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Design of an intelligent prevention and control platform for major public health emergencies based on a new generation of information technology

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Abstract: As the COVID-19 has spread over the globe and become a pandemic authority, it has relied heavily on social isolation as a primary strategy for containment. When individuals are confined to their homes, digital technology plays a critical role in supporting their social, professional, and economic activities. There is a pressing need for contemporary healthcare facilities, particularly in developing nations where rural locations have lack high-quality hospitals and medical professionals. For the upcoming years, public health, human civilization, and the global economy will continue to be impacted by this unique coronavirus. Due to the Internet of Things (IoT) health care and automation services, people's health and satisfaction can be preserved when they remain socially isolated. In this paper, the COVID-19 prevention and control using the Internet of Things (CPC-IoT) platform has been suggested to enable social distance in the pandemic. The most crucial metrics for critical care are body temperature, pulse rate, and oxygen saturation, and this research proposes an IoT-based system that uses these variables in real-time. Using the suggested IoT architecture, we offer a short- and long-term approach for managing pandemic situations. Each architectural layer's concerns have been addressed by providing guidelines for design implementation. Covid-19 can be prevented and controlled utilizing an IoT platform that includes symptom diagnosis and quarantine monitoring steps. Compared to other commercially available devices, the system's results are confirmed to be accurate. IoT-based technologies can be useful in the event of a COVID-19 viral epidemic.

1. Introduction

Severe Acute Respiratory Syndrome (SARS)-coronavirus 2 is the cause of Coronavirus disease 2019 [1]. The unmet vaccine and the lack of pharmacological therapy for COVID-19 have contributed to a gloomy outlook [2]. SARS-CoV-2 immunity and nonpharmaceutical interventions (NPIs) such as contact tracing, quarantine, and social distancing are critical for controlling the spread of COVID-19 [3]. SARS-CoV-2 immunity has a short lifetime, requiring more longitudinal investigations to provide light on the subject. Coronaviruses can be re-infected, even though protection against other coronaviruses decreases with time [4, 5]. Immunity to SARS-CoV-2 can perhaps be temporary rather than permanent. If the immunity to SARS-CoV-2 is not long-lasting, it is expected that COVID-19 outbreaks will often occur [6, 7]. SARS-CoV-2 can continue to spread for years even if it is a permanent condition [8].

IoT is revolutionizing contemporary healthcare, bringing new opportunities in technology, economics, and society at large [9]. Healthcare systems are being restructured to diagnose, treat, and monitor more individually [10]. Increasingly, the Internet of Things (IoT) is playing an important role in healthcare, where it can help save costs while enhancing service levels and the overall patient experience [11]. The IoT is a network of interconnected electronic devices that can interact across a wired or wireless network [12]. The sensors, which are connected to this global network, can provide us with data. Near-field communication and wireless sensor networks are only two technologies used in the IoT. Wireless sensor networks gather data from the environment and transmit it to the base station. Smart dustbins, environmental monitoring systems, irrigation systems based on IoT, smart healthcare systems, and traffic management systems are just a few examples of IoT's many applications.

The IoT provides health-monitoring devices to the healthcare industry. Sensors in IoT devices allow for health data collection. Health care is a system that promotes health and aids in treating and preventing illness. The Internet of Things (IoT) includes wireless systems that connect sensors and apps to patients, and information is collected and transferred to a doctor or specialist through an expert system for analysis. It is possible to remotely access medical equipment for the Internet of things, where sensors, actuators, and other communication devices are linked to the Internet. The intelligent system transmits the patient's data and information to a central location for analysis through a secure cloud-based platform.

In this paper, the IoT platform is the chosen method for accomplishing this because of its ubiquitous sensors and seamless communication. Smart healthcare, smart homes, and smart cities are just a few of the ways IoT is making our lives easier and more intelligent. Using the Internet of Things (IoT) to prevent and control epidemics is discussed in this study. A medical decision-support system is used to gather and analyze data from a patient. As a low-cost alternative for persons in rural places, this device can be used to determine whether they have a major health concern and contact nearby hospitals for treatment. An evaluation of the proposed system has shown that it's both effective and intelligent enough to provide health care.

• IoT-based technologies can be used to monitor and manage COVID-19 throughout the early stages of the disease, quarantine, and recovery. This study's goal is to examine the use of IoT-based technologies in COVID-19 tracking and control.

• Consequently, infected people will get better medical care if diagnosed and treated early.

• Locking down sick persons and quarantining those confirmed or suspected of having COVID-19 can help reduce the number of infections.

• Patients with COVID-19 who have recovered should be monitored for any return of symptoms or signs of infection.

