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Big Data Analytics in Healthcare using Google Cloud

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Abstract: ***The health care domain has undergone transformational change in the 21st century. The integration of new kinds of digital technologies has been acting as a catalyst. Big Data Analytics serves as a promising technology that has considerably changed how diverse functions are carried out in the health care discipline. It encompasses the integration as well as analysis of a humongous volume of data such as electronic health records, biomedical data and omics data [1]. The emphasis of the research is on Google Cloud and how it has been contributing to the health domain by evolving the health care paradigm and progressing research at scale and empowering diverse stakeholders to transform and innovate [2].***

Keywords: Big Data Analytics in health care, Google Cloud, enhanced patient care, leveraging technology, better health.

I. INTRODUCTION

The relevance of Big Data Analytics in the health domain has magnified in the digitalised era. Since a large volume of data is available online, the reliance on technology, especially Big Data Analytics has increased. The innovative technology enables health care professionals to investigate the growing velocity, volume and variety of data to get a detailed insight [3]. The application of Big Data Analytics not only helps to understand data in a simpler manner but also creates opportunities to integrate new technologies in health management as well as the treatment of patients [4]. Google Cloud is one of the key service providers that has succeeded in making its mark in the evolving health care domain. The distinctive features offered by Google Cloud, such as Pub/Sub services, BigQuery and Dataproc, have empowered health professionals to leverage Big Data Analytics to an optimum extent. In the ever-changing health setting the solutions of Google Cloud are considered to be highly valuable since they are aligned with the current health care needs and wants [2]. The innovative solutions are gaining popularity since they have the potential to enhance patient care, offer personalised and advanced care and minimise medical spending [5].

II. BIG DATA ANALYTICS OF GOOGLE CLOUD IN HEALTH CARE

The health care needs of people have undergone significant change in the past few years. It has increased the need to rely on an efficient technology provider that can enable health care organisations to conduct their functions effectively and efficiently. Google Cloud offers a diverse range of technical features that allow health care facilities to capitalise on the Big Data Analytics technology to the fullest. One of the distinctive features of Google Cloud is Pub/Sub. It enables health service providers to engage asynchronously. The ability to stream analytics and ingest and disseminate health-related data enables physicians and health care practitioners to make informed and timely health-related decisions for patients [2]. Similarly, BigQuery serves as an efficient, serverless, cost-effective and highly scalable clouds warehouse that promotes agility of health care organisations. Health care professionals can store medical data in BigQuery and conduct analytics [6]. Dataproc is another useful service of Google Cloud that is of high relevance in the health care domain. The highly scalable and fully managed service supports secure data science, data lake modernisation and ETC (extract, transform and load) functions. The integration of Google Cloud services has revolutionised the health domain by creating value in diverse areas. Fig. 1 highlights how BigQuery, Google's data warehouse, can be used for visualizing data using Google's report/ dashboard instrument known as Data Studio.

