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DISSERTATION SUBMITTED TOWARDS THE PARTIAL FULFILLMENT OF DEGREE OF BACHELOR OF BUSINESS ADMINISTRATION IN INTERNATIONAL BUSINESS AND ARTIFICIAL INTELLIGENCE

"Cognitive Computing in Healthcare"

Submitted by:

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Date: 08/04/2022

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This is to note that the research integrated in ‘Cognitive Computing in Healthcare sector’ project submitted by Tannu Singh, BBA(IBAI) for the B.B.A Degree Program, was carried out under the direction and supervision of Dr Vinita Sharma. The data obtained from the other sources was properly recognized in the project.

Dr. Vinita Sharma

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DECLARATION

I, Tannu Singh, student of BBA (IBAI) hereby declares that the project titled **"Cognitive Computing in Healthcare"** is plagiarism free and has not been submitted to any other University or Institute towards the award of any degree.

Tannu Singh

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Date: 08/04/2022

BBA – International Business & Artificial Intelligence

Abstract

Hospitals, medical devices, clinical trials, outsourcing, telemedicine, medical tourism, health insurance, and medical equipment are all part of the healthcare industry. The industry is expanding at a rapid pace as a result of improved coverage, services, and increased spending by both public and private players. And with the growth of AI in all the sectors, it has also become a helping hand in the healthcare sector with the help of cognitive computing. Cognitive computing is transforming healthcare delivery around the world, and all these frameworks use automated models to recreate human perspectives. On a global scale, these computing systems have been critical in deciphering the massive volume of healthcare data. This paper is going to put light on how important cognitive computing has become for getting better outcome from the health care sector, be it medical research personalized medial solution of illness of each patient or predicting the future possibilities of health issues in patients. There many questions which this paper is going to address in the field of cognitive computing in healthcare. This paper is also focused on the achievement that technology has made in past decades such as how Computer vision is helping visually challenged to make lives a little easy, also how IBM is using cognitive computing in making treatment system more personalized.

Table of Contents

Table of figures

1. Introduction

A machine being able to behave and think same as human may sound far-fetch, scary and like a plot of a movie. But it is becoming a reality as the time passes. And these computing machines are known as Cognitive Computing, which is the application of science and engineering of creating intelligent machines, predicated on computers' ability to sense, reason, act, and adapt in response to learning experience. Self-learning systems that use data mining techniques, pattern recognition, natural language and human senses processing, and system modifications based on real-time patient and other data are all examples of cognitive computing. In other words, these systems are designed to work similarly to the human brain and to continue to learn. Now healthcare industry is also advancing with the help of these computations. The following are some of the benefits of cognitive computing in healthcare: Medical research has to be accelerated: Analysis of massive amounts of data is simple and up-to-date information may be maintained. Practitioners can learn how to deliver the best possible patient care by gaining the necessary insight and practical implementations. Physicians can also provide their patients with the quality of care and treatment plans that are most successful for their diseases by customising their patient's care. In order to reduce the likelihood of health problems in the future, they can figure out ways to prevent them from occurring.

Clinical and operational efficiency can be improved through cognitive computing in the workplace. With the correct technology and healthcare delivery services, your employees will be able to examine patient data while still having time to care for your patients.

Encourage patients to adopt healthy habits: You can come to significant conclusions which will assist you recommend healthy behaviours to your patients using cognitive computing. You have the ability to persuade the patients to start taking care of themselves based on data on disease projections.

Computers were once too expensive and unstable for medical practises to rely on, despite the fact that forward thinkers began considering the prospect of employing computers in healthcare as early as the 1960s. As technology advanced and costs decreased, regulations and data standards were developed to encourage healthcare companies to embrace latest tech not only for medical equipment such as diagnostic imaging machines, as well as for daily record keeping. Electronic health records (EHRs) have largely replaced paper medical records, making it easier to retrieve health data such as test results and diagnoses efficiently and securely. It is now routine practise to use EHR systems or even other innovations when communicating with patients and developing treatment regimens. Laptops and tablets would become as widespread in healthcare institutions as stethoscopes, and there's mounting evidence that EHRs are improving access to and sharing of health data.

However, one significant issue raised by EHRs is the gathering of substantial numbers of unintegrated and unorganised data. Most healthcare companies currently have a plethora of data that they may utilise to improve their operations and business practises, but they may lack the tools or skills to unearth those insights. Newer technologies, such as cloud, blockchain, and machine learning-based AI tools, can assist healthcare businesses in identifying trends in huge amounts of information even while making that results more accurate and manageable.

Technology solutions are assisting healthcare professionals in improving performance, increasing cooperation across systems, and managing costs as the industry faces new challenges. As the demands on enterprises grow, healthcare technology can help firms optimise procedures, automate jobs, and improve workflows on a scale that humans can't. These solutions are assisting healthcare personnel in improving patient care, creating better experiences, and reducing burnout as hospitals and health systems adopt value-based health reimbursement models.

For a long time, the healthcare ecosystem i.e., providers, device makers, payers, and so on – has relied on technology. Clinics and patients are already employing technology to maintain patient information, schedule payments, and offer new treatment alternatives in the health and care arena. Aside from technology, it's also about how and why it can be used to help the medical care industry grow and improve. Telemedicine, AI-enabled medical gadgets, and blockchain electronic health records are just a few instances of digitalization in the healthcare sector. Patients, on the other hand, have begun to use the healthcare technology ecosystem for self-evaluation and health monitoring. Even if the healthcare industry has come to accept the use of technology in their activities as a result of application development, the digitalization game is always evolving. Things aren't getting any simpler in the age of healthcare consumerism.

Healthcare professionals and providers throughout the world are increasingly turning to cognitive technologies to help them make faster and more informed decisions, enhance patient outcomes, and improve overall care quality. The growing desire for tailored therapeutics in numerous fields of health, particularly oncology, has fuelled the adoption of a number of cognitive computing platforms in recent years around the world. The mass acceptance of IBM Watson and Microsoft's Cognitive Services by healthcare providers is fuelling the market's expansion. “We see everyday changes in the applications and services we use on a daily basis. This is owing to the massive amount of data transmitted at fast speeds between a range of heterogeneous devices and systems, as well as the wide availability of computational resources. Such rapid advancement has an impact on a wide range of applications and has paved the way for the emergence of a new wave of advanced services. Cloud, Semantic Web, Big Data, and Cognitive Computing are some of the keywords that describe the technology framework that enables this new wave.” (Mauro Coccoli, 2018).