The remainder of the CPC-IoT platform can be arranged accordingly. Section 2 describes the related study of public health emergencies. A summary of the planned study is provided in section 3, and results are presented in tabular form in section 4. Finally, in section 5, the study's findings and observations are discussed in great depth.

2. Related work

The World Health Organization had declared coronavirus illness a pandemic because of the disease's clinical severity, fast spread, and associated human losses. Recent advancements, particularly those using artificial intelligence models (AIM), have substantially enhanced the traditional epidemiological techniques. Using AI-based model systems might enhance disease detection in populations and forecasts of outbreaks in diverse geographic regions. The Covid-19 epidemic provides an excellent opportunity to examine the potential uses of AI model systems in healthcare settings and less in monitoring health. COVID-19 had a global effect and was a top cause of mortality in certain nations. These statistics might have been affected by underlying factors, such as Social Determinants of Health (SDoH). The Urban Population Health Observatory (UPHO) system was a web-based platform that links categorized group-level SDoH indicators to individual levels and accumulated population health data. The UPHO supports public health groups and policymakers in reducing health inequalities, achieving health equality, and improving the health of the city's people and less in responding to public health emergencies.

The worst public health disaster in human history, the Coronavirus Disease (COVID-19) pandemic, could be combated with the use of Integration of digital technologies (IDT) and public health (or digital healthcare). This study undertook a thorough and complete analysis of digital healthcare to understand better how to prevent the pandemic of COVID-19 and had less delay prediction. According to the findings, the COVID-19 pandemic had stimulated research into the Integration of digital technology and health care. Finally, this research explores the potential uses of digital healthcare in the long term. When used with other approaches, the Internet of Medical Things (IoMT) had helped several nations contain the spread of COVID-19, enhance the safety of front-line workers, boost effectiveness by reducing the disease's impact on human lives, and reduce death rates. Thus, this study focuses on the IoMT architecture, applications, technologies, and security advancements in the fight against COVID-19. As a result of this research, the medical community now understands how to tackle COVID-19 by using IoMT architectural models, new applications, security metrics, and less data transmission ratio.

The rapid spread of new coronavirus pneumonia (COVID-19) showed the inadequacies in medical resource allocation and response to significant public health crises. Decentralization and non-tampering were characteristics of blockchain technology (BCT), a vital aspect of the information technology infrastructure. It was possible to achieve medical resource sharing through a system that stores, circulates, monitors, and protects resources. Using blockchain technology to build a medical resource-sharing system would make sharing medical resources easier, reduce resource inequalities across areas, and less in the identification of COVID 19. This study has been suggested increasing smart healthcare monitoring systems, using IoT to respond to public health emergencies, delay prediction transmission, and identify COVID-19 ratios.

3. Proposed method: COVID-19 prevention and control using the Internet of Things platform

The level of global mobilization to combat COVID-19's health effects has been amazing, and more work needs to be done. The spread of the illness in poor and middle-income nations can be slowed by international support. Additionally, it can concentrate on generating and disseminating information about possible solutions and promoting best practices in the emergency response effort. An IoT-based monitoring architecture that can assist health care providers in obtaining relevant data during the current COVID-19 epidemic. In addition, a prototype system is created and tested out.

Physical objects can be linked to the Internet through IoT, delivering and receiving data over the network. Embedded and real-time analysis, sensor technology, machine learning, and other IoT components have all influenced the development of the IoT idea. Smart hospitals and other equipment are controlled by fixed or wireless Internet, and smart gadgets can capture and share data to complete the work at hand. Connected healthcare and smart cities are just two examples of how the Internet of Things expands its reach. Medical IoT relies on a wide range of sensors, medical equipment, AI, diagnostics, and high-resolution imaging technologies. In both old and modern industries and communities, these gadgets boost productivity and quality of life.

