

REAL TIME IMPLEMENTATION OF AI-BASED FACE MASK DETECTION SOCIAL DISTANCING MEASURING SYSTEM FOR COVID-19 PREVENTION

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Abstract -For monitoring the temperature of students at the entrance and take the necessary steps quickly to overcome the spread of COVID-19. The IR Temperature Sensor helps in predicting the body temperature. If the temperature range exceeds the normal limit, it stops allowing the person to enter the academic premises. This implementation helps to stop the spread of COVID-19 and acts as a prevention measure. A unique RFID receiver placed near the entrance in the identification of the corresponding student by scanning a unique RFID tag. The ID matches with the database and predicts the contact details, which are sent to the in-charge via SMS. For intelligence decision-making, artificial intelligence is applied to analyze the temperature history for corresponding students from the database, which helps to enable us to accurately detect the affected range. The Arduino UNO acts as the brain of the circuit, it controls and processes the data collected from the RFID tag and the wireless temperature sensor. Also, it connects with the IoT cloud using a Wi-Fi module. The buzzer is used to alert the student when the temperature measured is higher than the threshold temperature level. The servo motor is used to control the opening and closing of the door. The system helps to identify the high-temperature person and stop allowing into the college premises.

Key Words: Arduino UNO, ThingSpeak, IFTTT.

1. INTRODUCTION

SARS-COV-2 VIRUS is the virus that causes Covid-19. Covid-19 is transferred when affected persons coming into close touch. It spreads through the droplets of liquid coming out of the mouth of the infected individual while speaking, singing, and other activities. From a big respiratory droplet to small aerosols, these liquid particles appear in a variety of sizes. COVID-19 can infect others through the mouth, nose; this is more likely when humans come into direct or close contact with an infected person (much less than 1 meter). The virus is most typically spread through respiratory droplets between persons in close contact, according to existing evidence. Aerosol switch can happen in busy, poorly ventilated settings where sick people spend a

lot of time with others, such as restaurants, choir concerts, fitness activities, nightclubs, businesses, and/or places of worship. Outside of scientific institutions, more research is being done using specific scientific methodologies known as aerosol generating activities to understand better the factors that cause aerosol transmission. Sneezing, coughing, or touching surfaces or items like tables, doorknobs, and handrails all have the potential to spread the virus. Others may become sick because of coming into contact with contaminated surfaces and then touching their eyes, noses, or mouths without washing their hands first.

Based on the observation of the World Health Organization, it is said that virus gets transmitted who are at very close distance. The virus spread through the affected people's mouth and nasal liquids. When this particle gets in contact with the non-infected particle, the virus gets transmitted.

Aerosols and Droplets are the products of our respiratory system; they are created when a person sneeze. The aerosols are tiny globes of liquid that can move faster than the droplets but can evaporate soon. The diameter of the aerosol is much smaller than 5 micrometers. Covid-19 is found that the Corona virus can stay on for almost 20 min with its virulent characteristics. Thus, when an uninfected human gets in contact with these droplets transmitted through air, the disease can spread. Droplets that are transmitted can stay on a shiny or hard surface for up to 72 hours. These objects can be the source of the disease and they act as passive vectors of the disease. These objects have to be dis-infected to stop the spreading of the from one person to another. This way of transmission is said to be in indirect form, they spread is because of the contaminated food and water. The excretion from the body can act as a host of the disease. The virus stays in the gastro-intestinal tract of the infected people and gets released through the excretion.

1.1 LITERATURE SURVEY

Thoong Chun Onn et al proposed a system for a campus to recognize the student using RFID tag and non-

contact temperature sensing. The temperature is stored in a cloud server where they are kept for future reference. The temperature data is stored in Thing speak cloud. The system was said to be better than the standard device that is used to measure the temperature. The average accuracy was said to be better than standard device, but the system was yet to be deployed. The system was tested only with a small number of people in a lab.

