



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Special Issue 2, December 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.569

A Review: Data Science in Healthcare Industry

J.Lilly Roseline Mary ¹, G.Evanjalin Indra ²

Assistant Professor, Parvathy's Arts and Science College, Dindigul, TamilNadu, India ¹

Assistant Professor, Parvathy's Arts and Science College, Dindigul, TamilNadu, India ²

ABSTRACT: Data science expertise is focused on working with large sets of statistics in order to derive meaningful and logical results. It's a rebel discipline that encompasses a variety of operations, like as statistics mining and analysis. It simplifies the arena's vision, forecasts problems, and provides solutions. Rapid prediction and analysis of problems is crucial in the healthcare industry in order to preserve human life. This study examines statistics technology know-how in the healthcare industry, including its methodology, difficulties, and solutions to such challenges.

KEYWORDS: Healthcare Industry, Data Science, Technique, Mining, Analysis And Challenges Issues.

I. INTRODUCTION

Data Science is an interdisciplinary field concerned with extracting knowledge from massive data sets. This career entails data analysis, data processing, and presentation of findings to inform high-level decisions in an organisation. As a result, it brings together skills in computer science, mathematics, statistics, information visualisation, graphic design, and business.

Data Science is fast expanding to encompass all of the world's sectors today. We'll learn how data science is transforming the healthcare industry in this topic. We'll learn about the foundations of knowledge science and how they're applied in health and biotechnology. Medicine and healthcare are two of the most vital aspects of our life as humans. Medicine has traditionally relied completely on the discretion advised by doctors. A doctor, for example, would have to recommend therapies that supported a patient's complaints. However, this wasn't always the case, and it was prone to human mistake. However, with improvements in computers and, in particular, Data Science, precise diagnostic measures are now possible. Medical imaging, drug discovery, genetics, predictive diagnosis, and a variety of other fields in healthcare make use of knowledge science.

The purpose of this paper is to discuss data science-based technologies used in healthcare monitoring. Also, discuss the benefits and drawbacks of algorithms-based technologies from a variety of perspectives. This paper makes the following contributions: we present the state of the art in data science used in healthcare applications introduced over the last decade and discuss their security flaws. We take a broad look at the potential security threats that could pose a risk within healthcare applications, including patient privacy concerns.

The rest of the survey is structured as follows: Section 2 provides an overview of healthcare applications. Section 3 discusses the technologies used in healthcare monitoring applications, Section 4 discusses design challenges in healthcare monitoring using data science, and Section 5 draws conclusions for data science in healthcare applications.

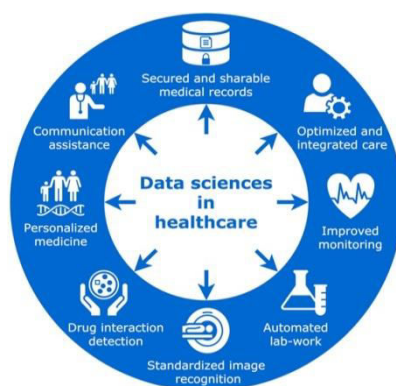


Figure 1: Application of data science in healthcare

15th & 16th September 2021

Organized by

Department of Computer Science, Parvathy's Arts and Science College, Dindigul, Tamilnadu, India

II. HEALTHCARE APPLICATION

Data science is a concept that combines ideas, data analysis, Machine Learning, and related methodologies in order to understand and dissect real-world events using data. It is a subfield of data analysis that encompasses topics such as data mining, statistics, and predictive analysis. It is a broad field that draws on methodologies and concepts from a variety of disciplines, including information science, statistics, mathematics, and computer science. Data Science employs machine learning, visualisation, pattern recognition, probability models, data engineering, signal processing, and other techniques.

Medical Imaging is a term that refers to the Medical imaging is the most common application of knowledge science in the health industry. Imaging techniques include X-rays, MRIs, and CT scans. All of these techniques allow you to peer inside the human body. Previously, doctors would physically examine these images for any anomalies. Finding tiny defects, on the other hand, was sometimes difficult, and doctors were unable to provide an accurate diagnosis as a result. Deep learning tools in data science have now enabled the detection of such minor flaws in scanned photos. Support Vector Machines are another image processing technique that can be used for image recognition, enhancement, and reconstruction.