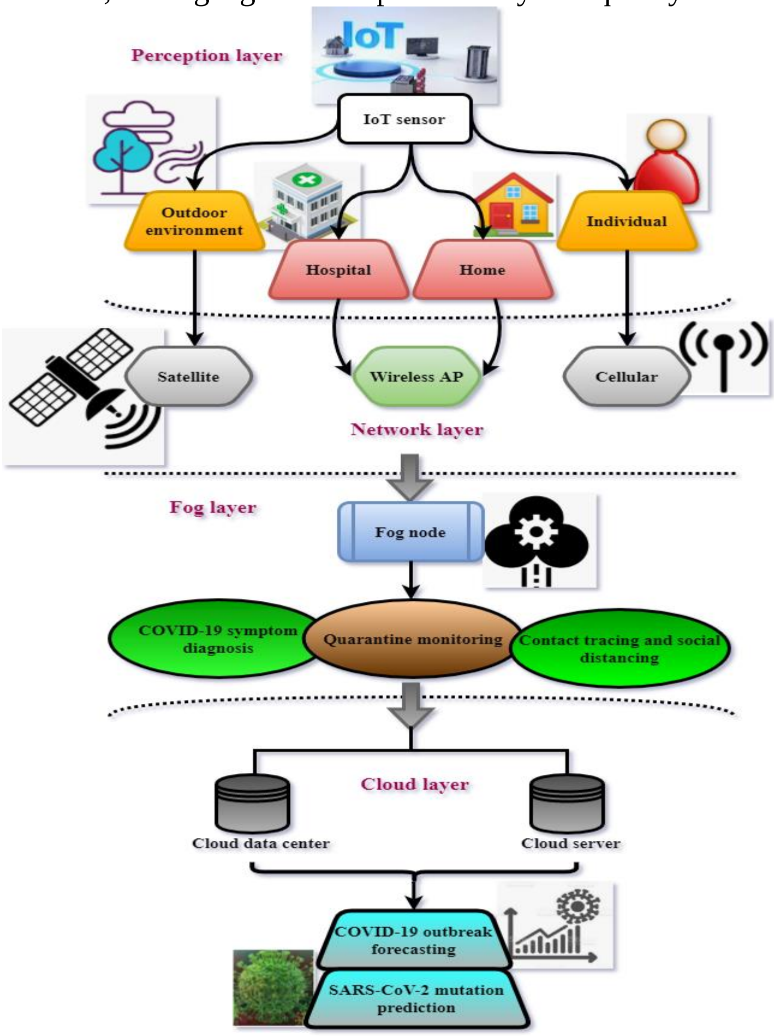

Figure 1: COVID-19 prevention and control using the Internet of Things platform

Figure 1 shows the COVID-19 prevention and control using the Internet of Things platform. There are a variety of devices in the perception layer that collect information about the immediate surroundings and the people inside it. Data collection at the perception layer is described using standard IoT devices. Non-clinical healthcare and human activity detection are popular applications for these IoT sensors. The camera is an essential sensor in mobile devices and IoT systems. Inertial sensors, which include accelerometers and gyroscopes, can be found in mobile and wearable devices and automobiles. IoT devices use magnetometers to sense magnetic fields along three perpendicular axes. For the most part, microphones are just sound sensors that record and analyze ambient noise. IoT devices frequently use microphones with micro-electromechanical systems (MEMS) because of their small size/thickness and good SNR.

The received signal strength indicator (RSSI) can fingerprint diverse human activities when individuals engage in various activities in a WiFi environment. mmWave radar can be used to provide non-invasive and non-contact sensing. A radio signal can identify a specific target using

RFID, a wireless communication technology. The perception layer sends data and instructions to the rest of the platform through the network layer. 4G/5G cellular networks, WiFi, and satellite networks are examples of public or private networks that convey information. Fog computing has lower data processing latency than cloud computing since it is placed adjacent to the IoT sensors at the edge networks.

As part of the health data exchange Z_{K-1}, an Internet of Things (IoT) access control Z_{K^+} is identified and authorized users M^S are able to obtain information through authentication is defined as,

$$Z_{K-1} = Z_{K^+}[M^S K + \sigma K]^{-1} M^S g \tag{1}$$

As exposed in equation (1), the desired healthcare transportation data K has been obtained. It is possible to detect safe health information σ and malware using wireless sensor g, which does not need a model.

The data from IoT devices are sent to the associated fog node in the fog layer and analyzed in real-time. For example, fog nodes can be embedded servers or routers, providing computation, storage, and network communication. Low-end and decentralized devices are used to infer its location and monitor the underlying IoT devices to achieve mobility. COVID-19 Symptom Diagnosis, Quarantine Monitoring, and Contact Tracing & Social Distancing can be integrated into the fog layer due to Fog Computing's low latency and portable support. The central server or data center in cloud computing can handle and store large amounts of data. Complex event prediction is one of the responsibilities of the cloud layer since the fog layer is unable to handle it. This layer includes two more NPIs, COVID19 Breakout Forecasting, and SARS-CoV-2 Mutations Tracking.