Healthcare being one of the most necessary industries for the care of people is looking forward to use technology to create better service and advance the facilities. Any IT tools or software meant to increase hospital and administrative efficiency, bring new knowledge into medicines and treatments, or significantly improve quality of services delivered is referred to as healthcare technology. The healthcare sector today is a $2 trillion monster at a fork in the road. The sector is seeking for methods to improve in practically every imaginable area, as it is now weighted down by devastating costs and red tape. This is where health-tech enters the picture. To address two major issues in healthcare: quality and efficiency, tech-infused solutions are being integrated through every step of the process.

A noteworthy feature strengthening the acceptance of cognitive systems in large regions is leveraging the capacity of self-learning systems to identify patterns and model viable alternatives in understanding health and wellbeing. This paper is going to give a broader view of how cognitive computing is going to make healthcare industry more efficient and the possibility of things that would be happening in the near future.

2. Methodology

This paper is divided mainly into two parts. First part incudes the Literature review of the case study how Cognitive computing is utilized in healthcare sector with the help of specific case studies that include Computer vision helping blind and visually challenged people and also IBM Watson is creating technologies which help in life science research, personalized treatment, cancer treatment and how they are using data of patients in the advance treatment of the patients.

The second part of paper focuses on twitter sentiment analysis of observation and reaction of people on twitter about cognitive computing in healthcare and also IBM Watson twitter sentiment analysis to find out what are opinion of the company who is working on it.

2.1. Significance of the research

This theoretical paper has a significant important as healthcare industry is one of the most important industries. When it comes to providing quality and timely healthcare, the sector must focus on the needs of the patient. Patients' interests and benefits are regularly taken into consideration in the development of various policies and initiatives. In order to better serve their patients, healthcare providers may need to gain a greater understanding of the beliefs and cultures of those they serve. The opinions of patients are rarely taken into account when countries are deciding on healthcare legislation. Patient-centeredness is also required in digital healthcare applications. All access control systems must be in the hands of patients, as it is their fundamental right to choose whether or not to disclose or conceal any of their health records. There is a lot of excitement about cognitive computing right now, thanks to the fact that it has the ability to empower self-driving cars, allow marketers to better understand and target their target audiences, and help investors conduct more thorough research. In any event, healthcare is expected to benefit the most from cognitive computing's augmentation.

Think of a world where the greatest of world-class doctors' abilities could be leveraged to reach the most remote locations and expose many patients to life-saving clinical trials. Individual and clinical research, as well as societal information gleaned from a variety of medical sources, will come together in the age of cognitive medical services to help patients find a path to improved health.

2.2. Data collection, cleaning and preparations

The data used in this study is extracted from the tweets of users on Twitter. Python library ‘twint’ was used for extracting data using hashtags such as ‘cognitive computing in healthcare’, ‘AI’, ‘computer vision’ and ‘NLP’ in the collection general data, which was used to gather over 289 tweets from January and December, 2021. After cleaning the general data 138 tweets were found relevant for the sentiment analysis.

date	username	name	tweet	replies_count	retweets_count	likes_count	hashtags
13/01/2022	mssoftware	Roberta Mullin	Starting our #AIinHe	0	1	3	['aiinhealthcare', 'ai']
13/01/2022	predictmedix	Predictmedix Inc. ((	Scalable AI solution	0	0	3	['aitools', 'aisolutions', 'covid19', 'ai', 'aiinhealthcare', 'pmed', 'pmedf']
13/01/2022	saketsinghi	Saket Singhi	How augmented int	0	1	0	['artificialintelligence', 'augmentedreality', 'healthcareit', 'aiinhealthcare
13/01/2022	softclinic_jvs	SoftClinic Software	How augmented int	0	0	1	['artificialintelligence', 'augmentedreality', 'healthcareit', 'aiinhealthcare
13/01/2022	delftimaging	Delft Imaging	Active case finding	0	1	1	['delftimaging', 'usaid', 'ehealth', 'healthcareit', 'healthcare', 'aiinhealthca
29/01/2022	shediaccat5	Paul RichardðŸ‡¨ðŸ	@ColinMacNeil1 wl	1	0	1	[]
29/01/2022	lynannem4a	Lyn Anne	Tell @GavinNewsor	0	0	3	['ab1400', 'calcare']
29/01/2022	anthony56429718	Anthony C	@b_crane1 @mikea	0	0	0	[]
29/01/2022	datogkushpusher	YungDopeDealer	@ThatGuySkyTV @r	0	0	0	[]
29/01/2022	darylcognito	daryl n cognito	@Patricia_Ann_E l t	0	0	0	[]

Figure 2.2. 1 Screenshot of twitter general

For collection of data of IBM user ID account, the data is collected by username ‘@IBMWatsonHealth’ which was used to gather over 241 tweets from April and May, 2021. After cleaning to get relevant data 110 tweets were resulted.

date	username	name	tweet	replies_count	retweets_count	likes_count	hashtags
26/01/2022	ibmwatsonhealth	IBM Watson Health	3D printed anatomica	0	3	3	['3dprinting']
21/01/2022	ibmwatsonhealth	IBM Watson Health	Read exciting news al	3	6	10	['ibmwatsonhealth']
20/01/2022	ibmwatsonhealth	IBM Watson Health	Healthcare analytics	0	0	3	[]
05/01/2022	ibmwatsonhealth	IBM Watson Health	New Year. New COVII	0	0	1	[]
22/12/2021	ibmwatsonhealth	IBM Watson Health	3ï¸âƒ£ IBM #DigitalHe	1	4	6	['digitalhealthpass']
22/12/2021	ibmwatsonhealth	IBM Watson Health	2ï¸âƒ£ Innovations in	1	2	5	['imaging']
22/12/2021	ibmwatsonhealth	IBM Watson Health	As we wrap up 2021,	1	1	2	[]
07/12/2021	ibmwatsonhealth	IBM Watson Health	Today we proudly hor	1	3	19	['ibmwatsonhealth']
01/12/2021	ibmwatsonhealth	IBM Watson Health	Unlock the full potent	0	1	2	['ai', 'rsna21']
24/11/2021	ibmwatsonhealth	IBM Watson Health	As we head to #RSNA2	0	5	7	['rsna21', 'healthtech']

Figure 2.2. 2 Screenshot of IBM account tweets

It was necessary to address various data concerns before moving on to the sentiment analysis section, such as missing numbers, incorrect data, and whether or not they complied to our language criteria. NumPy and Pandas were used to load and retrieve basic information about the datasets. Columns with no tweets but other variables were removed from the dataset after import because they weren't useful in the analysis.

