INTELLIGENT LOW-COST PRELIMINARY IDENTIFICATION OF COVID-19 USING IOT

K. Parveen[1], Aftab Ahmad Malik[2], WaqarAzeem[3], MujtabaAsad[4] and H.R Kayani[5]

[1]Departnt of Computer Science, University of Engineering and Technology (UET), Lahore
[2,3,4]Faculty of Computer Science, Lahore Garrison University (LGU), Lahore
[4]School of Electronics Information & Electrical Engineering,
Shanghai Jiao Tong University Shanghai China
[2]Email of Corresponding author: dr_afatb_malik@lgu.edu.pk.

ABSTRACT: The World Health Organization(WHO)has proclaimed a worldwide health emergency of international concern due to the coronavirus (COVID-19)disease outbreak. This viral outbreak has caused more than 2,863,225 deaths in the world. It has spread over into all areas of the globe. Excessive national and international action is being taken to stop the outbreak. The WHO suggested taking the necessary steps and measures to reduce the risk of the disease or importation.WHO's suggested measures are not to contact the infected person and do not touch the frequently used areas. People are observing these suggestions, but it is still spreading. The process of vaccination around the world has started. Coronavirus disease can be avoided or stopped, with the instant widespread of internet technologies. Current Internet of Things (IoT) developments on coronary virus protection is discussed in this paper from a fever control point of view on airports, religious sites, borders, events, etc. The design of the technique developed in this paper is a very low-cost remote temperature monitoring system model IoT Naïve Bayesian (INB) which measures body temperature by the sensor with infrared rays, processes and learns intelligently with Naïve Bayesian System and sends the data to a cloud system without any human intervention. It is extremely useful in preventing the epidemic on airports, religious sites, border crossings, and activities, among other places.

Keywords: Corona Virus, Naïve Bayesian, WHO, Internet of Things, Smart Devices.

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INTRODUCTION

A novel coronavirus known as 2019-nCoV was discovered in Wuhan, China, at the end of 2019(Munster *et al*., 2017). The COVID is abbreviated as'CO' for corona, 'VI' for the virus, and 'D' for Disease. Formerly, this illness was referred to as '2019 novel coronavirus' or '2019-nCoV.' The COVID-19 virus is a new virus linked to the same family of viruses as Severe Acute Respiratory Syndrome (SARS) and certain cases of a common cold. The WHO proclaimed the coronavirus disease outbreak COVID-19 a worldwide public health emergency of worldwide importance (PHEIC) on January 30, 2019(Who.int.2021). As of 5 March 2021, the COVID-19 has affected 219 countries and territories(Wold meter 2021). Although many elements of the nature and ability of the virus to spread between humans remain unknown, an increasing number of cases appear to have emerged from the transmission of the virus to humans. Following the 2002 epidemic of Severe Acute Air Coronavirus (SARS-CoV) and the 2012 epidemic of Middle East Respire Syndrome (MERS-CoV), 2019-nCoV is the third extremely widespread coronavirus in the world that has been alerted by the International Health Agency(De Wit et.al.016).

China responded rapidly by telling the WHO of the outbreak, after identifying the possible factor and exchanging data on the sequence with the international community. The WHO has reacted rapidly with the management of diagnostic production by guiding patient surveillance, specimen selection, and treatment. Many countries have shown the potential to reduce or stop the spread of the COVID-19 virus. The systemic crisis management and reaction strategy for COVID-19 aims at halting and preventing spreading, avoiding outbreaks, and delaying spread. Ensuring personalized treatment for all patients, especially those who are critically ill, mitigating the effect of the disease on health systems, social care, and economic growth. A robust framework of precautions is essential for countries to manage where there are no cases, frequent cases, groups of cases, population propagation, or worldwide propagation. The goals and strength of research for each technical area should depend on the circumstance a country or sub-national region is currently experiencing. This paper presents guidelines on responding to the transmission of COVID-19 to the population.

This paper describes the creation of a remote temperature control device that monitors an individual's body temperature with an INB system("**I** am **N**ot **B**othered System") and transfers data to a cloud network using Naïve Bayesian modeling without human intervention. Physicians or doctors on entry points or nearby hospitals will be able to decide whether to put them in quarantine or not in this way virus spread will be lessened,

The Indian and UK Corona-variant: According to a BBC report, recently, in India a new Corona-variant named B1617, has been discovered in the second wave, which is spreading fast. Giving opinion says, Dr. Jeremy Kamil, a virologist at Louisiana State University, the variant is more dangerous. It is well known that all viruses sometimes change their shapes, then it becomes difficult to make the previously available vaccination effective and useful. According to International Database "GISAID", a corona-variant has been identified in United Kingdom, South Africa as well as Brazil due to travelers coming from abroad. The Corona-variant of UK called the "Kent B117 variant" is more harmful and dangerous. Still more is to be discovered about the effects. The new infections exhibit different symptoms are compared to COVID-19, for example, flu and cold. Though the disease begins with the respiratory problem of infection with loss of smell, sore throat, cough cold, fever or diarrhea may be accompanied with fatigue. The body ache, dizziness and weakness are also observed.