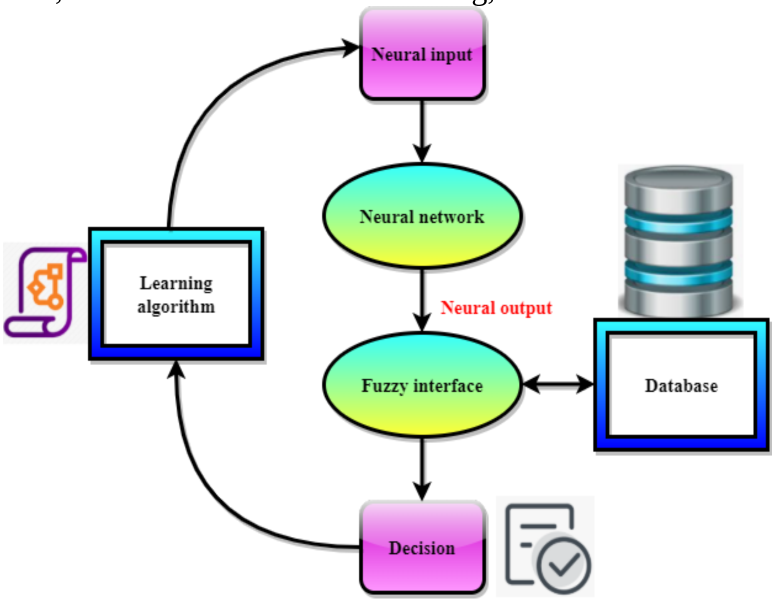

Figure 2: Smart healthcare monitoring using fuzzy logic

Fig 2 shows the smart healthcare monitoring using fuzzy logic. The IoT can deploy a device in a remote hospital as part of the proposed system. The device can communicate data from the patient's heart rate, temperature, and blood pressure to the appropriate doctor in the hospital, and this should accept these data as input. The doctor can use the data to evaluate the patient's health and tell the remote area clinic team the required actions to ensure the patient receives the best possible care. Body temperature, pulse rate, and heartbeat sensors make up the system. An Arduino board connects these three sensors to gather and organize patient data. Communication and networking devices handle the transport of data. Decision-making skills are given by data analytics using fuzzy logic in this system. Using the doctor's view, healthcare personnel can keep an eye on and engage with patients from any location.

The fuzzy system alerts the doctor when a choice is made on a patient's medical condition or therapy. The whole process has been programmed to run on autopilot. The logic of decision-making is secondary to the perception of patterns by neural networks. Inference rules are challenging because they need previous information, and fuzzy logic systems effectively describe how decisions are formed. The fuzzy neural network is created because of these restrictions. Fuzzy systems get their rules from patterns in neural networks. Data from the neural network's outputs help decision-making and learning algorithms in the device's database.

As a consequence of the propagation technique used to acquire the data in neural networks, the process is slow. It is tough to include particular data into the neural network to understand learning procedures better. Fuzzy rules are described, and fuzzy systems are employed in constrained systems where acquiring information is difficult to improve performance. Fuzzy rules derived from numerical data solve these challenges in solution design.

Modification modules t that are stochastic in nature increase control and response PHE with $w'(s)$ fuzzy components and the predicted probability regarding choices $w(s)$, and then generates the final product is defined as,

$$w'(s) = t(w(s), b[s, s-1]) \tag{2}$$

As exposed in equation (2), confidence gained through fuzzy inference is represented by the neural system's discovery of the $b[s, s-1]$ operation.

Each veiled unit u_1 is a remarkable repetitive task u_2 that communicates with the end standard net is stated as

$$net = b_1 + b_2 \quad = u_1 d_1 + u_2 d_2 \tag{3}$$

The neuron uses its exchange work g, which can be a sigmoid functional z, to determine the output is given as,

$$z = g(net) \quad = g(u_1 d_1 + u_2 d_2) \tag{4}$$

As exposed in equations (3) and (4), when a variation b_1 in load occurs, a support mechanism b_2 is used to monitor system states d_1 and evaluate d_2 action states.

