A Study on Uses of Predictive Analytics to Improve Health Care Industry

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Abstract

The covid pandemic era has taught us about importance health care industry. The healthcare organisations have started to accept information technology, as they evolving with the pace of technology. The healthcare system collects a vast amount of data. Analytics provides tools and methodologies for extracting information from this complex and massive data set. The gathered information is transformed into data, which aids in healthcare decision-making. The application of predictive analytics aids in the accomplishment of increased service quality while also lowering costs. The gathered data is available to better analysis by using good load balancing and as few resources as feasible. To obtain prospective outcomes, data prediction analysis is conducted throughout the patient data harvest method. For patient information prediction, data aggregation from large datasets is employed. The majority of recent research aim to increase the accuracy of diagnostics for health risk by employing a commercial model aided by predictive analytics. Concerns about privacy, security issues, limited resources, and the challenge of dealing

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with vast volumes of data have all hindered predictive data analytics adoption in the healthcare business. This study examines different useful predictive analytics strategies for ailments such as heart disease, high blood pressure, and diabetes.

Key Words: Health Care, Predictive Analytics, Data Driven Decision Making, Challenges in Adoption, Diseases

Introduction

Related Papers

Anandhavalli Muniasamy et al The use of deep learning and predictive analytics in the healthcare industry is examined in the paper "Deep Learning for Predictive Analytics in Healthcare." It discusses the difficulties that the healthcare sector faces with regard to data integration, illness forecasting, and electronic record management. The authors stress how these technologies can lower healthcare costs and speed up the shift to more individualized care. The impact of deep learning on clinical decision-making and its potential applications in healthcare predictive analytics are also highlighted in this paper's discussion of deep learning's present and future trends in healthcare data analysis.

The authors give a thorough summary of the reasons behind using deep learning in healthcare, the framework for making predictions in this field, the diseases that the deep learning community is focusing on, and the resources that allow deep learning systems to produce outcomes that are clinically significant. The paper also summarizes the latest uses of deep learning models in healthcare and explains the benefits and drawbacks of these models

M. Shanthipriya et al The paper's literature review covers a broad spectrum of chronic illnesses and the various ways in which they can be predicted. For example, Archanana Bakare et al. developed a 70% precision method to predict the occurrence of diseases using data collected from social networking sites. Furthermore, Rostom Mennour et al. achieved about 80% accuracy in virtual screening for the protein receptor linked to breast cancer using machine learning algorithms. Additionally, the usefulness of data mining techniques for estimating a patient's chances of surviving and of experiencing a disease relapse is examined, with an emphasis on the application of ANN and Decision Tree algorithms for classification tasks.

The study cites additional research that expands on our understanding of predictive analytics in the healthcare sector. These studies look at the difficulties that big data presents for healthcare applications, how to use Twitter messages to detect influenza outbreaks, and how to use classification techniques to build chronic illness early-warning systems.

Kylie Watson The paper "Predictive Analytics in Health Care" discusses the growing significance of technology, particularly predictive analytics, in the healthcare sector. It draws attention to the potential benefits of predictive analytics for more accurate diagnosis and treatment, improved service delivery, and caregiver information access. The article also covers the new risks and challenges that come with this technology, such as algorithmic bias, ethical conundrums, and the need for open risk management and accountability. It emphasizes how important risk management is to realizing the full potential of predictive analytics in the medical field. The paper also highlights the need for industry assurance and specific regulations to ensure patient-centred care and prevent discrimination. Taking everything into account, it provides stakeholders with informed information.

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Filipe Gonçalves et al The study on forecasting emergency department (ED) waits times using data from a Portuguese hospital is presented in the paper "Predictive analysis in healthcare: emergency wait time prediction." The Random Forest algorithm, a type of predictive modelling, is used in this study to forecast ED waiting times. Anonymized timestamps for various ED stages, departmental divisions, triage categories, and patient flow are included in the dataset. Included are records from January 1, 2013, to December 31, 2017.

The authors discuss how well the ED follows the Manchester Triage Protocol (MTP), which divides patients into groups based on the urgency of their conditions. They also highlight the three departments that make up the ED: general, pediatrics and obstetrics. As part of the study's methodology, the Random Forest algorithm is used for predictive modelling along with pre-processing and data collection. The paper also highlights significant research on the subject, such as studies on patient flow dynamics, duration of stay, and the use of machine learning algorithms such as quantile regression and Q-Lasso to estimate emergency department wait times.

The findings and methodology described in this study have important implications for improving resource allocation, patient management, and overall efficiency in emergency healthcare facilities. However, any errors or biases in the study's methodology and data collecting must be taken into account when interpreting the findings.