Nenad Petrovic proposed a system to monitor the temperature and detection of mask using Raspberry pi-based camera and Arduino. The raspberry Pi was used to detect the social distance in crowded areas like quarantine centers. Pi-cam is used to identify the people wearing mask using Open CV. To detect the temperature AMG8833 is used, it is interfaced with ESP8266 wifi module. The frames that can be captured using the pi-cam is less and the range of detection could be less. There is a need for additional person to monitor the camera and separate people who are violating the social distancing.

1.2 Methodology

1.2.1. System Description

Innovation in emerging technologies has made human life easy in all ways of communication and control. The emergence of Smartphone had made a revolution in the communication field, but the interactive environment is not still provided. In recent times, temperature monitoring has become an unavoidable aspect in academic Institutions. Since academic institutes can house many people, they must follow standard operating procedures (SOPs), such as measuring and documenting students' body temperatures. The IOT acts as an interactive environment, where all the devices are connected without any human intervention. In this digital world IOT plays a major role in contact based thermal screening of people, there is a chance of un-affected people getting affected, Thus, a contact -free portable screening technology is needed, such that we can identify people with excessive temperature from a safe distance. Thus, a non-contact thermal scanner for educational campus is proposed system. The students' temperature data need to be maintained to detect and prevent transmission of illness among students. This enables the administration to take appropriate measures to prevent the disease from spreading further. Temperature measurement is a key process, it can be done either by contact sensor or non-contact sensor. It is safer to have a wireless infrared temperature sensor than contact-based temperature detection. Few systems that exist for temperature monitoring is IoT-based monitoring, non-contact thermal camera-based systems, IoT-based Systems with MQTT Protocol. Even though the various system is listed in the review, no temperature system exists with Machine Learning-based decision making and is cost-effective. Our main contribution is to reduce the sensor's cost and add more intelligence to ML-based smart decision-

making based on the previous history of the temperature of the same person available in the IoT cloud.

1.2.2. Algorithms

A . Linear Regression

Linear regression is a linear model in which the input variables (x) and a single output variable (y) have a linear relationship (y). That is, y can be determined by combining the input variables in a linear fashion (x). The procedure is known as simple linear regression when only one input variable (x) is present. Linear regression is the term used in statistical literature when there are multiple input variables. The representation is a linear equation that takes a set of input values (x) and predicts the output for that set of input values (y). Both the input (x) and output (y) values are numeric as a result.

Each input value or column is assigned one scale factor, which is symbolized by the capital Greek letter Beta in the linear equation (B). One more coefficient is added, known as the intercept or bias coefficient, which gives the line an extra degree of freedom (e.g., moving up and down on a two-dimensional display).

$$y = B_0 + B_1 * x$$

While we've multiple input (x) in higher dimensions,

line is referred to as a aircraft or a hyper-plane. The form of the equation and the specific values used for the coefficients are thus the representation (e.g. B0 and B1 in the above example).It is common to discuss the complexity of a regression model, such as linear regression. The number of coefficients used in the model is denoted by this. While a coefficient reaches 0, it effectively removes the have an effect on of the input variable at the model and, as a result, the model's prediction ($0 * x = 0$).

B. XGBoost

XGBoost is a decision-tree-based gradient boosting ensemble Machine Learning technique. In prediction issues involving unstructured data, artificial neural networks outperform all existing algorithms or frameworks (images, text, etc.). However, for small-to-medium structured/tabular data, decision tree-based algorithms are now rated best-in-class.

The ensemble tree algorithms XGBoost and Gradient Boosting Machines (GBMs) leverage the gradient descent architecture to boost weak learners (CARTs in general). XGBoost, on the other hand, improves the underlying GBM framework by optimizing the system and improving the algorithms.

2. Proposed System

The proposed system consists of both software and hardware part to monitor the temperature of the student. The hardware part consists of RFID based identification system and software part consists of coding of the hardware system, the data storing mechanism in the cloud and the Machine Learning based analysing system. The hardware part is used detect the temperature of the student and the software part is used to store these temperature data in the cloud and later analyse using Machine Learning algorithms.

The spreading of COVID19 can be limited by wearing a mask. The image processing concept is implemented to monitor the wearing of mask during the entry into school, college and any other public sector. The temperature sensor helps in finding the body temperature in smart manner.