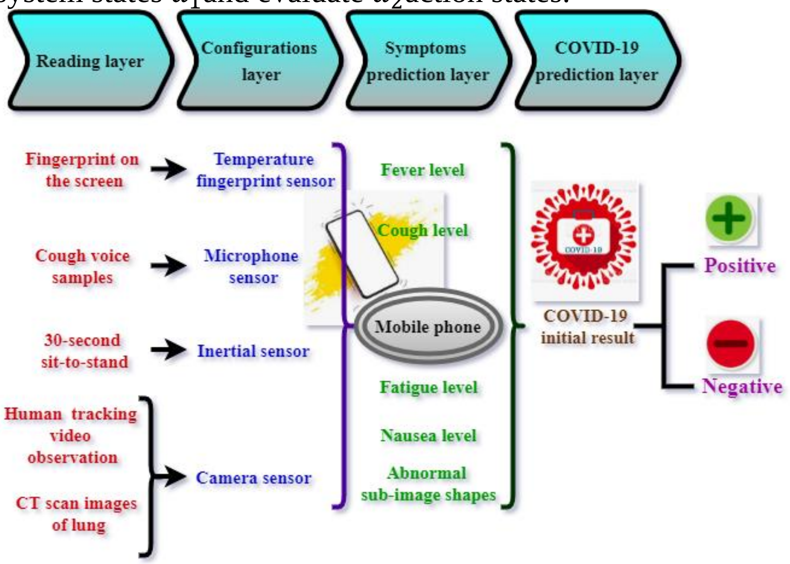

Figure 3: Mobile detection of COVID-19

Fig 3 shows the mobile detection of COVID-19. Diagnosed with a coronavirus infection or exposed to the virus, they are quarantined in a health care facility. Their health should be monitored for further evaluation and potential treatment, in addition to keeping them isolated from others. Medical professionals monitor patients' vital signs and physical activities in quarantine procedures. There are serious medical personnel and facilities shortages due to the epidemic. In addition, the monitoring of the contact points causes a headache. Smartphone-microphone chipsets have been investigated extensively to identify the sort of cough.

The first layer's functionality reads the sensors' data. Smartphone cameras can be used to read CT scan pictures, video clips, and inertial sensors (accelerometer sensors) and collect voice measures during coughs. Ultimately, scan the temperature sensor readings when a user touches the phone screen with their finger. Using the second layer, people can adjust the reading intervals of the smartphone sensors, the image size and buffer size, the time resolution, and other features. In addition, the smartphone application uses the measurements and setups as input for the symptoms algorithms. The determined symptoms level is provided in the third tier of the framework and is then recorded as a record input to the next layer. The COVID-19 will be predicted using ML approaches as the last layer. Various IoT methods could be employed, depending on the collected data. For example, CNN can detect abnormalities in CT scan images in the sub-images.

There is a considerable risk factor for infection among nursing personnel outlined in the suggested framework. Because of this, quarantine surveillance should be conducted at home during the pandemic. Quarantined people can not adhere to the restrictions, and their health cannot be checked by medical professionals or equipment at home. Several academics are looking into Internet of Things (IoT) improvements to enable remote smart healthcare, which performs autonomous surveillance of human activities and real-time monitoring of health in residential settings to address this issue. Different individuals are affected by COVID-19 in various ways. Hospitalization is seldom required for mild to severe cases of sickness. Some of the most frequent signs and symptoms are high fever, cough, exhaustion, and an inability to smell or taste.

Automotive devices $F(z)$can play to predict delay and important role in human health care S due to the Internet of Things (or IoT) is given as

$$F(z) = (F_1(z), F_2(z), \dots F_K(z))^S \tag{5}$$

As exposed in equation (5), wearable sensors, accessible remote healthcare systems, wireless communications, and expert systems are all employed in wireless health monitoring systems$F_K(z)$.

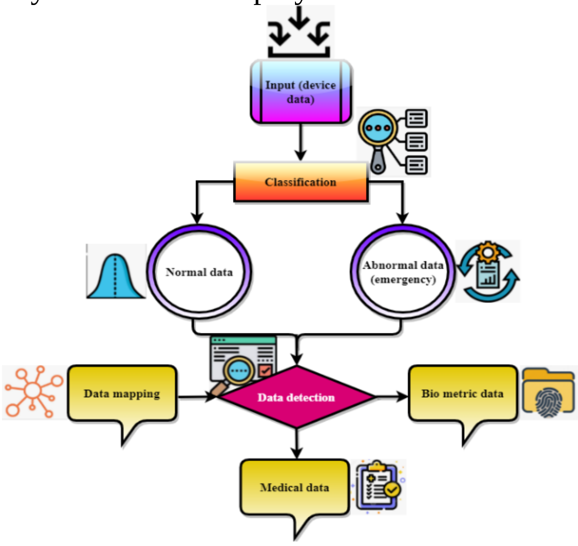

Figure 4: The strategy of detecting data

With RFID technology integrated into a wireless sensor network (WSN), long-range, low-power consumption, and low-cost patient monitoring are all possible. Smartphone cameras and inertial sensors are used to monitor the motions of people. It uses a microphone to collect acoustic impulses and a fingerprint sensor to determine the temperature of the patient's body. A machine learning algorithm is used to predict COVID-19 based on sensor data. The suggested IoT-based architecture for COVID-19 monitoring is an affordable option. In addition, a high-definition camera on a drone can be used to monitor quarantine zones outside.