Basma Boukenze et al study investigates the use of a decision tree classifier to predict chronic kidney disease using medical data. The authors emphasise the importance of big data analytics in healthcare and how it might assist with clinical decision-making. They also provide a brief overview of significant papers on the issue. The paper provides tables and metrics to evaluate the performance of the C4.5 classifier, demonstrating that it is an effective method for predicting chronic kidney disease. The authors conclude by highlighting the importance of predictive analytics in healthcare and the need for more research in the field.

Dolley Srivastava et al This article examines the use of big data analytics in the healthcare industry, emphasising the potential benefits of improving service quality while cutting costs. It addresses concerns such as privacy, security, limited resources, and managing large amounts of healthcare data. The authors also stress the need of real-time data analytics in healthcare, namely infection prevention and treatment innovation.

The study also looks into the use of predictive analytics approaches to a number of diseases, such as heart disease, blood pressure, and diabetes. It focuses on leveraging data mining and predictive modelling to improve patient risk prediction accuracy, resulting in more informed healthcare decisions.

The authors also discuss the importance of data standards and device interoperability in enabling real-time processing of healthcare data. They also explore the many data mining approaches used in healthcare research, including decision trees, clusters, neural networks, and time series analysis.

Sunita Soni et al There is increasing interest in using sophisticated methods like association rule mining to improve classification systems, according to the literature on predictive analysis applications, especially with regard to Associative Classification (AC). Association rule mining, which was first created for market basket research, finds rules in transactional databases that satisfy particular support and confidence requirements. This integrated approach shows potential across a number of sectors, with an emphasis on uses where associative classifiers' interpretability is useful, such the medical industry. for example, can help doctors diagnose patients more accurately by estimating the likelihood of certain diseases based on

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patient data. This allows doctors to make better treatment decisions. Current methods such as CBA, CMAR, CPAR, MCAR, and MMAC demonstrate advances in associative classification and strive to outperform classical classifiers in terms of accuracy by fine-tuning support and confidence definitions and guaranteeing the downward closure property's validation. These developments underscore the ongoing evolution of predictive analysis techniques for enhanced decision-making across diverse domains.

Mohamed Said et al This research study focuses at the revolutionary impact of machine learning and predictive analytics on illness prevention in healthcare. Large-scale patient data analysis shows how these technologies have the ability to transform disease detection, diagnosis, and treatment, resulting in better preventive measures. The study identifies important areas where machine learning and predictive analytics play a vital role, including early detection and diagnosis, risk assessment, precision medicine, public health surveillance, pharmacovigilance, and drug discovery.

Fitte et al This research paper presents an extensive literature review on the state of predictive and prescriptive analytics (PPA) in the healthcare industry, taking into account the growing volume, velocity, and variety of data generated in the field. The authors draw attention to the limited use of big data analytics in the industry, attributing it to the fragmented structure and competing interests among stakeholders. The purpose of the paper is to close this gap by combining expert knowledge with insights from academic and practical literature to present a comprehensive understanding of PPA in the healthcare industry. The literature review covers a wide range of topics, including the usefulness of PPA in early disease detection, enhancing services and treatments, and providing patient-centered care.

Ruby Hasan et al Recently, predictive analytics has drawn a lot of interest, especially when it comes to cardiovascular disorders. The need for early detection and efficient prediction models is increasing due to the rise in cardiovascular-related fatalities worldwide. In order to overcome the difficulties caused by a lack of specialized physicians and medical facilities, the authors stress the significance of technological interventions in healthcare. The report sheds light on each algorithm's benefits and drawbacks in order to determine how effective it is at creating precise prediction models. To improve the precision of prediction models, the use of data mining and machine learning methods is investigated, including recursive feature elimination and backward elimination. The thorough analysis seeks to support ongoing initiatives to lower the worldwide burden of cardiovascular illnesses and improve early prognosis.

Md. Ataur Rahman Bhuiyan et al The growing requirement for intelligent and interactive healthcare systems is addressed in the research "iHealthcare: Predictive Model Analysis Concerning Big Data Applications for Interactive Healthcare Systems" by using predictive models. The authors stress the importance of data-mining methods and biosensor-based Internet of Things (IoT) devices in designing effective treatment facilities. Managing vast amounts of semi-structured or unstructured biological data for early illness diagnosis presents a challenge to the healthcare system. The suggested technology combines cloud synchronization and high-performance computing with a two-way data warehouse and probabilistic data gathering scheme. The goal is to use Human–Computer Interaction (HCI) to automate the process of gathering patient data by leveraging a range of sources, including genetic, wearable, biosensor, motion, and emotional data, as well as electronic health records. The research uses cutting-edge technology, such as cloud computing, intellectual frameworks, and tensors, to examine the features of big data in healthcare. In order to handle the issues presented by the 5 Vs of big data (volume, velocity, variety, value, and veracity), the article provides a comprehensive architecture that includes data collection, data acquisition, an operating layer, and a data warehouse. The overall goal of the suggested system is to use interactive healthcare technologies to enable rapid and precise disease prediction.