Predictive Analytics in Healthcare: Healthcare is an important domain for predictive analytics. It is one of the most frequently debated topics in the field of health analytics. A predictive model uses previous data to learn from it, discover trends, and make accurate forecasts. It searches for various associations and correlations between symptoms, behaviours, and diseases before making relevant predictions. Predictive analytics is assisting in the improvement of patient care, chronic illness management, and the efficiency of supply chains and logistics. Population health management is becoming increasingly popular in the field of predictive analytics. It's a data-driven approach to disease prevention that focuses on society's most common diseases. Hospitals can use data science to predict a patient's health deterioration and provide preventive measures and early treatment to help reduce the risk of the patient's health deterioration worsening further. Predictive analytics can also be used to keep track of hospital and pharmacy logistical supplies.

Keeping an Eye on Patients' Health: Data science is critical in the Internet of Things (Internet of Things). These Internet of Things devices, which are available as wearable devices, monitor the user's heart rate, temperature, and other medical indicators. Data science is used to analyse previously collected data. Using analytical instruments, doctors can keep track of their patients' circadian cycle, blood pressure, and calorie intake. Doctors can monitor a patient's health using both home devices and wearable monitoring sensors. There are numerous systems for chronically ill patients that track their movements, monitor their physical parameters, and analyse data patterns. It employs real-time analytics to predict whether or not the patient will have a problem based on their current condition. It also assists clinicians in making the best decisions to help patients in distress.

Drug Research: As the world's population grows, new issues in the human body emerge on a regular basis. This could be due to a lack of proper food, a mental disorder, pollution, physical illnesses, and so on. It is now a challenge for medical research institutes to find medicines or vaccines for diseases in a short period of time. Because researchers need to understand the characteristics of the causative agent in order to find a formula for a drug, many test cases will be required. Following the discovery of a formula, the researchers must conduct tests. Disease Monitoring and Prevention: Data Science is critical in monitoring patients' health and informing them of the steps that must be taken to prevent diseases from developing. To detect chronic diseases early on, data scientists are using sophisticated predictive analytics. Diseases are often missed at an early stage in many extreme cases due to their insignificance. This is not only harmful to the patient's health, but it is also detrimental to the company's bottom line. The cost of treating the illness rises as the disease spreads. As a result, data science plays an important role in reducing healthcare costs.

AI has aided in the early detection of diseases on numerous occasions. The University of Campinas in Brazil has developed an artificial intelligence platform that can detect Zika infection using metabolic markers. A number of other companies, including IQity, are using machine learning to diagnose autoimmune diseases.

Genomics Data Science: Genomics is one of the most fascinating areas of study in life science. It is the study of the sequencing and examination of genomes containing genes and DNA from living beings. The study of organisms' genes enables high-level treatments.

The goal of genomics research is to identify the characteristics and irregularities in DNAs. It also aids in the discovery of a link between a disease, its symptoms, and the health of the person affected. Furthermore, genomics research includes the examination of drug response for a specific type of DNA.

15th & 16th September 2021

Organized by

Department of Computer Science, Parvathy's Arts and Science College, Dindigul, Tamilnadu, India

Virtual Assistance: The applications created with virtual assistance are an excellent example of the application of knowledge Science. Data Scientists have created comprehensive platforms that provide patients with a personalised experience. Data Science-based medical applications help patients identify diseases by analysing symptoms. The patient only needs to enter his or her symptoms, and the application will predict the patient's disease and condition. It will recommend precautions, medication, and, ultimately, treatment based on the patient's condition.

III. ISSUES WITH SECURITY

Many healthcare security flaws can jeopardise patient data. Electronic health records, as well as other valuable information, can easily fall into the hands of malicious individuals if proper safeguards are not in place.

Staff: Patients' files are easily accessible to employees. While the vast majority will not abuse this power, there is no guarantee that some will not steal sensitive information. Criminals can use this type of data to commit fraud, but it can also be used to intimidate or blackmail people. There are several ways for staff to steal the record. Employees may gain access to confidential financial documents and use patients' master card numbers to commit a series of fraudulent purchases in some cases.