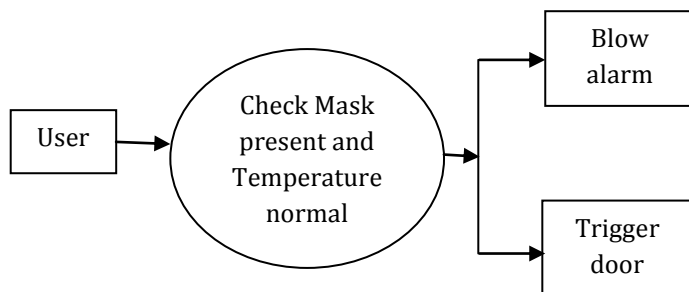


Fig 1 : Data Flow Diagram

2.1 Design

The architecture for the study is given below

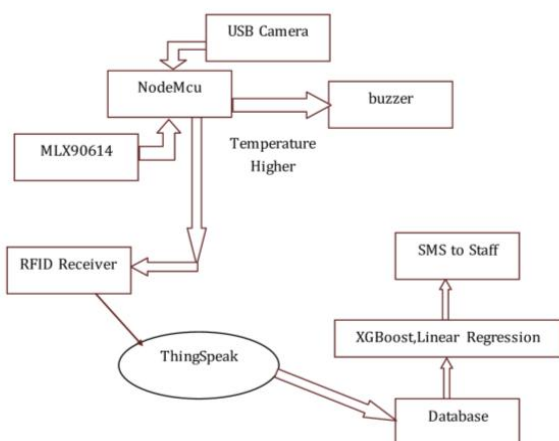


Fig 2 : Proposed system block diagram

The ESP8266 is the main part of the IOT system, the code gets stored in the board, and then the RFID receiver is commanded to verify the RFID tag that is been placed over the receiver, The temperature sensor is used to measure the temperature of the student. When the temperature measured is higher than the threshold the buzzer gets

turned on, which would alert the authority, this would stop help the authority to separate the student from the class being in contact. This could prevent the spread of the transmission of disease.

In the software, the ESP8266 is used to send the data to the cloud. Thingspeak cloud is used to store these data collected from the hardware parts. The Thingspeak can store the data in the form spreadsheet. The data can be visualized through graphical representation, which could give a clear picture on the data obtained.

The data stored in the cloud is obtained and given to the machine learning that is developed, the machine learning algorithm such as XGBoost, Linear regression, are used to analyze the temperature data of the student. The authorities are also informed using IFTTT platform. The IFTTT send the message to the authority when the temperature exceeds the threshold value.

2.1.1 ThingSpeak

ThingSpeak is a platform that provides several services tailored to the development of Internet of Things (IoT) applications. It allows for real-time data collecting, data visualisation via charts, and the construction of plugins and apps for cooperating with online services, social networks, and other APIs.

2.1.2 IFTTT

IFTTT for "if this, then that," which is a programming conditional statement which provides a software platform that integrates software applications devices, and services to trigger one or more automations involving those applications, devices.

3. IMPLEMENTATION

The data collected is sent to the Thingspeak cloud and they are visualized in the form of graph. This is shown in Fig 3

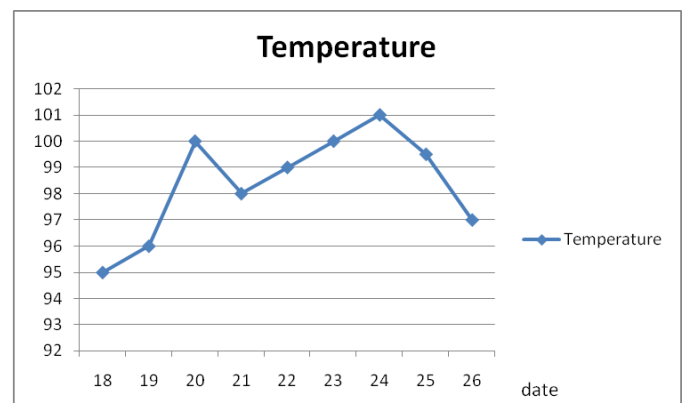


Fig 3 :. Thingspeak output of the temperature data

The Person Wear mask only can have permission to enter into the college. The person with mask shown in Fig 4.