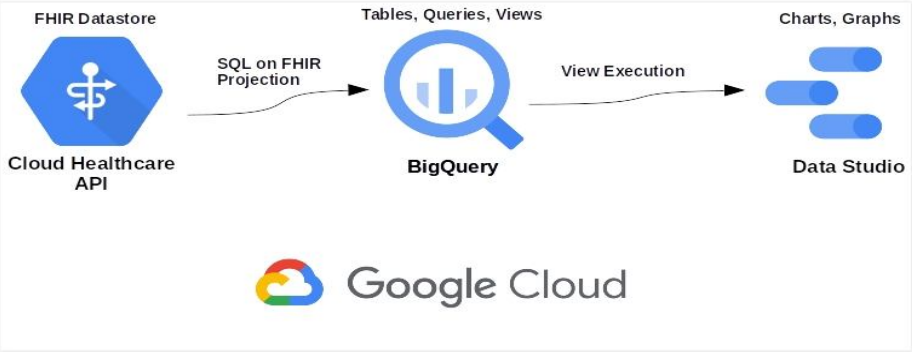


FIG. 1 Use of BigQuery in Health care

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A. Role of Google Cloud

The Big Data Analytics solution by Google Cloud has been bringing about transformational change in diverse health-related areas. Some of the distinctive features of the technology-based solution include the provision of secured and ongoing patient care, improved ability of health care practitioners and professionals to use collaborative and productivity tools, and the ability to make data-driven clinical decisions that have a direct impact on the health outcome of patients [6]. In recent times, health care facilities have been integrating the cloud solutions by Google in order to capitalise on the latest technologies and better comply with relevant laws such as HIPAA.

III. AREAS OF APPLICATION OF BIG DATA ANALYTICS IN HEALTH CARE

Even though the digital services of Google Cloud are fairly new in the health domain, they are being applied in diverse areas so that value for both health care service providers and health care service users can be improved. Google Cloud serves as one of the best-in-class analytical tools that allow health care organisations to realise their full potential in varying areas starting from patient care, research and development activities, maintaining administrative records to enhancing engagement between providers and patients. In the current times, the rapidly growing and heterogeneous nature of medical data poses new kinds of challenges for health care professional [7]. However, the Big Data Analytics solutions of Google Cloud help to address the challenges by integrating innovative solutions in the field of health care. The cloud computing solutions facilitate diverse Big Data operations via the provision of large storage along with processing power [8].

A. Solving Opioid Abuse

In the U.S, the instances of drug abuse have become quite common, which increases the vulnerability of the general public. The drugs that have been included in Schedule II, III and IV of the Controlled Substances Act (CSA) can be obtained through prescription and could be misused or abused. Opioids, belonging to Schedule II category is one of the most commonly abused drugs in the nation. Big Data Analytics serves as a useful instrument for tackling the abuse of opioids. The use of real-time data analytics tools helps health care professionals to keep track of drug misuse by individuals. The current opioid epidemic in the nation has led to the use of big data on individuals suffering from opioid use disorder [9].

The use of Big Data Analytics gives useful digital insights to health care professionals relating to the misuse of opioids. The Google Cloud solution enables professionals to analyse real-time and intelligent data for revealing the vulnerabilities of diverse sections of society. The data is being used for making predictions and making coordinated efforts to extend help to people who are addicted to opioids.

B. Improving Supply Chain of Drugs

The timely and accurate supply of medication and drugs to health care facilities, hospitals, clinics and pharmacists has a significant implication on the health outcome of individuals. The timely access to proper medication can save lives, whereas the inaccessibility to necessary drugs can be life-threatening. Big Data Analytics has been playing a key role in streamlining the supply chain activities that take place in the health care domain. The application of data analytics has been identified as the state-of-the-art technology that has revolutionised supply chain networking operations in the medical domain [10]. The collection of a large volume of data at diverse stages of value chain gives an insight into the real-world usage of drugs. It helps to identify when the shortage of specific drugs might arise in the market and thus allows supply participants to ensure there is consistent availability of necessary drugs and medicines for the general public to meet their health needs.

C. Prescription Processing

In the health care domain, prescriptions contain useful information that might be of high use to evaluate the medical history of patients and get a detailed insight into payer-provider data. The application of Big Data Analytics has simplified the prescription processing activity by integrating automation and reducing the reliance on manual processes [11]. For example, the integration of the Google Cloud solutions has been allowing health care professionals to understand whether prescribed drugs are being inappropriately used or not [12]. The application of the technology has simplified how a large volume of data captured in the prescriptions of patients is used for identifying specific patterns and trends relating to the use of medicines, the payable amount, etc. As details contained in prescriptions are typically unstructured, they pose unique challenges. The application of Big Data Analytics has made it possible to handle information that is presented in the unstructured format and present a clear and comprehensible picture to health care professionals and pharmacists.

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D. Improvement in Insurance Claims Processing and Efficient Customer Returns

Big Data Analytics has been playing an instrumental role in streamlining insurance-related activities and processes. For instance, the solution provided by Google Cloud can be used in order to flag insurance claims for detailed inspections, priority handling and other activities.