Other employees have been caught stealing face sheets containing demographic and Social Security information, which they may then use to commit a variety of crimes.

Malware and attempted phishing: Sophisticated malware and phishing schemes that install malicious scripts or steal login credentials on a computer can compromise an entire system. One of the most difficult aspects of dealing with malware is that it only takes one seemingly-authentic link to introduce a malicious cyber presence into your network. It is critical to train employees to recognise common phishing attempts. One common scam involves emails from legitimate-looking sites requesting login information — something that reputable companies never do via email. Once a user provides that information, the hacker on the other end of the line can gain access to the system. Various viruses will mine records-related data and either automatically send it back to the first host or leave a backdoor entrance open for later use.

Vendors: Healthcare providers frequently work with vendors without first assessing the associated risk. Employees of a hospital, for example, may gain access to computers if the hospital hires a cleaning company. While patient information should be secured in ways that the average employee cannot access, it is frequently difficult to secure all points of access because cleaning and maintenance are essential to maintaining a healthy work environment.

Mobile devices that are not secure: Healthcare facilities that allow mobile logins do not always require the devices to meet security standards. Because all of the organization's planning and security do not affect staff communication devices, their networks are vulnerable to malware and hackers. This problem is exacerbated when staff disposes of equipment during an upgrade — network information or passwords may still be accessible, providing a natural entry point for criminals. Employers have little control over user devices unless the organisation establishes strict guidelines or prohibits them entirely.

Lost or stolen mobile devices: In a similar vein, lost or stolen devices pose a significant risk. When a mobile device used to access a facility's network is lost or stolen, it becomes a liability. Once in the wrong hands, the user can easily access the system by using old or stored login data. Once a criminal has gained access to a network, it can be difficult to detect their presence or seal the breach.

Online medical devices: the security of online medical devices is often lacking, making them easy targets for hackers. Previously, tools such as infusion pumps only provided information to the doctor and patient involved. However, as the Internet of Medical Things (IoMT) expands, these devices are designed to export knowledge to external sources and otherwise interact with the world outside of the doctor's office. This data could be intercepted or manipulated, causing a slew of problems. Furthermore, hackers could gain access to most network-connected items, including how the machines function.

Unrestricted computer access: Computers that are not in restricted areas are easily accessible to unauthorised personnel. If these open computers are linked to sensitive patient information, unauthorised personnel or others in the area could quickly discover damaging information. In other cases, successful phishing attempts on general-access computers allow hackers to gain access to more sensitive areas of the network. Make certain that any computer containing patient information is kept in a secure location.

Inadequate disposal of old hardware: It's easy to think that once you've deleted data, you don't have to worry about anyone accessing it. However, when users improperly dispose of hard drives, old terminals, and other hardware that is

15th & 16th September 2021

Organized by

Department of Computer Science, Parvathy's Arts and Science College, Dindigul, Tamilnadu, India

unable to connect to a network using EHRs or credentials, that information is easily accessible to criminals. Even after drives are deleted — and even reformatted — it is possible to recover this data, which means that anything saved by the user remains vulnerable.

IV. DIFFICULTIES IN DESIGN

Data Collection: A Messy Problem:

Electronic health records (EHRs) are commonly used to capture and manage data gathered during patient appointments. Personal health records (PHRs) and patient portals, as well as payer claims and reimbursement information, are additional data sources for patient profiles. The health information exchange (HIE) is yet another initiative aimed at accelerating the transfer and consolidation of knowledge among various care partners.

Aside from this, a variety of other factors may influence health outcomes. Health behaviours, socioeconomic factors, physical environment, and lifestyle are examples of such factors. Such additional data about members and their surroundings may come from third-party vendors or government sources (e.g., the Social Security Administration), which can aid in making better predictions and targeting interventions to the right patients at the right time. Wearables, fitness monitors, and on-body sensors are also data sources. Data-driven insights and proposals help to improve both quality and efficacy in health care, particularly in disease prevention and early detection in high-risk populations. As one might expect, bringing together so much data and using it to make decisions is not without difficulties. Four of the primary data challenges confronting the health care industry today are fragmented data, ever-changing data, privacy/security regulations, and patient expectations.