3. Literature review

3.1. Big Data

(Mauro Coccoli, 2018) This research paper examines potential motives for implementing cognitive computing-based solutions in the healthcare industry, as well as some previous experiences. From a practical standpoint, the adoption of cognitive computing approaches can offer machines with human-like thinking capabilities, allowing them to deal with large amounts of uncertainty and difficulties that may need computationally costly activities to solve. Furthermore, cognitive computing enables efficient machine-learning approaches, resulting in the ability to find solutions based on past experience, taking advantage of both errors and successful finds, thanks to solid networking infrastructures and cloud environments. Because of these unique characteristics, it is clear that such an advanced tech may considerably enhance healthcare. Unfortunately, despite the availability of modern and complex cloud-based architectures, there is still a shortage of infrastructure settings, open big data, and in general, the basic requirements for the hardware to efficiently run such systems are still high. Nonetheless, cloud computing is projected to continue its rapid rise in the near future, allowing us to anticipate a large range of affordable services for a variety of applications. This will be one of the primary pillars on which the dispersion of cognitive systems will be built, and it will make it easier to penetrate such a diverse range of systems that will encourage new services and upset many established paradigms. The evolution of cloud computing will be heavily influenced by cognitive healthcare. In fact, an optimal cloud for all cognitive data - a hybrid and safe cloud - will be required.

(Danilo Dessì, 2019) This paper overview the previous few decades, clinical databases have accumulated a massive quantity of information in the form of medical documents, laboratory findings, treatment plans, and other documents that represent patients' health condition. As a result, the amount of digital data available for patient-centred decision making has increased dramatically, but it is rarely mined and analysed in depth because health records are very often unstructured and thus difficult to analyse automatically, and doctors typically depend on their experience to recognise an illness, offer a diagnosis, and prescribe medications. However, a doctor's experience is limited by the situations they've handled previously, and pharmaceutical errors are common. Furthermore, inferring data for evaluating unstructured data and analysing commonalities between disparate resources is often difficult and time-consuming. The suggested approach can classify new medical cases, allowing doctors to make more accurate and trustworthy decisions about specific diagnoses and treatments. They talk about the two clustering approaches that our recommender system uses right now. We used them to work with various VSMs and highlighted their benefits and applications dependent on the dataset type. The Machine Learning Module may be combined with categorization algorithms to deal with different types of reports, and we plan to finish this development soon. We haven't examined this evolution yet because it makes it tough to obtain datasets for meaningful classification task validation.

(Valencia, 2019) This paper talks about how big data and cognitive computing can contribute towards the personalized medicine sector. The Big Data paradigm shift is reshaping healthcare and biomedical research, with the potential to inspire systematic approaches to processing clinical and molecular data across the four dimensions of volume, velocity, variety, and veracity, which refer to the scale, rate, forms, and content of generated data. Currently, large amounts of multi-omics, imaging, medical devices, and electronic health record (EHR) data are accessible from huge group and demography research, uncovering subtle differences in human genetic factors and enabling Personalized Medicine interventions, all while promoting infrastructure and research management long term sustainability. Due to the volume of data and the complexities of biological systems, big data analytics challenges are pointing to the creation of innovative applications in the fields where identifying connections and insights might be challenging.

(Mohamed Alloghani, 2018) As developing medical sectors that potentially benefit from Industry 4.0, the paper explores Cognitive Computing, mHealth, and eHealth. This paper's contextual compendium analysis focuses on Industry 4.0 and healthcare innovation as they relate to it. The assessment defines the various aspects of Industry 4.0, as well as their relevant advances or contributions to the healthcare sector. The first aspect, Cyber-physical systems, has resulted in Medical Cyber-physical systems being used in a variety of situations to increase service delivery efficiency. The Internet of Things, the second component, has brought expanding networks, biosensors, smart medications, as well as other artificial organs with it. The last aspect has encouraged the integration of Natural Language Processing as a calm-system functioning in the foreground to complete a slew of processes that improve diagnoses, among several other service provision and help activities.

(Ying Chen, 2016) Researchers in the life sciences are under more pressure than ever to innovate quickly. Big data has the potential to unearth new insights and speed up breakthroughs. Ironically, despite the fact that there is more data than ever before, only a fraction of it is being integrated, comprehended, and analysed. The difficulty lies in utilising large amounts of data, integrating information from a number of sources, and comprehending their varied formats. Because cognitive solutions are specifically built to integrate and analyse large datasets, emerging technologies such as cognitive computing hold promise for tackling this difficulty. Watson, a cognitive computing system, has been set up to help researchers in the life sciences. This variant of Watson incorporates medical literature, patents, genomes, chemical and pharmacological data, all of which are commonly used by researchers. Watson was also built with a deep understanding of scientific language, allowing it to make fresh connections across reams and reams of literature. Watson has been used in a couple of pilot experiments involving pharmacological object tracking and repurposing. Watson's pilot results imply that by using the power of big data, Watson can speed up the discovery of new medication candidates and targets. The detection and categorization of adverse outcome reports from the text of case reports and published studies may also benefit from cognitive computing. Many sectors are adopting cognitive computing solutions that are modelled after several fundamental elements of human thought. Their ability to acquire a wide range of data, as well as comprehend, analyse, and learn from it, seems to have the potential of providing new insights. Watson has the ability to improve adverse-event detection and coding accuracy and speed. To analyse and improve Watson's drug safety abilities, various test cases across types of events, drug kinds, and diseases would be required, just as they were for discovery.

(J. Octavio Gutierrez-Garcia, 2015) Cognitive computing is a multidisciplinary field of study that aims to develop computational models and decision-making processes caused by brain neurobiology, cognitive science, and psychology. The goal of cognitive computational models is to provide computer systems with the ability to know, think, and feel. This survey's main contributions include providing perspectives in to the cognitive computing by identifying and referencing its definitions, related fields, and terms; classifying current cognitive computing research according to its objectives; providing a brief analysis of cognitive computing approaches; and classifying open research issues in the field of cognitive computing. This research article discusses the various definitions of cognitive computing and describes the topics and words that are associated with it. In the recent decade, research on cognitive computing has made significant progress in either endowing computer systems with the faculties of knowing, thinking, or feeling. However, there is still a long way to go before the brain can fully mimic how it processes information, acquires knowledge, makes decisions, and generates emotions.