Fig 4 shows the strategy of detecting data. A sensor gathers the information that monitors the data's current status and distinguishes between normal and abnormal states. Using fog nodes in the Internet of Things (IoT), continuous monitoring of healthcare conditions is suggested. Messages σ are sent to the patient's mobile phone to check the patient's physical status, and the appropriate action is taken as a result. The data in low-cost healthcare monitoring A can be detected quickly by using the following equation.

$$A = \left(\frac{u' - d_0}{v'/n_k}\right) * \prod_{\sigma}\left(n_0 - \frac{\gamma}{s_k * d_k}\right) + b_k - n_k(d_0) \tag{6}$$

As exposed in equation (6), the many components of patient healthcare system are analyzed in the above equation, where the detection is accomplished. It can be used to distinguish between normal $\left(\frac{u'-d_0}{v'/n_k}\right)$and aberrant data$b_k$. For each computing stage, the mapping is done, and it's done on time. Using the fog node$n_k(d_0)$, which is identified as$\left(n_0 - \frac{\gamma}{s_k * d_k}\right)$, data is sent to the patient for review and possible transmission.

Reliable estimation of the data condition status in the IoT environment and feedback is provided in the detection process. Data are sensed, and the identification detects normal and abnormal states. Detection is not transmitted if it is normal. A warning is provided to help the patient's condition if aberrant data is found. It depends on when the identification is completed. The following equation is used to evaluate biometric and medical observational data based on low-cost healthcare data's continuous monitoring and feedback.

Reliable estimation of the data condition status in the IoT environment and feedback is provided in the detection process. Data are sensed, and normal and abnormal states are detected by the identification, indicated as w. Detection is not transmitted if it is normal. A warning is provided to help the patient's condition if aberrant data is found. It depends on when the identification is completed. The following equation can be used to assess the evaluation of biometric and medical observational data and is based on the continuous monitoring and reporting of low-cost healthcare data m'.

$$w = \left\{ \overbrace{u'(d_k) + d_0 * \left(\frac{g_d + q_b}{n_k}\right) + z_k}^{m\prime} \middle| \overbrace{\sum_{z\prime}(n_0 + g_d) * \left(\frac{k_0}{\gamma} + z_k\right)}^{s_0} \right\} \tag{7}$$

As exposed in equation (7), depending on the data's nature, the sensor$u'(d_k)$ collects different biometric and medical observation data. Another patient's fingerprint, eyelid, and body detection condition are all included in biometric data. Medical observation data$\left(\frac{g_d+q_b}{n_k}\right)$, on the other hand, is based on the patient's ECGd_0 and other data. The biometric that was acquired at the moment of sense represents the initial derivationz_k of the formula. s_0 is the medical observing system, which uses the fog node to collect fluctuating data and identify the timeline of data indicated as$\left(\frac{k_0}{\gamma} + z_k\right)$. Biometric and medial observation are used to define the data and send it on time to the fog nodes, which is represented as$\sum_{z'}(n_0 + g_d)$. The patient's condition is recognized, and the equation above defines the types of data acquired during this processing.

Figure 5: The use of IoT for pandemic effect management in COVID-19

Figure 5 shows the use of IoT for pandemic effect management in COVID-19. The pandemic scenario has necessitated the usage of IoT networks in a wide range of applications, both current and prospective. As a consequence of COVID-19, a list of the most frequently used or anticipated applications has been provided. Smart helmets based on IoT have been suggested to replace time-consuming infrared thermometers for detecting fever among persons entering public areas since the emergence of COVID-19. Body Area Networks (BAN) have traditionally provided patients with remote health monitoring capabilities. Implanted, wearable, or ambient sensors have been used worldwide to monitor and transmit physiological characteristics to distant locations. The quarantine of persons, especially those with travel history, can be made easier using IoT and mobile applications.

Smartphones and IoT gadgets equipped with GPS trackers allow authorities to monitor the movements of patients and suspected criminals, allowing for more effective policing. IoT devices in the healthcare industry have been hailed to reduce treatment costs by allowing for early identification and prevention of disease. To prevent the transmission of viruses, the cleaning of the facilities is a vital activity that must be automated. Pandemics can be kept under control to a significant extent by cleaning and disinfecting the locations where the infected people are being accommodated. A person can be a carrier of the virus even before showing symptoms such as fever or a dry cough, making contact tracing essential in the fight against the spread of COVID-19.

In the Internet of Things (IoT) healthcare system, patients are connected to wireless networks to identify the COVID-19 through which various applications and sensors collect dataB_k, which is then transmitted to a doctor or specialist through an expert system w is described as,

$$w = \frac{\sum_{k=1}^{N} B_k}{\sum_{k=1}^{N} q_k} \tag{8}$$

As exposed in equation (8), patient data$N$ are sent through a gateway to a secure cloud-based platformq_k where they can be evaluated and interpreted.