Infectious diseases such as COVID-19 were rare but prejudicial to mankind. Infection disease management systems can be extremely reactive and provide high accuracy to the appropriate operation. Ideally, the government needs to check every patient for a COVID-19infection that is not possible in normal circumstances to control the outbreak at its initial level. The key objective of the proposed program is, therefore, to provide all patients with an actual diagnosis based on IoT and intelligent systems, This mechanism will help detect and monitor the propagation of COVID-19 at borders and airports. Table 1 illustrates some of the main safety benefits of IoT transformation.

Table 1: Reason for people to transfer the health information to IoT.

Factors	Explanations
Alliance	Through IoT, knowledge can be easily exchanged in real-time with approved physicians, health care professionals, and government agencies located in different geographical locations.
Swiftness	IoT offers easy and convenient access to stored data on-demand, thus gradation of the computing infrastructure can be accomplished with minimal interruption of operation.
Mobility	With IoT, healthcare services can be delivered anywhere and at any time.
Reduced Risk	The risk of transmission of the virus is reduced.
Cost Reduction	It also lesseen the cost of operations.
Data mining of quatrain person	All messages and data are saved in the cloud, where they can be conveniently shared and processed using a range of data analysis software.

This research helps in deciding whether a person is a victim of the coronavirus and provides a safe healthy environment for employees as well. This paper presents guidelines on the transmission of COVID-19 to the population from foreigners to other countries. WHO's suggested measures are discussed in this paper. These suggestions will be discussed from the IoT's point of view.

In communication and networks, the IoT is a rapidly growing field. It encompasses almost all fields of life, billions of heterogeneous devices are linked to each other in its environment(Roman et.al.2013). Coronavirus disease can be prevented or reversed, with easily universal use of internet technologies. Present IoT advances in coronavirus security are discussed from a fever management point of view on airports, religious sites, borders, activities, etc. This research helps in deciding whether a person is a victim of the coronavirus and safe health employees as well.

The remainder of the article is laid out as follows. Section 2 contains research on CoV-19 infection and the use of IoT in various applications. Section 3 suggests a scheme for avoiding COVID-19 infections in airports, religious institutions, and other public areas at a low rate. Experimental findings are discussed in Section 5 before the paper is concluded, and a success review is performed in Section 4.

LITERATURE REVIEW

According to the WHO Statement related to the spread of COVID-19, to 5 Mar 2021, a total of 131,930,613cases worldwide, with 106,219,966cases recovered and 2,866,266deaths. Due to the increased dissemination of 2019-nCoV, the WHO conducted a risk study, concluding that China is at "extremely high" risk, while the virus poses a "low" risk at the regional and global levels (Wang et.al.2020). Signs and propagation COVID-19 is transmitted by direct person-to-person

contact, such as coughing or sneezing, which is similar to the spread of influenza and other respiratory pathogens (Who. int. 2020).COVID-19 is most likely to affect individuals with cardiopulmonary disorders, impaired immune systems, infants, and the elderly. Flu-like symptoms, such as fever and cough, are normally the result (Cdc.gov. 2020). Fever seems to be the first symptom, followed by a dry cough.

The latest outbreak of the novel coronavirus (2019-nCoV) in Wuhan, China, has developed steadily since it was first discovered, with cases occurring throughout China and other countries and territories. If the corona patient comes into contact with another human, it is transmitted to other people. The WHO recommends that necessary steps and measures should be taken to reduce the possibility of the disease being transmitted or imported (Who.int.2020). Countries should be prepared for control, including active monitoring, early detection, isolation and case management, touch tracking, and prevention of 2019-nCoV infection, and full data should be exchanged with WHO (Who.int.2020). The qualified workers at airports are advised to check the fever and suspected patients should be in the isolation ward (Who.int.2020).