(Min Chen, 2018) The healthcare system has experienced a rush of interest from academics and industry thanks to the rapid growth of medical and computing technology. Most healthcare systems, on the other hand, do not address patients' emergency situations and unable to offer a good specialised resource service for unique users. In this study, we suggest an Edge-Cognitive-Computing-based (ECC-based) smart-healthcare system to address this problem. Using cognitive computing, this system can monitor and assess overall physical wellbeing of patients. It also modifies the computing allocation of resources of the entire edge computing network in accordance with each user's health-risk grade. The studies reveal that the ECC-based healthcare system improves user experience and efficiently allocates computing resources, as well as dramatically increasing patient survival rates in a sudden emergency. This system realised data and resource cognition and addressed the issue of rigid network resource management. In particular, using the edge cognitive computing architecture and associated technologies, the system first observed and assessed the physical health of smart-clothing users. The system then implemented an equitable distribution of edge computing resources based on the data-driven methodology. The experimental findings revealed that in an emergency, the suggested ECC-based healthcare system provided an improved user QoE while computer resources were reasonably optimised.

(Mehta, 2015) In this research, they discussed how Watson EMRA, a patient information summary and semantic search ability built on Watson's underpinnings, implements cognitive computing principles. The Watson EMRA's functionality is motivated by physicians' information demands in patient care. Watson EMRA collects a patient's longitudinal medical record and summarises it around an automatically created problem list. Natural language processing and machine learning are used to build the problem list. Semantic relationships between the issues as well as other clinical data aggregates, such as drugs ordered, are also included in the report. Watson EMRA also offers a semantic search, which identifies matching semantic medical concepts in semi-structured and unstructured EMR contents along multiple levels, including more broad, more specific, and negated occurrences, where the patient summary is insufficient for identifying precise details. Future study in this area will include advanced problem status summaries, natural language question responding on an EMR, and cognitive support to a physician in terms of diagnostic tests and treatment next steps. The system described here is a demonstration of cognitive computing for EMRs, as well as a sign of significant potential.

3.2. Computer Vision in healthcare

(Andre Esteva, 2021) Computer vision (CV) has a long history of attempts to make computers comprehend visual stimuli in a meaningful way. Machine perception encompasses a wide range of activities, from low-level tasks like recognising edges to high-level tasks like comprehending entire scenes. Three things have substantially contributed to advancements in the recent decade: Deep learning (DL), a sort of machine learning that allows for end-to-end learning of exceedingly complex functions from raw data, is maturing. 2 advances in GPU-based localised compute power, and the open-sourcing of massive labelled datasets for training these algorithms Individual researchers now have access to the resources they need to develop the area thanks to the confluence of these three aspects. Progress accelerated as the research community developed dramatically. In a number of scientific domains, the expansion of modern CV has coincided with the generation of vast volumes of digital data. Recent medical breakthroughs have been numerous, thanks in large part to DL's exceptional capacity to learn a variety of tasks from a variety of data sources. CV models can learn a variety of pattern-recognition skills using huge datasets, ranging from physician-level diagnosis to medical scene perception. We look at the intersection of CV and medicine in this article, focusing on medical imaging, medical video, and real-world clinical applications. We go over the essential algorithmic capabilities that enabled these opportunities, as well as the numerous achievements of recent years. Screening, diagnosis, detecting diseases, forecasting future outcomes, segmenting pathologies from organs to cells, monitoring disease, and clinical research are just a few of the clinical tasks suitable for CV. We explore the technology's future expansion and its consequences for medicine and healthcare throughout.

(Andre Esteva, JANUARY 2019) The discipline of computer vision has seen some of deep learning's greatest breakthroughs (CV). CV focuses on image and video comprehension, including tasks like object categorization, identification, and segmentation, which can help determine whether a patient's radiograph has malignant tumours. CNNs, a sort of deep-learning algorithm designed to process data with natural spatial invariance (e.g., images whose meanings do not change when translated), have become a key player in this field. Recent breakthroughs in picture categorization and object detection, for example, can benefit medical imaging significantly. In dermatology, radiography, ophthalmology, and pathology, many research have shown promising results in complicated diagnosis. Deep-learning technologies could help doctors by providing second opinions and highlighting potentially dangerous spots in photos. The use of CNN-based algorithms in image-level diagnostics has been highly fruitful. This is partly because CNNs have surpassed performance levels in object-classification tasks, wherein a CNN learns to identify the object included in an image. These same networks have shown strong performance in transfer learning, in which a CNN is fine-tuned on a much smaller dataset related to the task of interest after being trained on a massive dataset associated to the assignment of significance (e.g., ImageNet, a dataset of millions of common everyday objects) (e.g., medical images). The algorithm uses vast amounts of data in the first phase to learn about the natural statistics in images—straight lines, curves, colorations, and so on—and then in the second step, the system's higher-level layers are retrained to distinguish between diagnostic cases. Object detection and segmentation algorithms, on the other hand, identify specific areas of an image that correspond to certain items. Picture data is fed into CNN algorithms, which iteratively warp it through a series of convolutional and nonlinear processes until the raw data matrix is transformed into a probability distribution across all possible image classes (e.g., medical diagnostic cases).

(F. Al-Muqbali, 2020.) With the use of a smart device, this study effort intends to assist blind persons of all types in completing their daily duties more easily. This smart device can distinguish faces, colours, and different things using artificial intelligence and picture processing. The vision challenged person is notified by a sound alarm or vibration as part of the detecting procedure. In addition, this research includes a tangible survey of visually challenged people from the surrounding community. It displays that how smart device can identify specific physical objects and deliver a warning signal whenever it comes into contact with them. Overall, this study will contribute to the field of health care by assisting blind people through the application of smart technology.

