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SENSORS AND IOT, A WEARABLE DEVICES FOR PATIENT HEALTH MONITORING AND DISEASE PREDICTION USING DEEP LEARNING

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ABSTRACT

Despite countless advances in science, technology, and innovation, many countries still struggle to build the proper infrastructure that might handle pandemic and emergency scenarios. Therefore, it is required to have smart and digital fitness infrastructure to monitor, assess, and take care of patients. The suggested version makes use of an IOT-based fully wearable device with a few sensors to assess the patient's health. The wearable device's sensors may periodically upload data to a user account on the cloud. Doctors and caregivers may be granted more access so they can load the results of the examination and the drugs. So, we used the HTTP protocol through a LAN or Internet (nearby vicinity network). We developed a wearable device that measures temperature and pulse rate every eight seconds and uploads data to Things Communicate, an IOT platform that allows doctors, patient caretakers, and nurses to check on patients from anywhere in the world.

However, based solely on the indicators, Medical doctors often struggle to make original predictions. The most difficult task is accurately anticipating illness. A laptop was created to address this problem. In order to forecast the future, training is essential. We suggested preferred illness prediction based solely on the patient's symptoms.

Keywords: IOT, Health Monitoring, Disease Prediction**,** Pulse Sensor.

I. INTRODUCTION

Many scientists and researchers are working on this project and have developed numerous methods, some of which have their own drawbacks, such as lack of accuracy in disease prediction, improper tracking, cost, lack of record protection, slowness, lack of an emergency button for assistance, etc. In order to resolve some of these problems, however, new methods have been developed.

Doctors play a crucial role in assessing patient health, but in the current situation it is difficult for doctors, nurses, and caregivers to check on patients every hour. As a result, we have developed a wearable device that takes patients' simple readings and automatically updates matters talk so that it can be located and monitored online from anywhere in the world.

II. METHODOLOGY

Heart diseases have become a major problem over the past several years, and many people have died as a result of fitness-related issues. As a result, coronary heart disease must not be ignored. This disorder can be avoided by interpreting or monitoring the ECG indication at an early stage. Our business is divided essentially into three domains:

- Sensor Technology
- Communication
- Wireless Sensor Networks Technology

The hardware configuration of the fitness tracking device's machine architecture.

- Utilize three sensors to gather information from people.
- Manage the cloud database with those real-time values.
- Conduct analysis based on the sensor results.
- If any anomaly is noticed, alert the doctor or the patient using cloud technology and prompt immediate relief.
- In this project, we've designed an ESP8266 and Arduino-based IoT-based patient health monitoring system.

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• The Arduino Sketch running on the device carries out the specific tasks of the assignment, such as reading sensor records, translating them into strings, sending them to the IoT level, and other similar tasks. The IoT degree applied on this project is ThingSpeak.

• ThingSpeak is free software for the Internet of Things (IoT) that uses an API to preserve and retrieve better records of conversations utilising the HyperTextTransferProtocol conference across a LAN or the Internet. Using your continuous data, you may subsequently be able to design games and warnings and access the estimation of your data using visual tools. This Internet of Things device may need to check the temperature and rate of heartbeat. It continuously measures the surrounding temperature and heart rate, updating those measurements on an IoT platform. You may connect an ESP8266 board and an AD8232 ECG sensor, and Think Speak will display the ECG waveform on the screen.

• Using chest or hand ECG activation as a link, we will create an ECG sign. We can send the ECG chart to the cloud via WiFi and cloud interface by using Think Talk barriers like API Key or Token. An integrated signal moulding block for ECG and various biopotential estimation applications is the AD8232. In the presence of agitated situations, such as those caused by utilising motion or remote cathode location, it is intended to suppress, amplify, and channel minor biopotential alerts. This design takes into account an installed microcontroller or an ultralow-energy simple to advance converter (ADC) to obtain the yield indication quickly. For the purpose of eliminating motion historical rarities and the cathode half-mobileular potential, the AD8232 can operate a two-publish high-byskip channel. This channel is tightly integrated with the speaker's instrumentation engineering to enable each enormous boom and high-byskip sifting in a single degree, saving both space and money. The AD8232 is enabled to create a 3-shaft low-byskip channel by an uncertain operational intensifier in order to reduce more noise. All things considered, the user can select the recurrence cutoff to suit various types of usages. Additionally, utilising a PC or essentially a smartphone, you can send the ECG waveform over the IoT Cloud level and view the signal online from any location in the arena. Since you can monitor cardiac activity/behavior online from anywhere, there is no need for the hospital to be the final location where it is monitored. This method effectively enables the establishment of the patient health monitoring system.

III. COMPONENTS

• **Arduino uno:** Gathers data from the sensors and uploads it to the cloud using an ESP8266.

• Esp8266 WiFi module: Connects to the internet through Wi-Fi and uploads data acquired from an Arduino board to the cloud.