According to a publication released on medRxiv, the SARS-CoV-2 virus can be present in the air for up to 3 hours and on stainless steel and plastic surfaces for up to 3 days(Van Doremalen et.al. 2020). A similar coronavirus that affects SARS can live up to 9 days on non-porous substances like stainless steel or plastic, according to studies published in the Journal of Hospital Infection. It's unclear if bleach kills coronaviruses outdoors, and even though it does, it's unclear that eliminates viruses in the air. Under ultraviolet (UV) radiation, bleach degrades. Coronaviruses tend to be destroyed by UV light as well. There might also be disadvantages to widespread overzealous bleach disinfection. The people subjected to sprayed disinfectants, particularly staff who spray them are in danger of respiratory problems, among other conditions. In(Dumas et. al,2019) reports research says that nurses who frequently used clean surface disinfectants were at higher risk of chronic obstructive pulmonary disease.

The IoT is a dominant technology field today (Parveen et.al. 2018)]. This covers almost all communication fields of computers (Giusto 2020). IoT is universally recognized as one of the central technology enablers for the improvement of future intelligent settings (Niyato et.al. 2017). IoT's basic idea is to connect smart things over the internet. In the IoT, smart things are those objects which have sensors and they can be used not only in all businesses but also in social processes. They not only interact with each other but also transfer data with a nearby environment, react with the real or physical world and complete the different processes with the help or without human involvement. It is motivating that the computerized revolution of numerous altered domains of health and life. The vision of IoT has concerned many of the researchers ' attentiveness over the past many years(Atzori et.al. 2010)(Rachedi et.al. 2016) and (Ibraara et.al.2017).Most prominent researches of the IoT are concentrating on its application to a number of various application domains (Neirotti et.al.2014), like smart cities(Zanella et.al.2014) (Mehmood et.al. 2017),e-health (Islam et.al. 2015)(Elsts et.al. 2018),smart-environment(Trasviña-Moreno et.al. 2017)(Brewster et.al.2017), smart-home (Majumderet.al.,2017), and Industry 4.0 (Chen et.al.,2017).

Artificial Intelligence is the field, whose basic purpose is to design systems that perform their tasks with intelligence. A system is considered smart or intelligent when it performs its task perfectly without any interference from human beings. Machine learning, a sub-field of Artificial Intelligence, is responsible for the analysis, development, and testing of such algorithms that help in machine learning and decision making. Machine learning algorithms are based on statistics, human psychology, and human brain modeling. Human psychology and the neural network model helped the researchers in understanding the human brain and its learning process. Researchers became able to design such efficient algorithms based on the human brain model and learning processes (Carbonell et.al.,1983).

Machine learning algorithms use datasets to learn and form a model. Datasets are also known as training data in machine learning. Datasets help the system to learn, form a model and make a prediction or classify upcoming data based on its learned data model. Weather prediction systems and Waikato Environment for Knowledge Analysis are the examples of implementation of multiple machine learning algorithms (Garner,1995).

Machine learning is the ability of a machine to generate the outcome or behavior based on given knowledge, observation, and data. In the case of IoT, such kind of ability is needed while making decisions about big data, heterogeneous networks and devices, connectivity, and many other infrastructural requirements. It is believed that machine learning will be very beneficial for IoT solutions and will be a major part of the IoT industry. There are many ML algorithms available, some of them are, Fuzzy Logic, Decision Tree Algorithms, Artificial Neural, Algorithms, Support Vector Machines, and Bayesian Algorithms. Bayesian networks. Table 2 shows the comparison of machine learning techniques. The graphical models are used to reflect information in a domain that is unknown. When given training set with the target class, the naive Bayesian algorithm will learn a task. The aim is to identify an invisible sequence of defined input variables but unidentified class.

Table 2:Comparison Of Machine Learning Techniques.

Sr#	Machine Learning Technique	Pros	Cons
1.	Artificial Neural Networks (ANN)	Aware of extrapolating from noisy and incomplete data. Large knowledge is not required. ANN can detect new or unexpected intrusions.	Training takes a long time and is not ideal for real-time identification. ANN preparation can result in over-fitting.
2.	Support Vector Machine (SVM)	For small tests, strong learning ability. High judgment and training speeds, and insensitivity to input data dimension.	It takes a long time to prepare. The most often used binary classifier, which does not have any additional detail about the type of attack observed.
3.	Fuzzy Logic (FL)	Instead of being exact, reasoning can be approximate. Effective against probes and port scans, in particular.	High resource usage. It's difficult to define a smaller, more appropriate rule subset and dynamically update rules at runtime.
4.	Decision Trees (DT)	Simple and easy to understand as it used the White Box model. Results improved by numerical values on decision	Time-consuming, valuable resources are used. Do not take into account the dynamic nature of the work.
5.	Genetic Algorithm (GA)	Ability to derive the most effective classification rules and pick the most appropriate parameters. An evolutionary algorithm is used by GA.	It is impossible to guarantee continuous optimization reaction times. Over-tightening.
6.	Bayesian Network (BN)	The probabilistic relationships between the variables of interest are encoded. Capable of combining past data as well as information.	Continuous elements are more difficult to control. If prior information is incorrect, there could be no appropriate classifiers.