(Shankar Sivan, 2016) Electronically perceiving and intercepting an image is used to perform the computations. Computer vision is a scientific area that studies the concept underlying artificial systems that gather data from images. Video sequences, various camera perspectives, or multi-dimensional information from a medical scanner are all examples of picture data. Computer vision, as a technological subject, aims to apply its ideas and approaches to the development of computer vision systems. According to the World Health Organization, there seem to be around 39 million blind persons on the planet. As a result, assistive and rehabilitation devices are required. The most common way for the blind to avoid obstacles is to use a white cane with a guide dog. Because of their brain plasticity, blind persons can use their forebrain to interpret objects through other sensory cues, such as sound, which allows them to pinpoint dynamic impediments. However, in an unfamiliar environment, this can be difficult to do. Various commercial apps have been developed over the years, with the most popular being GPS-powered programmes such as Mobile Geo, Braille Note GPS, MoBIC, and others, as well as computer vision-based applications such as ‘The vOICe’, NAVI, ENVS, TVS, and others. The hardware of computer systems has grown dramatically during the last few decades. This paper has resulted in more affordable and compact high-performance computers, allowing researchers and scientists to develop handheld and wearable gadgets to assist the blind and visually impaired. This study discusses the numerous computer vision-based assistive technologies that have been developed for them, as well as a more cost-effective and efficient solution.

(YingLi Tian, 2013) For blind and visually challenged people, travelling alone is a well-known issue. This paper presents an actual evidence computer vision-based navigation tool for blind people to access unfamiliar indoor surroundings autonomously in this work. We combine object detection with text recognition to locate various rooms (e.g., an office, a lab, or a bathroom) as well as other building amenities (e.g., an exit or an elevator). To begin, we create a strong and efficient algorithm that combines edges and corners to locate doors, lifts, and cabinets evaluation of the overall geometric design. The algorithm can handle substantial intra-class changes of objects with varied looks in different indoor situations, as well as tiny inter-class variances between objects like doors and door-like cabinets. We next extract and recognise text information linked with the detected items in order to differentiate intra-class objects like an office entrance from a restroom door. To recognise text on signs with multiple colours and perhaps complicated backgrounds, we first extract text regions, then use character localization and topological analysis to take out background interference. Off-the-shelf optical character recognition (OCR) software is used to recognise the retrieved text. Speech is used to communicate the object kind, orientation, position, and text information to the blind traveller. The paper has outlined certain methods and techniques that will be useful in developing a prototype of a computer vision-based indoor wayfinding device to assist blind people in unfamiliar situations. Our algorithms detect doors and wall protrusions, as well as recognise text signage to distinguish between doors with distinct functionalities (e.g. office from bathroom). Our innovative and reliable door detection method can distinguish between doors and other rectangular objects like bookshelves and cabinets. The method can detect objects in a variety of contexts with varying colours, textures, occlusions, illumination, and views because it is based solely on general properties (e.g. edges and corners) as well as geometric connections. The identified door is combined with the text signage recognition, which is then conveyed in audio for blind people. The resilience and universality of the most crucial components of the suggested methods have been shown in our trials with the door detection algorithm and text recognition in various contexts. Our future work will concentrate on dealing with large occlusions by employing more discriminative features such as door knobs and other hardware, as well as detecting and recognising more kinds of indoor objects and icons on signage in addition to text for indoor wayfinding aid to help blind people travel independently. We'll also look into some of the most important human interface challenges, such as auditory outputs and spatial tracking and updating of object position, orientation, and distance. Blind users would be able to better employ spatial memory to interpret the surrounding world with real-time updates.

3.3. IBM Watson Health

(Bhattacharya, 2005) Despite increases in R&D budgets from year to year, the number of successful NCEs (new chemical entities) has dropped sharply. Drug companies are seeking for innovative ways to streamline research processes, better organize information, and boost collaboration across research departments. The "industrialization of discovery processes" is a term used to describe the change from an artisan method to an organized, streamlined discovery process. The formal modelling of research processes at multiple different levels of abstraction, mappings amongst adjacent layers, and execution of this hierarchy utilizing information technology-level implementation elements are presented in this study as a method for industrializing drug development. This method is used in the drug discovery process during the assay development phase. A business operations model is created by first identifying business artefacts, constructing models for their life cycles, and then combining such life-cycle models as well as their interactions into a comprehensive model. A solution assembly model that improves on the operational model is constructed using the notion of adaptive business objects. \

The IBM WebSpheret platform is then used to convert this model into an effective platform-specific implementation. IBM Research and Bayer HealthCare collaborated to develop and validate our prototype system. Most initiatives to industrializing the drug development process in recent years have been data-driven. Finding signals from a great amount of data is, in fact, a big obstacle in the regular living of a pharmaceutical researcher. This crucial aspect has sparked a flurry of study in the fields of data mining and federated databases. Davis and Peakman promoted the rule of information-driven drug discovery (4D) from a more corporate perspective. They show the difficulties and expenses of dealing with the many various forms of data generated in pharmaceutical research in their work. Their strategy begins with a methodology that is comparable to ours. The authors propose a study of data latency, data quality, data utilization, data leverage, data productivity, and data expenses in the context of corporate data. The authors developed maturity profiles based on this conceptual model, which measure a company's specific strengths and shortcomings. This method is intriguing since it attempts to get to the root of the problem. The authors note that most pharmaceutical businesses have issues with four areas: loading key data onto business network, data sharing across organizations, scientists accessing, visualizing, and modifying data, and data gathering and presentation for decision making. When compared to ours, one disadvantage of their method is the lack of standardized modelling techniques. Despite the fact that their methodology produces a maturity model that predicts the amount to which a corporation uses cutting-edge data handling techniques, their approach does not provide solutions to any of the four areas of concern. By contrast, we examine the current condition of the business by modelling business operations and using this model to assess the quality of the business process using simulations or other methods. This method not only yields similar maturity assessment results, but it also allows for the creation of services to achieve the processes in question. This strategy, which is based on business operations, serves as an organizing concept, assisting in the definition of goals for related research activities as well as the development of ways for handling the data generated. The formal models that underpin the tiers of the hierarchy, as well as the mappings between them, allow us to study and refine business needs before translating them into IT solutions, bridging the business-IT divide.

(Roxanne Vroegindeweij, 2019) The healthcare industry generates massive amounts of structured and unstructured data on a regular basis. Cognitive computing, a novel computing paradigm, has the potential to greatly assist healthcare practitioners and researchers in extracting valuable information from data. IBM Watson, arguably the most well-known cognitive computing system, has been extended to a variety of disciplines, including healthcare. In this research, we look into whether healthcare personnel have a natural desire for cognitive computing systems. Specifically, we investigate diverse impressions of IBM Watson among healthcare professionals in the Netherlands, using the technological adoption model as a guide. The findings of our interviews suggest that almost everyone has a negative attitude. We provide numerous explanations for these impressions, as well as possible approaches to change them. We believe our findings will be extremely useful to health information technology experts attempting to launch a potentially game-changing product, as well as businesses considering investing in such technologies.