People can place orders for goods and medications without having any physical contact with vendors using an IoT architecture developed. Simple IoT devices can be used to keep workers safe in the workplace. Examples include smartphone applications that remind people to wash their hands, wearable technologies that prohibit people from touching their faces, and range sensors that keep people at a safe distance in public spaces such as the restroom or cafeteria. Energy suppliers can charge people while keeping a safe distance from their personnel and people by using smart meters. People's way of life all around the globe has been drastically altered by COVID-19, which has serious consequences for the health of people and families. The proposed method enhances the smart healthcare monitoring system, using IoT to respond to public health emergencies, delay prediction, transmission, and identification of COVID-19 ratios.

4. Simulation outcome

The impact of the COVID-19 epidemic on people's daily lives has been profound. There has been a massive strain on the health systems of both industrialized and developing nations due to vaccination delays. Most nations' GDP percentages have dropped precipitously after the COVID-19 has been implemented. This means that it is critical to raise economic output, dependent on population recovery, to its pre-crisis level. Most countries have made cooperative efforts to develop, and the vaccine's deployment and subsequent sanitization have contributed to a smooth recovery of the global economy. As a result, the health authorities/departments are very concerned about the surveillance of patients who have been infected with COVID-19 and who have recovered. A burgeoning technology, the Internet of Things (IoT), is interwoven into every aspect of human existence. The proposed method analyzes smart healthcare monitoring system, using IoT to respond to public health emergencies, delay prediction, transmission, and identification of COVID-19 ratios.

Table 1: Smart healthcare monitoring system

Number of Peoples	AIM	IDT	CPC-IoT
10	47.8	59	71.5
20	48	63.5	82
30	57	67	78.9
40	60.5	72	84
50	47	63	77
60	52	61.7	92
70	55	65.5	80.1
80	45	73	94
90	51	71	89
100	55	78.9	97.9

Table 1 shows the smart healthcare monitoring system. The COVID-19 epidemic has necessitated social isolation and quarantine over the world. Using IoT-based health monitoring devices cuts down on the number of trips to the doctor and the number of meetings between patients and physicians. On the other hand, many people need regular medical professional supervision and observation. An Internet of Things (IoT)-based health monitoring system is actively being created to detect a patient's heart rate, pulse rate, oxygen level, and body temperature. A benefit of this system is that it allows nearby hospitals to communicate with city hospitals about the health concerns of their patients. The proposed method enhances healthcare monitoring by 97.9% compared to the existing methods.

If a patient's health status deviates from the expected range, the IoT system will alert a doctor. Health care providers can easily gather real-time data with an IoT-based health monitoring system. Allowing for frequent parameter checks is possible by having access to high-speed Internet. This platform's data storing capabilities mean that prior measurements can be quickly accessed. Individual COVID-19 sufferers might be identified and treated more quickly with the aid of this approach.

Table 2: Using IoT to respond to public health emergencies

Number of Peoples	AIM	IDT	CPC-IoT
10	49.8	67.9	72.3
20	55	71	84
30	47	75	78.9
40	49.9	62.9	93
50	53	72	90.3
60	57	78	91
70	45.1	68.2	92.7
80	51	74.1	89.3
90	57	77	82
100	48.8	75.2	94.8

Table 2 shows the using IoT to respond to public health emergencies. IoT can assist focus and accurately executing education and treatment programs and decreasing waste by identifying certain populations or geographical areas with population health challenges. The Internet of Things (IoT) and machine learning allow computers to simulate the cognitive functions of human brains. It is possible to detect at-risk groups for any variety of ailments, from diabetes to heart disease, with a sensor. The industry has seen first-hand the value of clinical monitoring during the coronavirus outbreak. Health systems and public health agencies have sought a mechanism to interpret and follow individuals with infections that can be identified using a wide range of discrete tests to detect a COVID-19 illness.

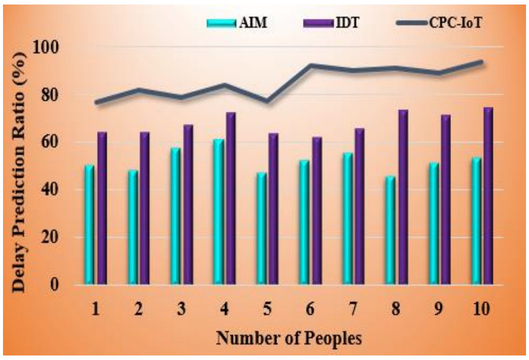

Figure 6: Delay prediction

Fig 6 shows the delay prediction. Health emergencies are included and excluded from the larger category of public emergencies, including natural disasters, terrorist attacks, and natural disasters. The data rate is the sum of all errors separated by various delays, while the delay prediction is the maximum time it will take to transmit the packets to the correct intact. Users can see how long the machine takes to get to a given point on a percentage basis. It's important to note any patient data transmission, contact, or uploading/downloading delays. The latency is negligible, and the IoT devices have a great processing capacity. Network management, load balancing, and efficient resource use are all supported by the processing of devices. Compared to the existing methods, the proposed method enhances the analysis of delay prediction by 93.8%.