Advanced computer-aided technologies help healthcare stakeholders detect pathogens and predict the transmission of diseases like malaria(Haroon *et al*.,2021). Likewise, Machine learning techniques are used in this Covid 19 article.

METHODOLOGY

Figure 1 depicts a futuristic view of the device. The system's center is a walkthrough gate made up of low-cost components such as an Arduino Super microcontroller, MLX90614 infrared-based temperature sensor, and an ESP8266 network IC combined with an Arduino Mega in a Wemos Mega development board with LCD.

The readings from the sensors are sent to the local area network via a router on a given server through esp8266 chip and the readings can be retrieved using a PC or an android system using a Virtuino App, which is connected to that network. This data is further sent to the cloud database via wifi. These are discussed one by one and this system is low cost as well.

A. Wemos Mega Development Board: The Wemos Mega Production Board, which includes an Arduino Mega microcontroller and Esp8266 network chip, makes IoT-based electronics processes more usable in multidisciplinary ventures.

The equipment is made up of a basic Arduino board with a 10-bit ATmega2560 processor and 54 optical input/output pins. The ESP8266 WROOM chip with ESP-WROOM-02 mcu is the other portion of the board. It has a built-in 32-bit Wi-Fi module that enables IP/TCP 10-bit ADC, network stacks, and HSPI/PWM/UART/I2C/I2S interfaces. The ESP-WROOM-S2 has a 32 MB SPI flash that works as an SPI/SDIO slave at 8 Mbps.

B. Arduino Micro-Controller Software: The Arduino IDE is a cross-platform, Java-based framework. The Wiring project IDE and the Processing programming language were used to achieve it. A boot-loader and a programming language compiler are included in the Arduino software. A programming language that is similar to C++ can be used to program the Arduino hardware. It makes microcontroller programming a lot simpler. It can send data to a serial port by writing on to it with a simple serial communication instruction, without the need for synchronization, initialization, or interrupts. Arduino software is free and open. It significantly reduces the expense of microcontroller programming.

C. Mlx90614 Temperature Sensor: The MLX90614 is an infrared thermometer that can be used to take non-

contact temperature readings. Both the infrared-sensitive thermopile detector chip and the signal conditioning have a low noise amplifier, a 17-bit ADC, and a very efficient Digital signal processing unit with good thermometer precision and resolution. The thermometer has a mechanical PWM and SMBus (System Management Bus) output and is factory tuned. The 10-bit PWM is designed to continuously relay the measured temperature ranges from -20C to 120C, with an output resolution of 0.14, as it is in normal form.

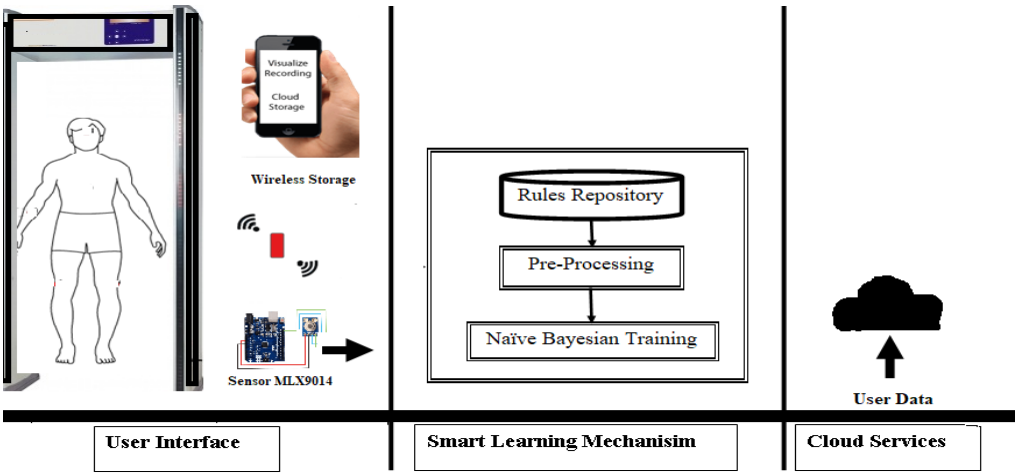

Figure 1: IoTNaïve Bayesian System

E. Virtuino Mobile Application: Virtuino is an IoT server and Arduino-based module Human Machine Interface (HMI) platform. It's used to make virtual screens and controls in Android and iOS devices, such as on/off buttons and slider switches. It allows us to use our phone or tablet to build virtual screens on which we can monitor any automation device through Bluetooth, WiFi, or the web. As a result, we use Wifi in our setup.