Digital images from CT scans and MRIs, information from medical devices, patients' medical records, clinical testing results, and billing records are just few of the data sources that the healthcare ecosystem generates on a regular basis. These data can be found in a variety of formats, ranging from structured spreadsheet data to highly unstructured paper documents. Cognitive computing is a new concept that promises to assist researchers and practitioners in making sense of this information. IBM, a forerunner in the creation of cognitive systems, created Watson, a cognitive computing system that competed in the Jeopardy! game show. IBM began adapting Watson to new sectors, including healthcare, after startling the world by defeating previous Jeopardy! winners. This modified system has the potential to gather evidence from massive amounts of data to support or contradict medical diagnosis and treatments. We looked into if there really is a genuine need for cognitive systems among healthcare workers in our research.

The after-results simply demonstrate how hazy different conceptions of Watson are, in that it is unclear what this technology is or can achieve in general. They came to the conclusion that IBM's present aim is to introduce Watson to innovators and early adopters in university hospitals. However, many familiar with Watson say that the same is more ideal for small hospitals and general physicians, thus this may be a bad plan. This hazy environment could explain the current issues that IBM's underlying Watson Health subsidiary has been experiencing, such as the expected layoff of 300 people (Strickland, 2018). Despite the foregoing conclusion, we believe IBM's efforts to bring Watson to university hospitals will be fruitful. Despite the relative advantage of Watson at small hospitals, as both Respondents B and C propose, academic hospital specialists can do case studies and publish about the observed evidence in favor or against Watson. Case studies like these can help people comprehend what technology is capable of. The more information potential users have about an innovation's projected implications, the further likely they are to accept it (Rogers, 2003). "One of the reasons the da Vinci robot was easily adopted by some Dutch hospitals was because of this reduction in uncertainty," Abrishami says. We looked into five other aspects of Watson's perceptions, in addition to its perceived usefulness and simplicity of use: performance expectancy, comparability, complexity, quantitative measurements, and trialability. When these impressions are favorable, a technological innovation is more likely to be embraced quickly. Unfortunately, there seems to be a lot of ambiguity impacting such perceptions at the time. With the exception of complexity, some other perceptions of Watson, according the interviewees, are quite negative, resulting in ambiguity about several parts of Watson and, as a result, a barrier to its implementation.

(Ying Chen, 2016) Researchers in the life sciences are under more pressure than ever to innovate quickly. Big data has the potential to unearth new insights and speed up breakthroughs. Ironically, despite the fact that there is more data than ever before, only a fraction of it is being integrated, comprehended, and analyzed. The difficulty is in utilizing large amounts of data, integrating data from a multitude of sources, and comprehending their varied formats. Because cognitive solutions are specifically built to integrate and analyze large datasets, emerging technologies like cognitive computing hold promise for tackling this difficulty. Different sorts of data, such as lab measurements in a structured database and the language of a scientific journal, can be understood by cognitive solutions. Cognitive solutions are programmed to comprehend specialized, industry-specific knowledge and to accelerate research by employing advanced reasoning, predictive modelling, and machine learning approaches. Watson, a cognitive computer system, has been set up to help researchers in the life sciences. This version of Watson incorporates medical literature, patents, genomes, chemical and pharmacological data, all of which are commonly used by researchers.

Watson was also built with a deep understanding of scientific language, allowing it to make fresh connections across dozens of pages of literature. Watson has been used in a couple of pilot experiments involving pharmacological target identification and repurposing. Watson's pilot results imply that by using the power of big data, Watson can speed up the discovery of new medication candidates and targets. Many sectors are adopting cognitive computing solutions that are modelled after several fundamental elements of human thought. Their ability to acquire a wide range of data, as well as comprehend, analyze, and learn from it, has the potential to yield new insights. These methods could help fields like Life Sciences, that are in desperate need of faster innovation. Cognitive computing, according to the early experimental projects covered below, adds novelty and quickness to the qualitative research. More research is needed to confirm its efficacy in many treatment areas and study areas. The detection and categorization of unwanted outcome reports from the text of published studies and researched cases may also benefit from cognitive computing.

Current test experiments are beginning to reveal if Watson has the capacity to increase incident detection and coding accuracy and speed. To analyze and improve Watson's drug safety abilities, various test instances throughout types of events, drug kinds, and diseases will be required, just as they were for discovery. Through predictive text analytics, IBM will learn from each engagement and increase Watson's capacity to extract existing relationships and propose novel relationships in both scenarios.

(Fei Jiang, 2016) In this discipline, the IBM Watson system is a pioneer. The system, which contains both machine learning and natural language processing modules, has shown encouraging results in cancer. In cancer research, for example, Watson's therapy suggestions are 99 percent consistent with medical conclusions. Watson also partnered with Quest Diagnostics to provide an AI Genetic Diagnostic Analysis. Furthermore, the system began to have an effect on actual clinical practices. Watson, for example, was effective in identifying the uncommon secondary leukemia triggered by myelodysplastic syndromes in Japan by analyzing genetic data. One concept for connecting an AI system with front-end data input and back-end clinical actions is the cloud-based CC-Cruiser. Patients' demographic and medical data (image, EP results, genetic results, blood pressure, patient records, and so forth) are entered into the AI system with their permission when they come in. The AI system eventually makes clinical recommendations based on the information provided by the patients. These recommendations are delivered to doctors to help them make clinical decisions. Feedback on the ideas will be gathered and handed back into to the AI system, allowing it to improve its accuracy. Stroke management is a lengthy process including a wide range of clinical critical points. Clinical research has traditionally concentrated on a single or small number of clinical concerns, ignoring the ongoing aspect of stroke therapy. Using a huge quantity of data with great data, AI is projected to aid in the research of far more sophisticated yet closer to actual clinical concerns, resulting in better stroke care decision-making. Recently, researchers have begun work in this approach, with promising preliminary results.

