Application of Data Science in Healthcare And The Implications That Arise

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Abstract

The era of technology has brought a variety of approaches that aim to improve the quality of service. This has changed from the traditional scopes of practice to a technically superior age where the machine plays a critical part in society. This has also raised competitiveness since every faction is obsessed with being the best, providing the best quality of service, and appealing to several intricate domains. These systems have a way to ensure data and information are safeguarded by firewalls that encrypt the data preventing any leakage or breaking the confidentiality between two individuals bound by an agreement of privilege and trust. However, these systems can be hacked or information sullied by cyber terrorists. These crimes have egregious implications and pose ethical dilemmas since crucial personal data is no longer covertly preserved. Some of these implications can prove to be detrimental for several actors. For instance, if critical personal records and history are leaked or shared between or among individuals who do not have the authority or jurisdiction to do so, this is considered a cyber-crime. As such, the law is allowed to prosecute and charge that individual. This paper aims to identify the underpinning factors that promote Data Science in Healthcare and provision. It highlights the study's relevance today and how we can relate to the changing scope of Medicine. It then outlines the significance of the research and use of Data Sciences in the United States. Through a variety of literature on the subject, this paper outlines how Artificial Intelligence functions in the 21st Century and how it has revolutionized the practice of practically every single relevant field and or sector. The main points discussed are the changing scope and practice of health, the utility of Artificial Intelligence and adoption of Data Science in Healthcare, and the significance to the U.S.

Keywords

Artificial Intelligence, Healthcare, Data Science, Technology, Security and privacy

Introduction

Medical practice is fast changing with the adoption of Artificial Intelligence as a guiding system for patient records and relevant medical data. A.I. is a field in computer science that tries to mimic, adapt and duplicate human intelligence through computer systems. Medicine is an ever-evolving discipline and, as such, needs to adjust to the current practices. Technology has primarily played a part in revolutionizing industry practice and operation. Digital health has provided a quick and more streamlined way of accessing medical

care through advanced medical technologies in machinery and drug dispensation, communication via digital means, and innovative data collection and recording inventions (Dalianis et al., 2015). This has proven to revamp the whole practice of Medicine. The dawn of the 21st Century inaugurated the era of big data and the data economy. The data D.N.A. digital storage stipulates an encoding and decoding design. Stored within it are essential information, appreciative insights, and perspective. This has become a core aspect in all data-based entities.

The utility of Artificial intelligence applications is gradually dominating sectors that were considered to be strictly an area of expertise for humans. The interworking and interpretation in healthcare have been focused on the traditional exchange of information and data between business bodies, for instance, between two different hospital practices (Hermon & Williams, 2014). In recent times, however, there has been a brisk push to adopt patient-driven interoperation. The patient essentially oversees the provision and mediation of critical medical data. They are allowing them to monitor records without disclosing or leaking sensitive data closely.

Data Science and Artificial Intelligence are among the most practices and sort-after technology systems in the world today. Data science is defined as an emerging field of research that presents a channel for the process of knowledge discovery whereby systems of analytics are and assessed to better the practice of experts in their chosen field of expertise (Koumpouros, 2014). It focuses on acquiring, securing and analyzing confidential information while maintaining privilege of said data in healthcare. As an avenue for machine learning, Data Science uses various techniques such as supervised clustering and regression. Supervised clustering involves using an algorithm to produce desirable clustering and outcomes. Algorithms that cluster accepts a set of items and have a partitioning of that specific set.

On the other hand, regression is a technique practiced using a statistical approach to mold the relationship and interconnectedness of a dependent variable concerning one or more independent variables (Naqishbandi et al., 2015). To adequately understand the complexity of data, D.N.A. and its active entities require an adept comprehension of data science and its foundation, analytics (Andreu-Perez, 2015). Data D.N.A. provides information about an individual and can be crucial in detecting a variety of ailments. For instance, genomic information gathered from a seemingly healthy lady propositioned a high possibility of breast cancer. This is also useful in matching patients with medications based on their risk for extreme reactions.

Literature Review

Healthcare has shifted to a more progressive trend that has provided a safe way to secure and store essential data through the cloud. It presents various convenience in terms of the complete history of patient records in real-time and cost savings, for instance, in the economics of managing healthcare data. Though still at its early stages of implementation and utilization, notable objections, challenges, and opportunities are being presented or have been influenced by the practice through research, innovation, and education in the field of data science.

Importance of A.I. based systems

The healthcare industry has seen a gradual increase in the implementation of data-based systems in their service delivery. Therefore, it has prompted the endorsement of big data tactics and operating procedures towards improving the quality of delivery in healthcare (Zhang, 2015). Big data analytics helps organizations harness their data and put it into operation to identify new opportunities. In turn, it leads to more innovative business moves, more efficient work execution, increased profits, and happier customers (in this case, patients). Data scientists use powerful analytical tools to detect chronic and severe cases (kaur & Rani, 2015). Big Data in healthcare emanates from the internal actors within the healthcare institutions or clinics and external sources such as; research laboratories, governments, pharmaceutical companies, medical journals, and data aggregators).

Machine learning methods that support A.I. more often than not provide hope and promise towards improving healthcare. Data-driven tools and methods are a sure way to identify the underlying reasons for an individual's condition. Several institutions and companies are adopting data-based systems in storing information and relevant data. For instance, DeepMind Technologies Limited, a subsidiary of Google developed their first medical project and partnered with Royal Free London N.H.S. Foundation Trust to try and manage acute kidney injury.