The Naive Bayesian algorithm, which is used for efficient decision making, demands that all properties of an input instance have distinct values. If there are some indistinct values, they must be dealt with before being sent as input. If any attributes in an instance are absent, default values must be allocated to them. Since missing values may trigger problems when measuring chance, the machine can come to a halt. As a consequence, indistinct and incomplete values attributes must be dealt with before they can be included.

The Naive Bayesian is applied and trained based on available rules and decisions regarding body temperature. The format of the body temperature is on value '96.7' if condition '1' do action '1';

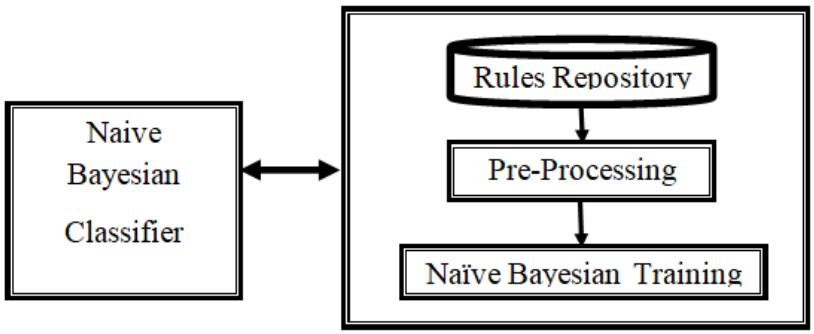

Figure 2. Naive Bayesian Algorithm Architecture

RESULTS AND DISCUSSION

The efficacy of the new INB approach is checked in particular with the early-stage prediction of the COVID-19 epidemic. Inferential numbers from the files of Chinese health authorities have been used (Who.2020). After January 21, 2020, the figures on the annual rise in the size of infected people in China are updated regularly. The trends are classified according to whether they have completed the post-infection case cycle: confirmed, normal, suspicious, and crucial. Whenever a patient's temperature increases above 100 degrees Celsius, he or she is referred to as "confirmed." Patients with viral infections are first classified as

"suspicious," then "verified" or "consistent" with a medical diagnosis. When a patient shows no symptoms of a viral infection, he or she is described as normal. The nave Bayesian learning machine algorithm has been introduced to the dataset in the proposed paper, and simulation has been done using the MATLAB method. The overall 1404 number of experiments were used in the forecasting model of coronavirus outbreak during the training process, which is further categorized into 9, 1095, and 300 samples of natural and suspect, respectively, as seen in table 3.

In training, these are put in the INB for prediction. Predicted cases out of 1404 are 300, here 286 are confirmed cases, while 14are suspicious. These suspicions are further categorized in table 4.

Table 3: Proposed INB system model prediction cases

	Input (1404)
	Output
Suspicious	14
Confirmed	286
Normal	1095

Table 5: showing the suspicious cases after passing through the proposed INB system.

	Input(14)
	Output
Other issues symptoms	2
Confirmed	7
Normal	5

Table 6: During validation and preparation, the proposed INB was evaluated for results.

	Training	**Validation**
Accuracy	95.3%	93.53%
Miss Rate	4.7	6.31%

During the training and evaluation processes, Table6 demonstrates the efficiency of the proposed INB device model in terms of accuracy and miss rate. It is obvious that during testing, the proposed INB system provides 95.3 percent precision and 4.7 percent miss rate, accordingly. During validation, the proposed INB system achieves accuracy and miss rates of 93.53 percent and 6.31 percent, respectively.

Conclusions: The world's population is being infected with the coronavirus and spreading it each day. To minimize the cases of the virus, the movement of people should be tracked by the modern IoT approaches. In this paper, patients with coronavirus are detected by Wireless Body Temperature INB. It is a low-cost IoT-based intelligent system and its works without human intervention.Its results are stimulated on Matlab and it is proved that it can be used for detection of corona on entry points of any crowded place.

In the future, we will add web semantics to detect epidemics.

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