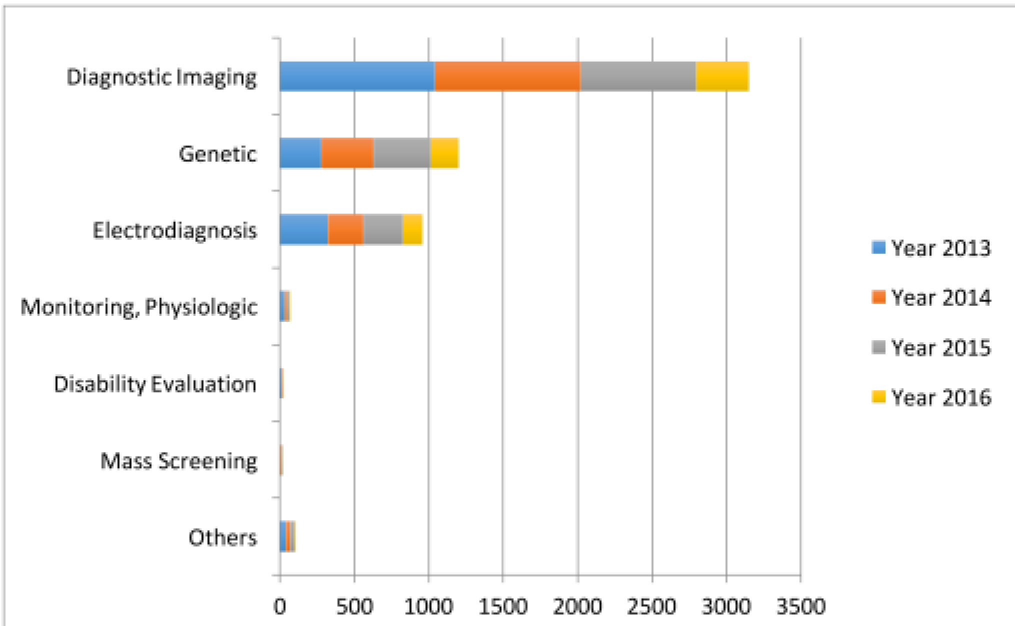

Figure 3.3. 1 The data types considered in the artificial intelligence artificial (AI) literature. The comparison is obtained through searching the diagnosis techniques in the AI literature on the PubMed database.

Physical clinical laboratory and examination notes findings are the other two key data sources, according to the figure.

4. Result and Discussion

4.1. Sentiment analysis by hashtags

Sentiment Analysis has a wide range of applications. For example, a historian can use sentiment analysis to deduce an author's intent hundreds of years ago. This Sentiment Analysis is done on excel by the Azure Machine Learning Add-in. The Sentiment Analysis approach described in this article will score your content and categorize it as conveying Positive, Negative, or Neutral feelings using machine learning.

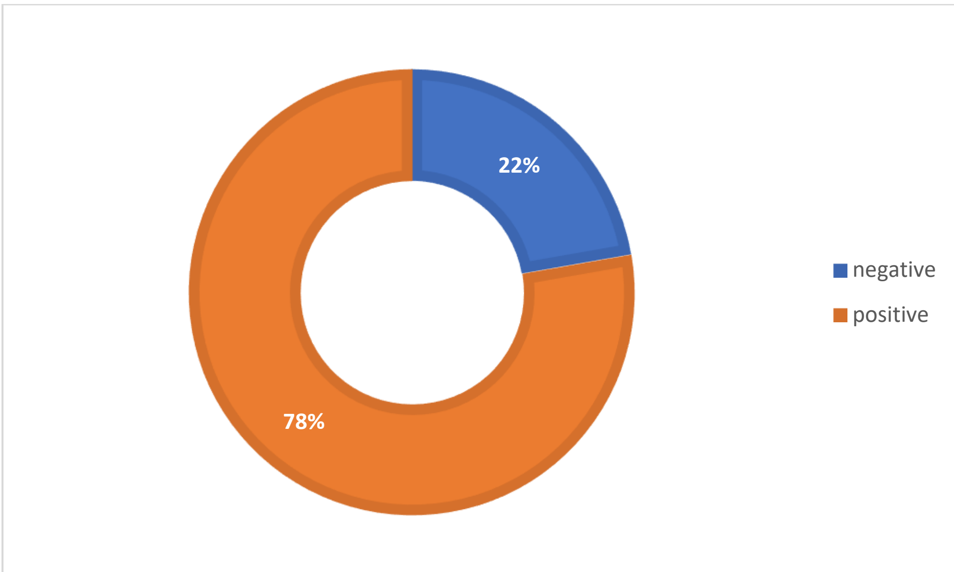

Figure 4.1. 1 Sentiment analysis by hashtags

This figure 2 signifies the sentiment that was analyzed through the twitter extracted data by ‘Azure Machine Learning Add-in’ function of excel. As the graph signifies the greatest number of positive emotions on the twitter. Most healthcare professionals and technical professionals welcoming cognitive computing in healthcare with excitement. Cognitive computing's promise is generating significant interest in the innovations and advancements in almost every field: it has empowered AVs, marketers are utilizing it to understand better and aim their consumers, and investors are using it to improve their analysis and research. The greatest upheaval, however, will most definitely happen in the healthcare field as a consequence of rising of cognitive computing. New AI systems that supplement doctors' roles and involve patients will increase access, cut costs, and, most crucially, improve outcomes, making our planet healthier and happier in the long run. Cognitive computing and AI are altering the way enterprises impact health and wellness in a variety of ways, from advanced personal training to cancer treatment, clinical trial matching to insulin pumps that think.

