Challenges Smartphone’s Big Data in HealthCare Systems

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Abstract

Smartphones and wearable devices offer promising perspectives for processing and collecting velocity, variety, and high-quality data in healthcare scenarios. Collecting, investigating, analyze, and mining health data to generate individual and public health rules. These rules will measure and enhance the quality of everyday life. However current health systems are limited on their local data collection. As the current big data is so underutilized is because many challenges are existing. The aim of this study was to point the challenges of smartphone big data technologies and big data.

Keywords: component; Big Data; Smartphones; Internet of Things, Machine learning; Healthcare.

Introduction

One of the most famous and biggest health systems is Kaiser Permanente, with more than nine million members, it manages data since 1945 almost a forty-four petabytes of Electronic Health Record (EHR) in that system alone. All the data entry has been entered by the hospital peripherals or operatives. Yet it’s not enough to generate health rules, distinguish between the good/bad life style, or to give notifications about the member health status outside the hospital.

Smartphone and wearable devices are the most carried devices by adults as well as kids, along with increasing number of sensors became the most vital dynamic source of information [9][12]. In 2015 there were 2.6 billion smartphone subscriptions in the world, the number of smartphone users is predicted to be 6.1 billion by 2020 [6]. The last decades have seen huge advance in the amount of routinely generated and collected data from sensors and applications are giving rise to a new research domain across most

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industries and is rightly considered the entrance to become more efficient and productive, along with the technologies to analyze and understand it. [2] Mobile Data volumes is growing faster than ever before, by 2020 near to 1.7 MB of information will be created every second for every human being on the planet. [5] Data sets become complex or so large, can’t be easily stored or manipulate or analyze with traditional methods like spreadsheet, and R because of size, speed, format that encompassing the Big Data Three Vs: volume, velocity and variety [7].

Fig. 3. Three V’s of Big Data

Smartphones and wearable devices offer promising perspectives for collecting, sensing, updating, and even the ability to notify when some health rules apply. [1] Such improvement in health care system with big data is not implemented so far. This paper examines technical issues related to infrastructure, technologies and policies required.

Current Health Care’s Systems

Most of the Health care systems contain electronic health record, which represents patient’s history, diagnoses and treatments, x-rays, computed tomography (CT) scan images, and magnetic resonance imaging (MRI) images. The current big data health system has limited advantages.

First, clinical value of Big-data revolution is being used to predict epidemics, cure disease, improve quality of life avoids preventable deaths, which most done in healthcare companies where they have patient’s information recorded structurally or nonstructurally in their computers, yet it is not efficient, accurate, with limited number life parameters, as these data are not dynamic and doesn’t explain current status, habits, behavior, and patient mental status.
Second, economical value, minimizing the cost by automated services, visualization, and reduce number of human factor in the system, yet insurance fraud still possible with missing of real human associated parameters.

Gain and analysis of patient-generated smartphone data provide solution for the current healthcare big data systems.

Privacy Rule

In 1996 Health Insurance Portability and Accountability Act (HIPAA) saw the light and activated in 1999. [3][4] A set of standards for the protection of certain health information. The main goal of this rule is to assure that individuals’ health information is properly protected while allowing the flow of health information needed to provide and promote high quality health care and to protect the public’s health. While this law written with absent of current smartphone services thus some of the smartphone or (IoT) devices collected data are protected by this law. At the same time such data are so sensitive it can’t be transferred, in addition, regarding other personal data, this is a challenge that most refuse to overcome. The reason that people don’t want to share their own “daily life Big Data” is more related to personal matters and sensitive data that they have.

Otherwise, if this line is crossed, for each user will provide more data that can be analyzed so that more accurate results can be obtained. With more detailed data, comes better results.

Personal Data

Reading to the previous point, most of the new smartphones have at their hardware and software large amount of data that can generate and use it to server health system. Its available only of everyone shares it. [8]

For smartphone users, there is a difference between what is personal and public. The issue of what is personal and what is public mostly resides in the point of view of the services that they use. Statistically there is some of the persons don’t provide hospital or clinic on their actual data. convince persons to share their all their data with hospital or clinics still challenges in real life.
Dirty Data

Big data plays important role all over the world, but gaining those exclusive advantages requires having high quality data at the right time, that has become increasingly difficult to gain a clean data.

the value of big data for health decision-making purpose will be endangered if the data is not accurate or timely.

Often the data collected by hospitals’ input, mobile’s or Internet of Things (IoT)’s sensors, or user input are filled with mistakes, errors, incomplete values, duplicate data and incorrect data linking. This is referred to as dirty data.

The ability to transfer and store every piece of mobile data produces in its original form increase the problem. Dirty data costs time, processing and endanger the decision making. There are three possible ways to provide accurate big data are Cleaning and/or preventing.

First, batch processing through scripting after the data collection. Or interactively with data wrangling tools. both Data cleansing technologies consuming time; time is the second important factor in health systems, and it will lead to inaccurate decision by time.

Second, preventing dirty data by the proper preparations of establishing a structured, pattern collecting, sensor validation. That will lead to less inaccurate or false information on any forms it will transfer out. yet velocity of health Big data tends to be bursty, making it difficult to managed and predicted.

Moreover, Hybrid Health systems with data scrubbing, which is like data cleaning but more thorough, involving processes like filtering, validating, and translating. It possibly leads to consume time and processing over the decision has the same impact of standalone techniques.

Shared Data

Scientists collaboration is most to promote the knowledge generating over the collected health big data. Incase overcome all previous challenges of collecting every required clean data, still sharing these data consider as a big challenge [10]. So far no one Fig.d out how share such dynamic big data, or specify the required data.
Techniques

Big Data techniques starts with Mining, pattern recognition, natural language processing, visual analysis and all mathematical analytics and algorithmic based processing of data resources to generate descriptive, predictive and prescriptive models to analyze and derive insight from unstructured, semi-structured, and structured text data [11] [13]. While The growth of the 3v’s of Smartphone data will continue to pose challenges with real-time techniques. It required techniques with ability to handle the different forms of the data all within reasonable time frames; such techniques of tools and services for generating integrated meaningful data with visualization are still required.

Appropriate Data

Collecting all smartphones’ sensing and data doesn’t necessarily lead to actionable insights, adding, the limitations of existing Data Analytics Architecture as only 10% of the ~ 2 petabytes of data is available for mining while 90% of ~2 petabytes of data are not opened nor analyzed properly resulting in premature data death. [14]

One of the data science challenges is to pinpoint a clear objective and the appropriate data sources to collect and analyze to meet up the objective, however. Once key patterns have been identified, Smartphone data collection must be prepared to act and make necessary changes in order to derive heath rule value from them.

Conclusion

To adept smartphone data in healthcare system requires tuning the policies, infrastructure and technologies to meet such complexity and maintaining stewardship and privacy. These challenges go beyond the big data’s nature and features. One of the potential solutions is address some of these challenges at smartphone itself by generating timely filtered structured data entry to healthcare systems.

References


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