The accessibility to a humongous volume of data has simplified the insurance ecosystem in the health care domain. One of the main advantages is the improved speed as well as efficiency relating to the claims processing activity. The integration of technology at key steps has made it possible to have better control over data in the claims process.

It has become easier to identify claim patterns, perform analysis of overpayments by patients, detect suspicious behaviour and enhance the existing health care plan of individuals. Currently, health and insurance claims are considered to be one of the most valuable sources of data for health analytics since they can be used for estimating disease burden, processing claims and evaluating the proper application of insurance policies [13].

E. Identification of Fraud and Inaccurate Claims

The instances of fraudulent and malicious activities are not uncommon in the health care setting. Patients rely on the health insurance that is provided by the government as well as private systems to avail costly health care expenses [14]. However, there are individuals who try to take part in fraudulent activities to gain an excessive advantage by falsifying their insurance claims. The application of Big Data Analytics makes it possible to have a better control over such kinds of fraudulent activities due to the streamlining of identification techniques.

The Big Data Analytics solution by Google Cloud opens up an entirely new dimension of analytics, thereby offering a clear picture of the accuracy and truthfulness of insurance claims. The application of Big Data technology is considered to be a promising insurance innovation that helps in solving information asymmetry and correctly classifying the general public as per their actual health situation [15].

Moreover, the technology can even help in making data-driven predictions pertaining to insurance claim frauds and save money worth millions of dollars.

F. Enhancement in Patient Care

Big Data Analytics has brought about a major change in the health care domain by positively impacting the health outcome of patients through better quality of care. The application of the innovative technology in the medical field has made it possible for health care practitioners to make the strategic use of health data from a diverse range of sources such as electronic health records (EHR), data from wearable devices, payer records, pharmaceutical information, and many more. The collection of data from abundant sources gives a comprehensive insight into the health condition of patients. This information can be used in order to offer value-based care to patients that are aligned with their specific health needs [16]. For example, the application of Google Cloud solutions in the health care domain has been revolutionising the process of diagnostics, medical research, and the implementation of an integrated care plan. Furthermore, the application of Big Data Analytics helps in minimising the possibility of adverse medical events, thus positively impacting the health condition of vulnerable individuals. The availability of refined and insightful data has been enabling health care professionals to make timely, accurate and information-oriented health decisions in a collaborative manner which leads to enhanced quality of care.

G. Improvement in Operational and Clinical Analytics

The Big Data Analytics solution of Google Cloud has brought about remarkable change, especially in terms of decisions that are made in the health care domain.

With the help of the innovative tool, professionals in the health care setting are able to make data-driven decisions that have implications on them as well as health care service users. The AI-powered analytics facilitates timelier decisions which ultimately leads to the optimization of the care pathway. The healthcare API that is offered by Google supports data liquidity and thus, health care entities are in a position to leverage technology efficiently, and securely. The distinctive feature of Google Cloud is considered to be a useful tool in the health domain since it offers physicians valuable information in an actionable window and enables them to make meaning actions for patients. Moreover, the Healthcare API Management component that is offered by Google Cloud makes it simpler for health care service providers, application developers and data partners in the health domain to collaboratively work for building new Fast Healthcare Interoperability Resources (FHIR) API-oriented digital solutions.

