Prediction and Detection of Heart Attack using Ai and ML Technology

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ABSTRACT

In recent years a wide range of wearable IOT healthcare application have been developed and deployed. The rapid increases wearable devices allows the transfer of patients health information between different devices, but the difficulty is in predicting and detecting of health status. The introduced system includes patients observing units, cloud for information maintenance and secure. By using some equipment units, different sensors and gadgets with networking association. The sensors that are used for sensing and monitoring will send the data; keep track of the regular health status of patients and we used ML and AI technology for predicting and detecting of heart attack.

Keywords: IOT, ML, Healthcare, ECG, Temperature, Sensors.

1. INTRODUCTION

Internet of things (IoT) has been a path breaking technology backed by many handshaking research areas to establish a high-end connectivity and communication between several mutually related devices to share information and interact, toward a better user experience. In the field of healthcare, the task of IoT is not only to offer a truly efficient and personalized healthcare to the users but also to redefine the healthcare system by connecting all the stakeholders and the state-of-art technologies making the most of the information shared across the closely communicating devices using the IoT platform.

The internet of things in healthcare plays a major role in providing ease to patient and

doctors. It consist of system that communicates between network connected system, applications and devices that can help patients and doctors to monitor, track and record patients 'vital data and medical information. Some of the devices include sensors, wifi modules that are connected to mobiles. Applications of smart phones also help to keeping a medical record with real time alerts and emergency services. These interconnected IoT devices produce large amount of data and information that should be dealt efficiently by the provider and so is a big challenge.

The IoT technique is implemented to overcome the challenges of predicting, detecting, analysing and classifying the data. In this case, unlimited number of patients for a large period of time has become very fast and easy using the potential of IoT. The power of IoT for health and medical services are harnessed by sensors which accurately measures, monitors and analyze a variety of health status indicators. These can include basic vital health signs such as pulse rate and temperature.

2. RELATED WORK

In the year 2017 "IoT Clinic-Internet based Patient Monitoring and Diagnosis System" by Niharika Kumar[1]. They proposed a various components of a healthcare system and the different hardware architecture and the sensors being used to develop the ecosystem and provide treatment on time. Traditional healthcare system involves autonomous medical devices providing specific healthcare facilities. These Systems are generally installed at either healthcare centers or at the hospitals. Patients have to visit these medical centers to healthcare services.

In the year 2018 "IoT based Mobile Healthcare System for Human Activity Recognition" by Abdulhamit Subasi, Mariam Radhwan, Rabea kurdi Kholoud Khateeb[2]. They proposed a accomplished through the help of introducing smart phones, health checking gadgets, smart IoT, and individual computerized collaborators in the health. In the modern healthcare application the usage of IoT technologies brings physicians and patients together for automated and intelligent daily activity monitoring for elderly people.

In the year 2017 "Complexity of Cyber Security Architecture for IoT Healthcare Industry: A Comparative Study" by Aysha K, Alharam and Wael El-madany[3]. They proposed discuss the complexity issue of

cyber security architecture for IoT based healthcare system. The objective of the study is for protecting healthcare industry from cyber attacks focusing on IoT based healthcare devices. The IP core architecture is considered to have more advantages compared to other architecture.

In the year 2017 “Modelling of Healthcare IoT using the Queuing Theory” by Anastasiia, strielkina, Dmytro Uzun, Vyacheslav Kharchenko[4]. They proposed In this paper, we discussed opportunities and prospects for the IoT application in the field of healthcare. A healthcare IoT infrastructure with a brief description of each component is presented. These components are a device with a reader, cloud, healthcare provider and communication channel. Justification of applicability of the Queueing Theory.

In the year 2017 “A smart IoT platform for personalized healthcaremonitoring using semantic technologies” by Ahmed Dridi, Salma Sassi, Sami Faiz [5]. They proposed a new IoT-based platform for personalized healthcare monitoring has been proposed, where, the problems of data interoperability, integration, visualization and confidentiality are addressed. The ultimate goal of achieving high quality of healthcare practices depends on the ability to effectively integrate data incoming from heterogeneous sources, share the collected data while keeping their security and privacy, use powerful data analytics tools to extract useful information from these data, and the ability to have an expressive and personalized visualization.

ARDUINO:

Arduino is an open source hardware and software company, project and user community that designs and manufactures single board microcontroller kits for building digital devices and interactive objects that seen and control objects in the physical and digital world. The board is equipped with sets of digital and analog input/output (I/O) Pins that may be interfaced to various expansion boards (shields) and other circuits. The boards has 14 digital pins, 6 Analog pins, and programmable with the Arduino IDE (integrated development environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts

DATA MINING:

Data mining is that the method of discovering patterns in giant information sets involving strategies at the intersection of machine learning, statistics and information system. Data processing is associate knowledge domain subfield of engineering science associated statistics with an overall goal to extract data from a dataset and remodel the knowledge into a plain structure for any use.{Data mining | data method}is that the analysis step of the data discovery in information process or kdd. The distinction between information analysis and data processing is that information analysis is employed to check models and hypothesis on dataset example analysing the effectiveness of a promoting campaign, notwithstanding the quantity of information in distinction data processing uses machine learning and applied mathematics models to uncover clock-and-dagger or hidden patterns in an exceedingly giant volume of information. The term data processing is in fact a name as a result of the goal is that the extraction of patterns and data from and huge quantity of information not the extraction of information itself. It is also a buzzward and is usually applied to any type of giant scale information or informatics further as any application of pc call supporting system, as well as and business intelligence.