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Roger Higdon et al The study conducted at Seattle Children's Hospital (SCH) demonstrates the application of predictive analytics in healthcare, specifically in the management of medically complicated children (MCCs) and children with special healthcare needs (CSHCN). The goal of the study was to use a straightforward screening technique based on pharmaceutical data to find MCCs early in the course of treatment. A medical complexity ranking system was developed as a result of the study's evaluation of the relationship between patients' MCC status and the quantity and kind of medications they take. This prediction model addresses the difficulties brought on by the intricate and expanding weight of healthcare costs by assisting in strategic planning, resource efficiency, and better care for MCCs. In light of the rising demand for healthcare resources, the study highlights the need of utilizing predictive analytics to improve patient care, direct treatment choices, and assist institutional and governmental planning.

Objective

- In the healthcare sector, how data prediction would help in getting future precautions for patients.
- To understand the use of secondary data and how predictive analysis used in healthcare system

Methodology

In this research paper utilize a secondary data methodology, the study aims to systematically analyse existing datasets to address specific research questions or objectives. This process involves the identification and selection of relevant secondary data sources, such as published literature, databases, or pre-existing research findings.

Scope

The scope of this research paper is to explore the potential uses of predictive analytics in the healthcare industry. The paper discusses the benefits of predictive analytics for more accurate diagnosis and treatment, improved service delivery, and caregiver information access. It also covers the new risks and challenges that come with this technology, such as algorithmic bias, ethical conundrums, and the need for open risk management and accountability. The study focuses on leveraging data mining and predictive modelling to improve patient risk prediction accuracy, resulting in more informed healthcare decisions. The paper provides insights into the use of predictive analytics approaches to a number of diseases, such as heart disease, blood pressure, and diabetes. The authors also discuss the importance of data standards and device interoperability in enabling real-time processing of healthcare data. Overall, the research paper provides stakeholders with informed information on the potential uses of predictive analytics in the healthcare industry.

Findings

- Predictive analytics is important in the healthcare sector since it helps to improve service quality while reducing cost. Predictive analytics may help healthcare firms make more informed decisions, resulting in better patient care and operational efficiency.
- The study emphasizes the importance of technology and data-driven decision-making in modernizing the healthcare sector. It stresses the potential benefits of predictive analytics in terms of accurate diagnosis, therapy, and carer information access.
- The study recognizes that there are challenges and issues associated with the use of predictive analytics in healthcare. These challenges and problems include handling massive volumes of data, limited resources, privacy, and security risks. To get over these challenges, the healthcare industry has to effectively apply predictive analytics.

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- The study emphasizes how predictive analytics may increase the accuracy of risk assessment for a number of diseases, including heart disease, high blood pressure, diabetes, hypertension, and heart attack. Predictive modeling and data mining can assist healthcare organizations in making better decisions and offering their patients better treatment.

Conclusion

In conclusion, the information in this article shows how predictive analytics and machine learning are revolutionising the healthcare industry. Associative categorization has advanced as seen by the expanding array of predictive analytic tools which aim to improve decision-making across several healthcare domains. Furthermore, the literature review highlights the potential of predictive and prescriptive analytics (PPA) in early illness identification, therapy augmentation, and patient-centred care, even as it tackles the challenges of fragmented data and conflicting stakeholder interests. Furthermore, the amalgamation of biosensor-based Internet of Things (IoT) gadgets, big data applications, and interactive healthcare systems demonstrates how predictive models have the potential to transform medical diagnostic and treatment facilities. The need for reliable prediction models highlights this as a result, there is growing interest in using predictive analytics to facilitate early detection and improved diagnosis. The study also emphasises the potential applications of predictive analytics to reduce costs, improve service quality, and offer real-time data analytics for cutting-edge infection prevention and treatment strategies. Finally, studies on various predictive analytics methods for heart disease, high blood pressure, and diabetes demonstrate how these technologies can improve early diagnosis and lessen the global burden of cardiovascular illnesses.

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