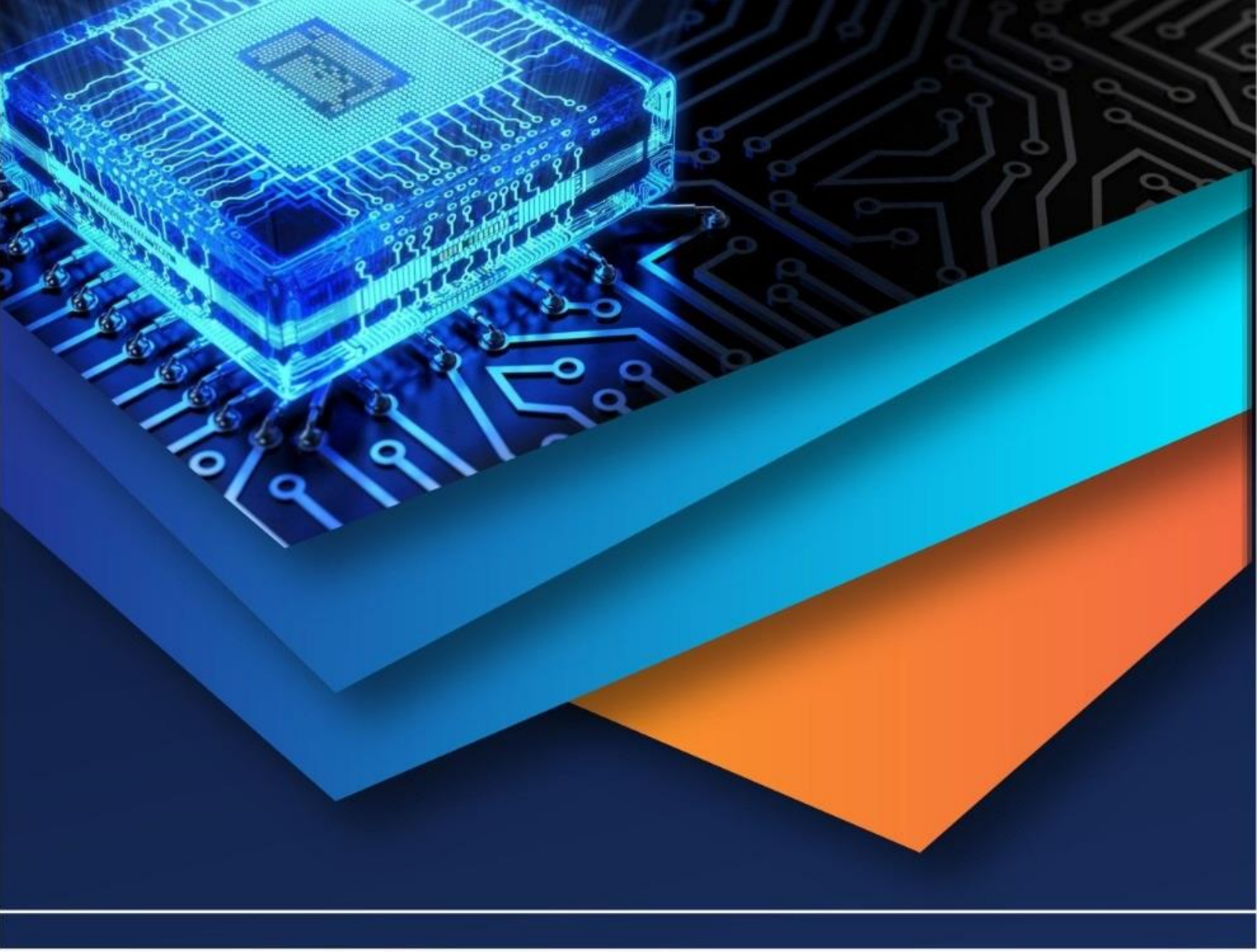
IV. CONCLUSION

The integration of Big Data Analytics in the health care domain has led to significant changes. The innovative solutions that are offered by Google Cloud have made it possible for hospitals, clinics and health care facilities to leverage technology and improve how they function. The application of the promising technology has led to improvement in diverse areas such as better patient care, solving the instances of drug abuse, such as opioids, automated prescription processing and identification of fraudulent elements in the insurance ecosystem of health care. Some of the distinctive features of Google Cloud that have helped in streamlining large volumes of data in the health care environment are Pub/Sub services, BigQuery and Dataproc. Such technology-oriented features have been playing a key role in transforming raw and unintelligent data into its refined and intelligent form.

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