Fragmented Data:

Health care data is collected from a dizzying array of sources and formats, including structured data, paper, digital, pictures, videos, multimedia, and so on. The data collection and aggregation communities are equally fragmented, making data extraction and integration difficult. Data is collected by providers, payers, public health specialists, employers, social network communities, and patients, but no effort is made to unify the information. There is knowledge divergence and duplication, with no single source of truth. This results in inaccurate and incomplete health care member profiles, with little insight into a patient's well-being journey and a member's ever-changing relationship with providers, payers, pharmacies, friends, and relatives. Low adherence and high readmission risks are caused by a lack of understanding, monitoring, and support. Poor communication (particularly during the preoperative phase) frequently leads to procedure cancellation, resulting in revenue loss and inefficient resource utilisation.

Ever-changing Data:

Patients and doctors, like everyone else, move, change their names and professions, retire, and pass away. Payer organisations can also relocate, open new branches, or engage in various mergers and acquisitions. Furthermore, the introduction of new treatments, drugs, and personalised care models alters service delivery and data capture, making it difficult to keep health care data clean, complete, and current. Stale data and information latency have a direct impact on a member's experience and the viability of a provider's business. As a result, there is a delay in the adoption of new treatment options, an inadequate response to health-care programmes, and a lack of engagement and knowledge.

Privacy and Security Regulations:

Patient privacy is dependent on HIPAA2 compliance and the secure adoption of electronic health records, so data security has become critical in the health care industry. Furthermore, with ever-changing regulatory requirements, staying compliant with data sets and engagements can be difficult. Poor data quality and strategy prevent organisations from meeting new regulatory requirements and result in high audit and reporting costs. It will be difficult to improve the health of the general population until data security and compliance issues are adequately addressed.

Patient Expectations:

The health-care industry is on the verge of experiencing a similar shift to that seen in retail, banking, and hospitality. The health-care system is about to face an ideal storm. The ageing baby boomer population will put the system to the test, while pressures from millennials and Generation Z will force health care organisations to choose newer forms of engagement. Health-care organisations must prepare for a replacement in terms of age, volume, and type of members. The industry must understand members' changing needs and preferences in order to provide solutions that are compatible with their way of life.

15th & 16th September 2021

Organized by

Department of Computer Science, Parvathy's Arts and Science College, Dindigul, Tamilnadu, India

V. CONCLUSION

The advancement of technology in data science and networking technology has resulted in a variety of healthcare applications that make people's lives easier and more comfortable. Data science applications have a significant impact on patient monitoring in medical care. It is responsible for providing a pleasant environment for patients at home. The article discusses the various security issues and design challenges in data science. There are numerous healthcare applications that can monitor patients and alert physicians when they are in danger. The small size of wearable sensor devices usually has no effect on the patient's normal schedule. It is extremely difficult to design a suitable sensor network to meet the various needs of health care applications.

REFERENCES

- [1] Hercules Dalianis, Aron Henriksson, Maria Kvist¹, Sumithra Velupillai¹ and Rebecka Weegar, HEALTH BANK –A Workbench for Data Science Applications in Healthcare. Proceeding from CAiSE 2015 Industry Track.
- [2] Pankaj Khurana^{1*}, Rajeev Varshney¹, Data Science in Healthcare- Current Challenges and Opportunities . Creative Commons CC BY license. doi:10.20944/preprints202103.0425.v1 March 2021.
- [3] RusyaizilaRamli, NasriahZakaria, Putra Sumari, privacy issues in Healthcare Monitoring in data science . World academy of science, engineering and technology Vol:4 2010-12-23.
- [4] DilipChaudhary, Dr. L.M.Waghmare, Design Challenges of data science and Impact on Healthcare Application. International Journal of Latest Research in Science and Technology, Volume 3, Issue 2: Page No.110-114 ,March-April, 2019.
- [5] M. Souil and A. Bou Abdullah, .On QoS Provisioning in Context- Aware data science for Healthcare, of 20th international conference on Computer Communications and Networks (ICCCN), 2020.
- [6] GenitaGautam, BiswarajSen, Survey of different types of attack in healthcare application using data science. GenitaGautam et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 6 (1) , 2015, 770-774.



**Impact Factor:
7.569**



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details