Figure 7 shows the transmission ratio. With minimum network resources and successfully eliminating the intermediary malware attack, IoT-health data can be accessed and sent with minimal network resources. Even though these networks have appropriate security, the verification of health data is becoming less significant due to the growth in energy consumption of IoT devices. A network's ability to detect and identify threats is evaluated using detection performance and error rate identification measures. Several benefits to IoT implementations are supported by the equipment used, including effective interaction between nodes, in-vehicle networks and sensors, and detector networks. Their delay rate determines the amount of energy used by IoT devices. Compared to the existing methods, the proposed method enhances the transmission ratio by 96.9%.

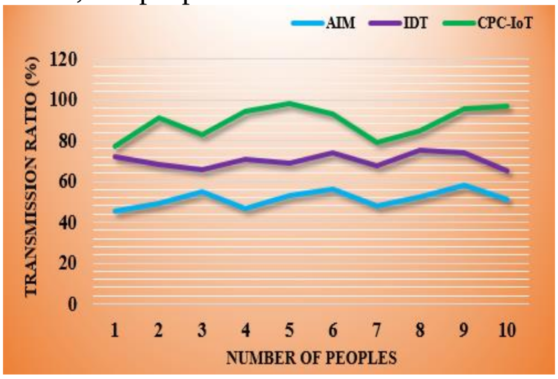

Figure 7: Transmission ratio

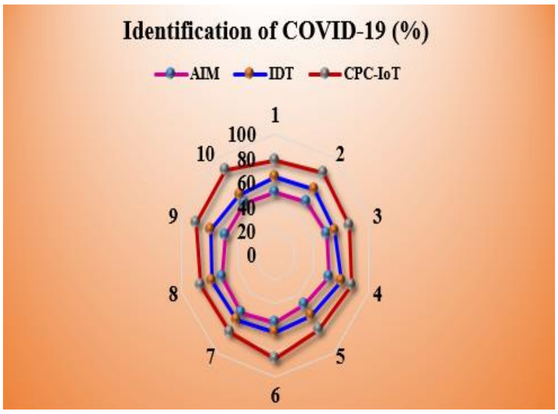

Figure 8: Identification of COVID-19

Figure 8 shows the identification of COVID-19. Increasing the ability to detect and respond to sickness early on can significantly impact the spread and impact. As a COVID-19 prescreening tool, deep learning AI models that categorize cough sounds have demonstrated promising results. If authorized, the cough-based diagnosis could be a game-changer in the fight against COVID-19 because it is non-invasive, cost-effective, and scalable. Initial diagnostics or prescreening for Covid-19 detection have recently been tried using cough sounds through the Internet of Things (IoT). These complicated algorithms integrating acoustic signal processing and machine learning are helpful because the virus can generate subtle changes in the body that can be discovered even if no symptoms are present. With this new method in asymptomatic individuals, prescreening for COVID-19 based on temperature could be more efficient. Compared to the existing methods, the proposed method enhances the identification of COVID-19 by 97.1%. The proposed method evaluated the smart healthcare monitoring system, using IoT to respond to public health emergencies, delay prediction, transmission, and identification of COVID-19 ratios.

5. Conclusion

For COVID-19 prevention and control, a fog-cloud IoT platform is suggested in this study by including five NPIs: COVID-19 symptom diagnosis, quarantine monitoring; traceability of contacts; and social distance. Patients and healthcare professionals can benefit from improved communication due to the Internet of Things. Patient's vital signs are monitored using sensors that track their temperature, heart rate, and blood pressure. The system combined a knowledge base and a fuzzy logic engine to make smart decisions for patient care, monitoring, and management to determine potential ailments and treatments. The proposed method intends to enhance the patient care and monitoring system's time, cost, and human resource efficiency. Sensor-based patient monitoring is the focus of the suggested solution, which displays acceptable accuracy and cost reductions compared to existing methods. An end-to-end social distancing and basic supply architecture are projected to enable people, governments, and medical professionals to cope more effectively with pandemics. According to the mathematical equation, a patient's medical record can be encrypted and accessible only to that patient. Increasingly, healthcare practitioners are relying on technology to keep track of patients and register them. Patients' medical histories will be gathered through more sensors in the future. The numerical result of the proposed method increases the smart healthcare monitoring system (97.9%), using IoT to respond to public health emergencies (94.8%), delay prediction (93.8%.), transmission (96.9%.), and identification of COVID-19 ratios (97.1%).

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