• **Pulse sensor:** It detects the patient's actual pulse rate.

• The LM35 temperature sensor measures the temperature and provides an output in accordance with the temperature variation of the persistence frame.

• **2x16 lineLCD display:** Used to show the heartbeat rate and frame temperature.

• Cloud, also known as thing speak: Used to gather statistics and store them in the cloud for later use.

• **AD8232 ECG Sensor:** Keep an eye on Think Speak's ECG Waveform. This was all about a fitness tracking device that used sensors and the internet of things. Let's now have a look at how we used machine learning to anticipate fitness-related ailments.

IV. IMPLEMENTATION OF MACHINE LEARNING TO PREDICT HEALTH DISEASES

Step 1:A Graphical User Interface is created in Python using the packages axes3d standardscaler plt tkinter.

Step 2: List the signs as Level 1 The list L1 was created for various symptoms that can typically be seen in humans for various diseases.

Step 3: In this step, ailments are called variables and listed. Disease is a classification created for unique diseases that are most frequently observed in unique people.

Step 4: Growing a vacant list equivalent to a number of illnesses in listing L1, L2, and appending it in a number of zeroes.

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Step 5: Studying the education file. The version is created using a CSV file called education.csv that contains a list of diseases and their symptoms. The Read csv() function is used to store the statistics inside the df dataframe. With the aid of the replace() function, the analysis column—which represents the distinct illnesses—was modified using the integers from 0 to n-1, where n is the number of distinct illnesses present in the.csv file. The coaching dataframe's first five rows are printed using the Head() function.

Step 6: Expanding the column's distribution graph

Step 7: Growing the scatter and density plot.

Step 8: Setting symptoms in X and illnesses in Y for version education. output for the x wherein one of a kind smptoms has the values zero or 1 consistent with their presence in he specific illnesses. output for y wherein one of a kind ailment has values consistent with their signs.

Step 9: we're the usage of selection tree for education the version and predicting the ailment on checking out the dataset consistent with signs that's entered via way of means of users. very last selection tree is strored in a variable named 'pred1'. accuracy of predicting the ailment is outlined the usage of accuracy score and confusion matrix is created.

Step 12: Using the KNN feature, we locate a sample in the data that connects the information to the outcomes and increases the patter popularity with each repetition. Okay, the regulations for the nearest neighbour are under supervision. It is a fundamental but important set of guidelines. It demonstrates widespread application in sample location and data mining. We successfully classified our dataset using K Nearest Neighbor.

Step 13: We are using the naive Bayes characteristic under the premise that all functions contribute equally and impartially to the prediction. We used the naive Bayes set of rules in our challenge to produce a 95 percent accurate forecast. The naive bayes set of rules is a distinct family of algorithms that is entirely based on the naive bayes theorem. They adhere to a common principle that states that every pair of predictions is independent of the others.

Step 14: It is to use the GUI version. Python's tkinter module is used to create graphical user interfaces. The GUI starts with Root. The historical past is preset with the setting "Ivory." Using the title() function in the tkinter library, the GUI title is "Smart Disease Predictor System". The size GUI can be fixed using the resizable feature. Variables like Name, Symptom1, Symptom2, and so forth are described here and initialised to "Select Here" using the set() feature of the Tkinter library.

V. RESULTS AND DISCUSSION

The combination of remote sensor institutions and cloud processing will bring about innovation in a number of areas, such as patient monitoring at low cost, a reduction in the number of safe beds in hospitals, and an improvement in the performance of the medical staff. The suggested framework can be set up inside of the clinics, and a significant amount of data can be collected and stored inside of the online records set. In fact, even the results can be made to be accessible from a portable device via an application. As the name implies, both patients and medical professionals will find little utility in the Smart Health Monitoring form's results. The patient can check their financial standing from the comfort of their homes and visit clinics only when they genuinely choose to. This should be possible by utilising our shape, the results of which are welcomed on the internet and are accessible from everywhere on the planet.

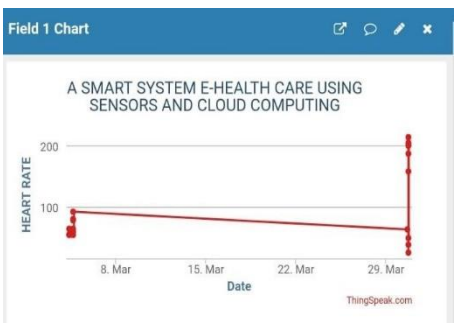

Fig 1: Reading we observe of health rate.