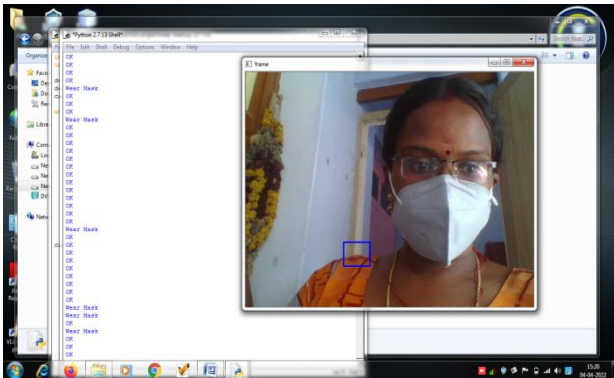


Fig 4 :Detection of face with mask

4. CONCLUSIONS

The proposed system is implemented, and it can be able to identify the students based on the RFID tags, which has unique values. The MLX90614 non-contact temperature sensor is used to sense the temperature of the students and stores it in the cloud. The application will monitor the person's temperature automatically. If the predicted temperature is higher than the limit, at that time, it will fetch the person's details from the database and intimate the in-charge through SMS. This helps to find the corresponding person quickly, and thus the spread of the virus can be limited in the initial stage. Machine learning algorithms are used to analyse the temperature data obtained. Thus, the machine learning algorithm-based decision-making for temperature analysis in the face mask detection and social distancing works better.

REFERENCES

- [1] T. C. Onn *et al.*, "IoT-Based Contactless Body Temperature Scanning System for a Smart and Safe Campus," *2021 4th International Symposium on Agents, Multi-Agent Systems and Robotics (ISAMSR)*, 2021, pp. 39-44, doi: 10.1109/ISAMSR53229.2021.9567862.
- [2] Islam, M.M., Rahaman, A. & Islam, M.R: "Development of Smart Healthcare Monitoring System in IoT Environment". *SN COMPUT. SCI.* 1, 185 (2020). <https://doi.org/10.1007/s42979-020-00195-y>.
- [3] Artha Pratim Ray: "A survey of IoT cloud platforms", *Future Computing and Informatics Journal*, Volume 1, Issues 1-2, 2016, Pages 35-46, doi: 10.1016/j.fcij.2017.02.001.
- [4] Dang, L.M.; Piran, M.J.; Han, D.; Min, K.; Moon, H : "A Survey on Internet of Things and Cloud Computing for Healthcare". *Electronics* 2019, 8, 768. <https://doi.org/10.3390/electronics8070768>.
- [5] <https://thingspeak.com>
- [6] D. Parida, A. Behera, J. K. Naik, S. Pattanaik and R. S. Nanda, "Real-time Environment Monitoring System using ESP8266 and ThingSpeak on Internet of Things Platform," *2019 International Conference on Intelligent Computing and Control Systems (ICCS)*, 2019, pp. 225-229, doi: 10.1109/ICCS45141.2019.9065451.
- [7] Muzammil Khan, Muhammad Taqi Mehran, Zeeshan Ul Haq, Zahid Ullah, Salman Raza Naqvi, Mehreen Ihsan, Haider Abbass: "Applications of artificial intelligence in COVID-19 pandemic: A comprehensive review", *Expert Systems with Applications*, Volume 185, 2021, 115695, <https://doi.org/10.1016/j.eswa.2021.115695>.
- [8] Imran, M.; Zaman, U.; Imran; Imtiaz, J.; Fayaz, M.; Gwak, J "Comprehensive Survey of IoT, Machine Learning, and Blockchain for Health Care Applications: A Topical Assessment for Pandemic Preparedness, Challenges, and Solutions". *Electronics* 2021, 10, 2501. <https://doi.org/10.3390/electronics10202501>.