3. PROPOSED METHODOLOGY

In the proposed method we are acquiring the data from sensors and store it in mlab. This system is an IoT based health monitoring system which collect all the medical data of a patient including his heart rate, temperature and ECG and would send the data to the patient's doctor regarding his full medical information, providing a reliable and fast healthcare service and also able to predict the heart attack using AI technology. There are three sensors in this system and they are:

- Pulse sensor
- Temperature sensor
- ECG sensor

These sensors are attached to the patient's body and interfaced to the Arduino. The information are collected using sensors and then stored in the cloud and then the data transferred to the android system using wifi module.

Fig 3.1 Architectural diagram

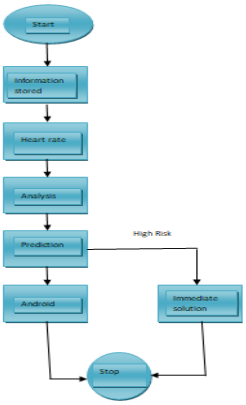


Fig 3.2 Flow Chart

ID3 Algorithm:

1) Calculate the entropy of every attribute α of the data set D.
2) Partition the set D into subsets using the attribute for which the resulting entropy after splitting is minimized or equivalent information gain is maximum.
3) Make decision tree node containing that attribute.
4) Recur on subsets using remaining attributes.

Bayesian Network:

1) Bayesian network is a simple graphical notation for conditional independence assumption
2) Each variable is represented by a node.
3) The edges connecting the nodes show the dependency relation between the variables.
4) The resultant graph is a DAG that represents the probability distribution of data over a set of variables.

   More precisely,
5) If A1, A2….. An are the random variables, where each variable Ai can take a set of values X (Ai).
6) Each item corresponds to one of the possible assignments of values to the tuple of variables <A1,A2…..AN>

7) The probability distribution over this joint space is called the joint probability distribution

   Hence, a BBN describes the joint probability distribution over the set of variables. It is a graphical model of casual relationship cause and effect.

Apriori Algorithm:

Apriori(X, ε)

Y1←{large 1 – item sets}

k←2

While Yk-1 ≠ Ø

Bk ←{b = α ∪{c}| α ∈ Yk-1 ∧ c ∉ α,{s ⊆ b||s|=k-1} ⊆ Yk-1}

for transaction x∈X

Dx←{b ∈ Bk| b⊆x}

for candidates b∈Dx

Count[b]←count[b]+1

Yk←{b∈Bk| count[b]>= ε}

k←k+1

return **U**Yk

4.RESULT AND ANALYSIS

- Detect as well as predict heart attack
- Helps old age people for regular checkups
- Working people can easily carry with themselves
- Status of the patient's health is updated doctors and patient's family regularly.

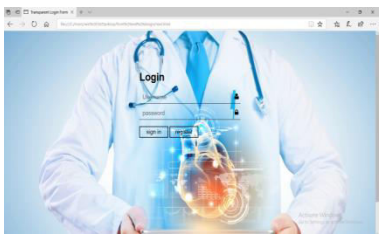


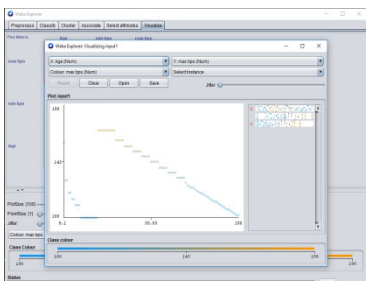
Fig4.2 sign in page

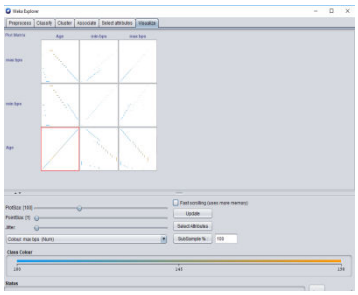
Age	Min	Max
1 month	70	190
1 to 11 month	80	160
1 to 2 year	80	130
3 to 4 year	80	120
5 to 6 year	75	115
7 to 9 year	70	110
Over 10 year	60	100
Over 20 year	100	170
Over 30 year	95	162
Over 35 year	93	157
Over 40 year	90	153
Over 45 year	88	149
Over 50 year	85	145

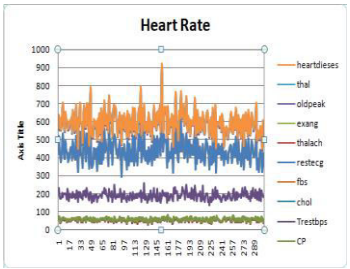
Table 4.1 heartbeat range according to age

Fig4.3 registration page

Result Analysis







CP: Chest Pain

Trestbps: Resting Blood Pressure

Chol: Serum Cholesterol In Mg/Dl

fbs: Fasting Blood Sugar

restecg: Resting Electrocardiography

thalach: Maximum Heart Rate Achieved

exang: Exercise Induced Angina

oldpeak = ST depression induced by exercise relative to rest

thal: 3 = normal; 6 = fixed defect; 7 = reversible defect

5. CONCLUSION

The paper reports an IOT based system for heart attack prediction and detection. We are using AI and ML technology to predict and detect heart attack. Arduino board is used which is a low cost solution for the possessing purpose. IOT technology integrates patients, doctor and is most useful for the people located in rural areas and do not have the resources to make frequent hospital visits.

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