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Internet of Things with Data Mining

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ABSTRACT

The Internet of Things is a very fast growing field. It is a connection of several devices which work together in order to store and process large amount of data. IoT is a new paradigm and is a technology that currently advancing at jet speed. IoT has been playing an essential role ever since it appeared, which covers traditional equipment. It has become an important research domain as many devices and their applications. To make IoT smarter, we use many analysis technologies. The most common technology is Data Mining. Data mining is a technology to enable data exploration, data analysis, and visualisation of data at a high level of abstraction.

Keywords: Internet of Things, Data mining, Smart city application, Data cleaning, Data integration, Data Transformation, Data mining process

1. Introduction

IoT refers to a system of internet-connected objects that gather and transfer data over a wireless network without human mediate. It plays an essential role in smart homes and smart devices. Things have evolved due to the joining of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. The Massachusetts Institute of Technology (MIT) put forward the concept of IoT. IoT is described as data and things around the clock connected through the Internet. The IoT also views everything as the same, as things. Enormous amount of data in the world today has been created in the last two years alone and with new devices, sensors, and technologies emerging the data growth rate will rapidly increase. Big data architectures in the cloud, acts as a distributed system for efficiently storing and processing this data. Data from IoT devices and gadgets are moved into big data platforms inside the cloud and then processed to get insights. The analytical skills for extracting insights out of the data are nothing but machine learning algorithms, where we train the system to extract insights as well as predict outcomes from the following data.

The real challenge of the Internet of Things environment is how to analyze the massive amount of information from all sources and take action in real-time. Data mining is about processing the data and extracting the values from the data and relevant insights out of it. The main purpose of data mining is to detect trends, by gathering information about the product and service we will predict various outcomes and finally model the data. It helps us to understand customer aspects. Data Mining refers to the extraction of data stored in the databases. The Knowledge Discovery in Databases process comprises of a few steps leading from raw data collection to form new knowledge. It involves the following steps:

- *Data Cleaning:* It will remove all the unwanted data and files from the databases.
- *Data Integration:* In this, we can put multiple data sources into a single source.
- *Data Transformation:* Here, for the mining process, we will transform the selected data into appropriate forms for the mining procedure.
- *Data Mining:* This is the crucial phase. In this phase, we apply intelligent techniques to extract useful patterns.
- *Pattern Evaluation:* In this step, interesting patterns which represents the knowledge are found based on given measures.
- *Knowledge representation:* This is the final phase. This step uses visualization techniques to help users understand and interpret the data mining results.

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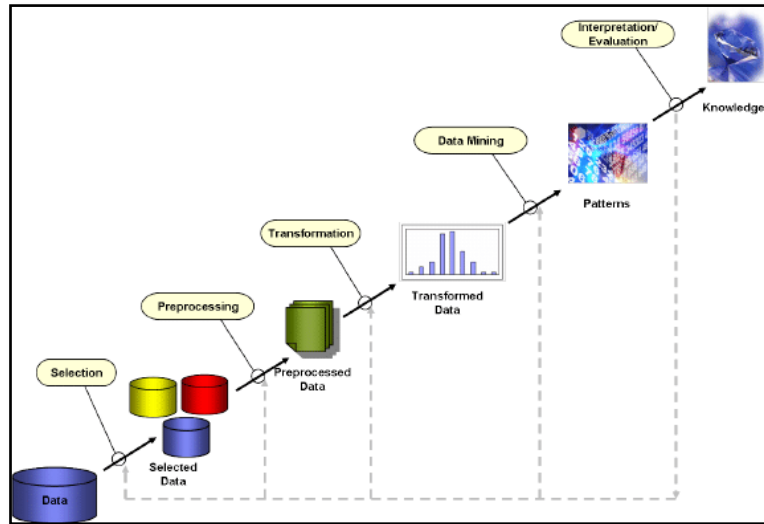


Fig. 1 –Data mining architecture

2. Application of IoT with Data Mining

2.1 Smart City Application

Smart cities can be used in multiple areas. They can give us a healthy environment, improve the traffic light for the safety of the public, and also improve the street lights.

2.1.1 Traffic Control

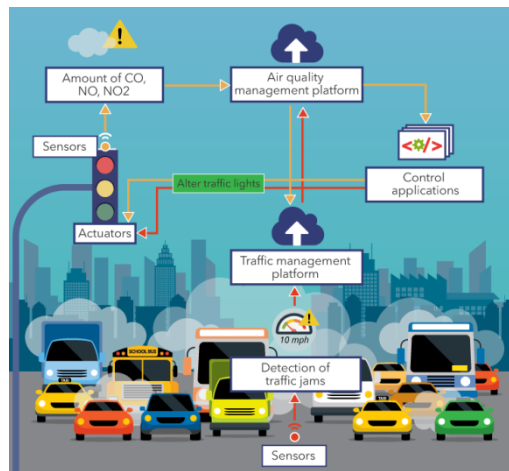


Fig.2- IoT for smart cities-use cases and implementation

Smart cities have to ensure their city should be safe. For that, they implement IoT development to develop smart devices. For determining the number speed and location of the vehicle, smart devices use different sensors to fetch the GPS of the user mobile phone. We can serve smart devices, sensors, mobile phones as data points and by evaluating these data points, we can find the accident prone areas, construction areas, and traffic areas easily. The traffic lights are connected to the cloud management system and they control the traffic lights system to reduce traffic congestion. By using the classification algorithm we can solve traffic blockage. We classify the areas based on the chances of traffic jam incidents in an area. We will predict at which time in a day the traffic occurs and everything.

