring the social gap, as well as face cover, whether there is or not as stated in [38],[11].

9.2. Internet of Medical Things (IoMT) for remote patient surveillance

One of the Internet of Things cases that is meant for medicinal uses is IoMT. It benefits both medical staff and patients with diagnosis and remote control, and decreases the number of medical visits. It helps greatly with the continuous monitoring of isolated individuals with low medical bills. The IoMT concept addresses remote monitoring concerns. that cause patient inconvenience by using small and compact sensors etc as mentioned in [39],[11].

9.3. Methods focused on smartphones for infection detection

As an alternative to well-known methods such as X-ray and CT. for detecting Coronavirus. a device using smartphone sensors is proposed A large range of sensors, such as temperature, proximity, adhesion, and sound sensors, can be fitted with smartphones as mentioned in [40],[11].

10. CONCLUSION

With the emergence of the Corona epidemic in the world, a challenge to health organizations in the world, as well as the difficulty of controlling it, opening the way for the Internet of Things to fight the Coronavirus. as it consists of a wide network of connected devices that gave it strength in the field of medical applications. by reducing time and effort and compensating for the lack of doctors in hospitals, especially during the Corona epidemic. this paper reviews the role of the Internet of things in combating the virus. especially during the quarantine period, providing assistance to the medical staff, preventing the spread of the virus and contributing to the diagnosis of the disease. as well as the various technologies that have been adopted to diagnose the Coronavirus, and the role of networks and the fifth generation, And the various applications used to combat it. Coronavirus pandemic. The article also explains the speed of information flow using the Internet of Things, which limits human contact, and remote monitoring of patients and thus limits the spread of the virus.
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