Technology has provided us with Wearable medical devices with sensors that detect the slightest change in normal body functioning. These devices generate many data, commonly known as big data, with a combination of both unstructured and structured data (Godbole & Lamb, 2015). It is implementing the IoT to process sensor data for application in healthcare settings. The Grouping and Choosing architecture use an algorithm that secures the integration of fog computing with cloud computing. It uses a MapReduce-based prediction model to detect and predict heart diseases.

Digital technology is being used to encourage and foster change in behavior in the form. Of digital interventions. They are becoming increasingly pervasive, and as such, they are being adopted in patient diagnosis and treatment recommendations, self-managing chronic diseases, and primary prevention measures (Jothi & Husain, 2015). They have been acknowledged to have the latency to change the way individuals can monitor the progress and rate of healing while also improving health behaviors. This helps improve outcomes, reduce costs and enhance the overall patient experience.

Early disease detection has been revolutionized using data-based systems and A.I. These systems performed accurate detection of diseases and diagnoses. They have improved patient care and community involvement, and services. The accuracy, however, is tainted with the provision of incomplete medical data and history. The choice of data analysis relies on the structure of the causal factor of the problem.

Limitations of adopting A.I. in healthcare

Limitations arise in implementing and using cryptographic accelerators and access control systems in data science to relay security issues and concerns in a progressive cloud-based atmosphere. The challenge in these systems comes when the numerous approaches and solutions focus on

applying optimized units to offer maximum throughput and minimum size, bandwidth, and power output (Hersh, 2014). There is very minimum flexibility with operations and systems reserved for fixed operations.

Data Science has been in effect for decades, but its practice hardly being utilized in core sectors of industry. The mass adoption of this form of analytics will provide the hospital and the patient with a contoured experience (Asri et al., 2015. The utilization of Personal Health Record (PHR) systems is yet to realize a massive adoption of the practice despite years of enforcement. These systems can help improve patient engagement and participation (Baro et al., 2015). Tracking health records and procedures provide the patient with the necessary tools, and with that, they can be more astute, involved, and present in their health and care.

Securing client confidentiality and privilege is essential in healthcare and service provision. It builds trust between the medical practitioner and the patient. Privacy and confidentiality are critical policy in all health organizations and institutions. Sharing information and data can prove to be perilous when it comes to privacy and securing data, and more so if it includes sensitive information (Mans et al., 2015). Through algorithms, synthetic data can be duplicated from the original, and this information is compromised. Considerable data research and already existing forums have been integrated into healthcare. Despite this implementation, they have failed to prevent emergency cases. Their reliability is further seen by providing crucial real-time information for healthcare systems and also offer a more clarified predicting algorithm for patient cases.

Several issues have been brought to light on the ethical and legal implications of accessing personal and confidential information and the use of said data in health research (Tekieh & Raahemi, 2015). A sea of data and information on a subject poses a threat and risks re-identification of the individual (Craven & Page 2015). The progressive rate of digital behavior in research and practice involves developing intervention models and approaches in an ever-growing and technologically run world, promoting user involvement, supporting science and theory, assessing the effectiveness, addressing regulatory issues, ethical implications, and governance (Brennan & Bakken, 2015). Clinical practice using data analytics can base their lack of performance and operation on predictive models, an inadequacy in interpreting composite predictions provided by available models, and a lack of authenticity in prospective clinical trials whose focus is on benefit than the basic principle of care.

Significance to United States

The U.S. healthcare system is considered to be one of the best in the world. Unlike other developed countries, it does not have all-inclusive coverage. It offers to offer world-class care and treatment. Besides the U.S. government, other significant sources of healthcare coverage are Medicaid covering about 70 million, Medicare protecting around 50 million people then healthcare insurance marketplaces supported and created by the Affordable Care Act (A.C.A.), a total of 17 million people.

Stratified Medicine entails categorizing patients based on their disease subtype, the risks involved for them and others, the prognosis, and treatment using specialized diagnostic tests. The core and ideal conceptualization are making critical medical decisions based on an individual patient's unique traits (Burton, 2015). The personalization of Medicine is very much linked and subject to data science and, more significantly, machine learning.

Patient and clinical team outcomes have been seen to improve gradually due to implementing Artificial Intelligence. There is a reduction in costs, and it influences population health. The capacity of the human cognitive function is no match to the quantity of information able to be saved and backed up in A.I. systems. It has a more complementary role in supporting the supply and conveyance of personalized care. A.I. processes in healthcare involve diagnosis and recommendations for treatment, patient engagement, involvement and adherence, and administrative actions.

Conclusion

Artificial intelligence has in its wake seen the development and improvement in performance for a variety of systems in several disciplines. This has come in the wake of the technological influence in almost all sectors of industry. Data Science and analytics are critical providers in accurate medical diagnosis and storage of client information and essential data in healthcare. This has gradually and greatly improved the quality of health care with minimal errors and mistakes. It has, however, made the human cognitive function and moreso that of physicians, to be irrelevant. Digitalization has seen that traditional means of practicing Medicine are being overlooked and considered not as critical. Digital behavior intervention developers should strictly follow established regulation frameworks with reflection and consideration to evolving and efflorescing criterion around governing and managing information, the ethical implications, and the interoperation between and among relevant factions.

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