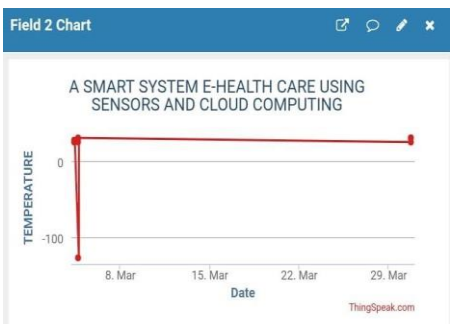

Fig 2: The reading we observe of temperature

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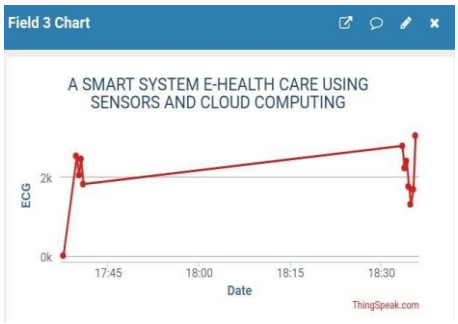

Fig 3: The reading we observe of ECG

Fig 4: The result in serial port monitor

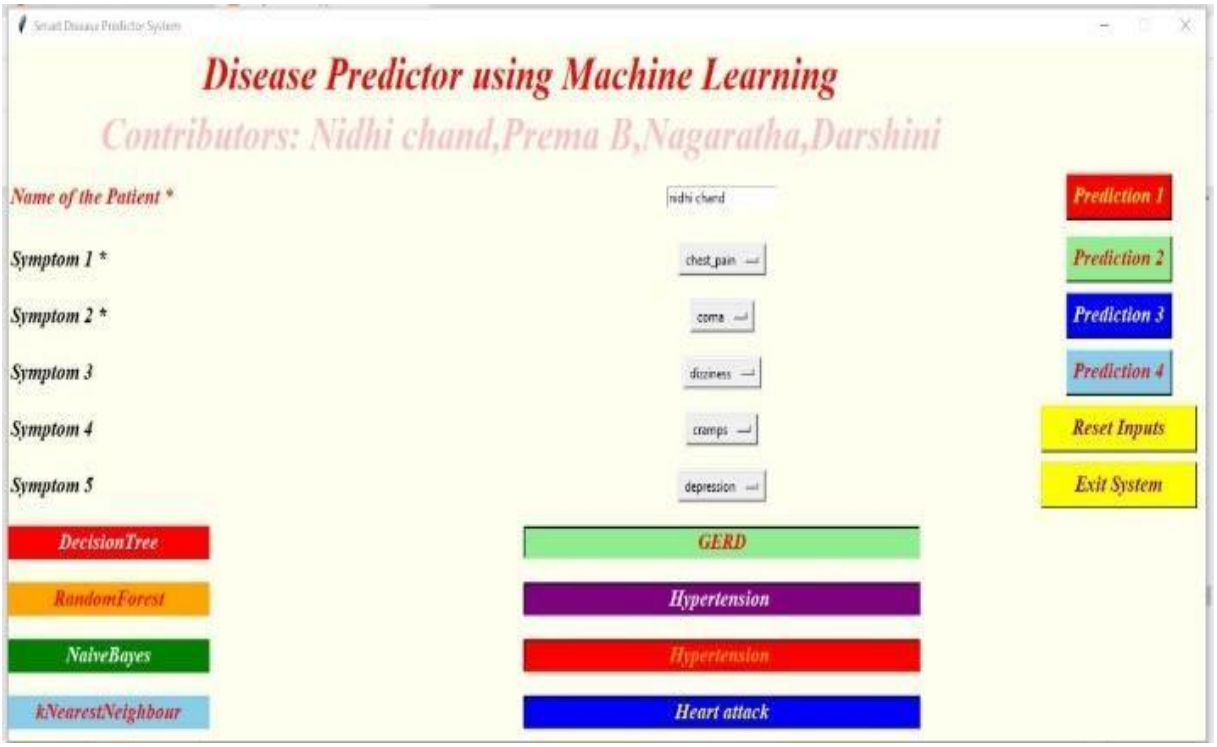

Fig 5: The Result of disease Prediction using Machine Learning

VI. CONCLUSION

The fact that both mature age human organisations and heart patients desire to automatically check their health condition, the internet of things (IoT)-based Health Care Management System may be highly valuable to them. In the unlikely event that they take this framework with them, they could effectively examine their medical issue at home without travelling to the hospital. A doctor can view their patient remotely on a screen. This helps the patient save money and time while also saving lives. In the future, we'll expand on this framework to measure circulatory strain, ECG, and blood oxygen levels to screen a patient's health and also improve the framework so that message can be sent via WhatsApp or other social messaging platforms. With the aid of AI, computation could do numerous miracles in the field of science. Locating the illness was made easier for health care personnel, allowing for timely administration of medication. As we may be aware with the Covid-19 situation, experts and clinical services personnel are very interested in Covid-19 patients and are unable to examine patients who are experiencing fever, influenza, and other symptoms. People can use this method to perform their routine checks while relaxing at home and may find proactive ways to protect themselves from this event.

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