2.1.2 Smart Home Applications

Smart Home can be defined as a home, an environment for living with high advanced automatic systems. IoT plays a major role such that every object of our day to day life can be connected to the Internet.

An IoT based Smart Home enabled various things such as lighting, PC hardware, electronic home appliances, security camera etc. All these technological developments allow users to monitor things regardless of the constraints such as time and location.

Hence for implementation, this paper proposed a method named Frugal Labs IoT Platform (FLIP) for building IoT enabled Smart Home. This system introduces FLIP architecture for the implementation of Smart Home Services. It's a completely open source platform that aims at developers, DIYers, Hobbyists who want to learn and work on IoT platform to transform their "IDEA" to "PROOF OF CONCEPT". For that the users just need to flip the Smart Home Kit to develop a Home Automation based IoT product and then implement it to a real time system.

2.1.3 Health Care Applications

IoT provides application for health care services as well. A new measure has been introduced to monitor patient's health care by collecting patient's health data and enabling real-time monitoring. This data is a thread for healthcare specialist to improve patient's health and providing opportunities for improving healthcare operations. By the act of intelligent data collection, we can analyse the lifestyle factors and activities of a person, possible to study the disease and predict abnormal health conditions. Hence to analyse the case, the Convolution Neutral Network (CNN) model has been proposed. This proposed model can accurately detect the disease even from an unstructured medical health record through a network structure. In this framework, a CNN-pattern discovery model has been used for classification. At first, most common health related factors has been selected and then an analysis has been conducted to classify them positively and negatively. The output of the model has been subdivided under parameters related to obesity, Blood pressure and diabetes.

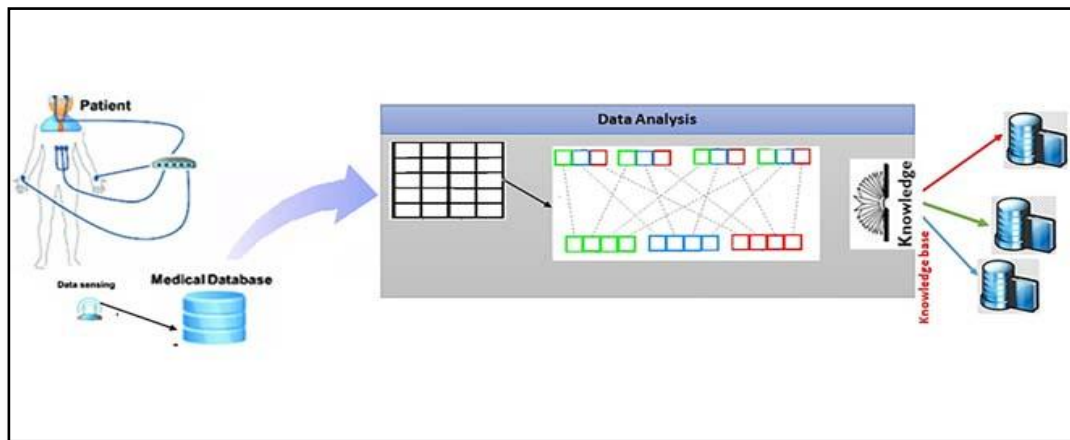


Fig. 3-Iot in healthcare application

The conclusions show up that how the proposed model has resulted in better accuracy and reduced manipulation load than compared to other technical methods.

3. Data Mining Process

Data mining is mainly a 5- step process. These steps are as follows:

1. First we need do identify the source of information.
2. Next we need to pick the data that is to be analyzed.
3. Extract the appropriate information from the data.
4. After that identify the key values from it.
5. Analyze and report the results.

4. Challenges of IoT

A massive amount of data must be analyzed in IoT. The data collected must be passed shared among several devices. For this reason, the data should be scalable. The data must be stored in cloud storage for future references. Another main challenge faced by IoT is the lack of government support. The government should set up rules and regulations for the security of sensitive data. When wearable devices are developed by IoT for patients any error in the devices can harm the life of the patients. IoT does not ensure the safety of confidential data. The integrity and security of data should not be compromised. Design based challenge is also faced by IoT. As large amount of data needs to be processed, it needs a computer with high computation speed and large memory capacity.

5. Conclusion

Streaming in an era of Internet Of Things, there arises a need to manage and automate all devices in the world. As time goes on, a number of data will be generated and collected from different devices. This vast stream of data can be used in real time decision making and for future analytics. Hence data mining concept has been introduced which is then integrated with IoT technologies for decision making and device optimization. It involves the concept of using data and applying several algorithmtechniques for the extraction of hidden information.

Nowadays, big data is a tough topic for IoT and data mining and as a result, IoT architecture has been established for the large and flowing data. Later IoT applied discovery and framework in this paper and finally, IoT and its tools has been introduced with a set of commonly used tools.

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