4.2. Sentiment analysis from IBM Watson twitter account data

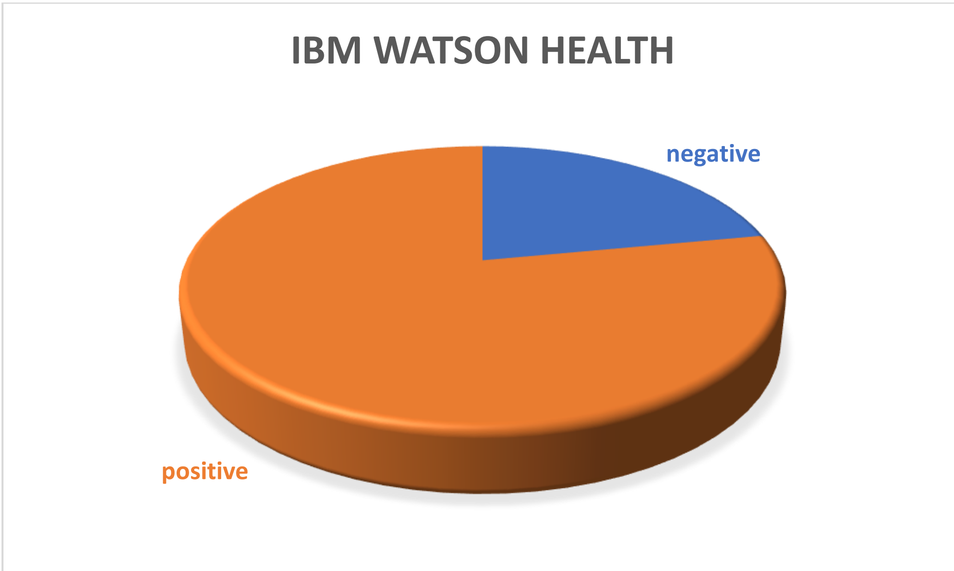

Figure 4.2. 1 Sentiments analysis from IBM Watson Health

The figure 3 shows the significant number of negative tweets or may consider it as re-tweets on the account of company who are working in this specific field. After the analysis of the negative tweets, it was clear that most of them were on the concern of covid-19 showing disappointment toward healthcare sector but the tweets were not exactly targeted toward the IBM Watson in that way. As IBM has only created tool for business class people i.e., The IBM Digital Health Pass is a tool that allows businesses to check COVID-19 test results and vaccination status for employees, customers, and visitors entering their facility, such as a sports stadium, airport, university, government building, or office. The IBM Digital Health Pass is a secure, voluntary digital alternative to paper test results or vaccination cards that uses a combination of encryption, QR codes, and blockchain technology to get another opportunity, if needed, for users to share that they may have tested negative or been vaccinated for COVID.

For a healthy future, medical science and technology advancement must work together. Technology has produced significant and groundbreaking advances to the field of medical care, which has aided in the extension of people's lives all around the world. It has also benefited people's standard of living by making disease care and management more efficient. Among the first medical inventions were the thermometer, microscope, ophthalmoscope, stethoscope, laryngoscope, and X-ray. But IBM hasn’t taken any major actions which may have disappointed people towards the IBM for not creating a technology which could help in controlling the disaster that covid is.

5. Discussion

Healthcare data and information from a wide range of sources is driving the demand for cognitive computing systems. Cognitive computing is predicted to receive a considerable boost in the healthcare market due to the rising popularity of AI, IoT, and wearables, as well as the increasing demand for cloud computing models. We may conclude from this overview that cognitive computing in healthcare is an exciting and promising area of research. To improve current systems' performance and propose fresh solutions based on the efficient use of big data, both academia and industry are working hard. Most of the reported experiences, we've established, are in fact based on those of Americans, whose healthcare system is structured in a unique way compared to that of the majority of nations. Think of a world where healthcare practitioners could tap into the world's greatest doctors to serve the most remote locations and connect more patients to clinical trials that could save their lives. Individual and clinical studies as well as social data from a variety of healthcare sources will be brought together in the age of cognitive health care to reimagine how patients might achieve greater health.

It's not out of the question that clinical assistants powered by artificial intelligence will be handling routine examinations and health problems in the future. This will help to expedite things and prevent the doctor from wasting any time. Other specialties and universities are collaborating with organisations to further expand the cognitive system's ability to anticipate and diagnose other illnesses as well. Cognitive computing is unquestionably a tremendous help to mankind in its quest to live a better but also more difficult existence. And now is the time to achieve and transform global healthcare.

Data, analytics, and digital transformation solutions from Scalable Health help healthcare businesses improve patient outcomes. As a provider of healthcare technology solutions, we use the latest next-generation technologies like Big Data, Social, Mobile, and Cloud to provide healthcare organisations with affordable real-time platforms and products that allow them to improve healthcare, better manage patients and diseases, reduce fraud and waste, speed up drug development, and achieve operational excellence.

Highly parallel processing and artificial intelligence are integrated in cognitive computing to provide a humanlike learning ability, as well as the ability to handle millions of data points in seconds. A cognitive computing system derives conclusions after examining massive datasets, and it improves continuously from the input it obtains about its conclusions, rather than being pre-programmed to deliver specific answers to specific problems. A cognitive computing system is a combination of overlapped, logical algorithms that may be expanded and updated, unlike the present analytic technique, which applies one algorithm at a time. “The current version of cognitive computing provides healthcare organizations with a wide range of options in areas such as clinical decision assistance and clinical quality improvement, as well as healthcare research instruments and analytics for population health management. Because of its greater ability to cope with the amount, velocity, and variety of healthcare information, the big data strategy is gaining favor in larger healthcare companies. Researchers can use cognitive computing to learn more about the connections between genes, proteins, circuits, phenotypes, and diseases”.

Patients and healthcare practitioners can benefit from cognitive computing because it can help identify the most important aspects of a patient's situation and produce easy-to-understand summaries. Clinical trial matching has used cognitive capacities to improve patient selection and recruitment. It can aid in the development of tailored treatment programmes, improving the patient and clinician experience.

6. Conclusion

This paper has highlighted dome new-age cases that are going to be the future of healthcare sector. Individuals will be given a thorough picture of the various factors that impact their health in the future of health care. Patients today desire individualized, transparent, unified, and high-quality care, similar to what they get in other businesses. But now, it is possible for companies to determine whether patients are at an increased risk of developing a particular disease or health problem. It is possible to track post-discharge outcomes and reduce readmissions to a minimum. It will be easier for doctors to make diagnoses now that computer systems and ML algorithms are capable of understanding and recognizing patterns, which is critical in diagnostics. Patients will be able to better understand what is going on and what steps they need to take next because of this improved speed in diagnosis. A new era of AI, similar to the merging of multiple devices into a single smartphone, is upon us. It's only a matter of time before cognitive computing is used to create solutions that will lead to my AI health adviser.

For example, there are application, which can connect patients to doctor instantly through smartphone and is presently accessible as a telephone health coach. Chats with you using advanced machine learning and displays data in context of your daily life. You don't have to sift through a long list of options when it comes to deciding what to eat for lunch. Like texting a friend, you send a free content message to someone. Healthcare businesses need better ways to connect into and analyzes health data in real time to give the experiences empowered consumers deserve. Real-time analysis enables doctors, researchers, insurers, case workers, and other stakeholders to make the best decisions possible, while also giving patients more influence over their own health care. This intricate coordination, on the other hand, takes a long time and can strain even the most adaptable organizations' resources. Health care, like any other business, is being revolutionized and transformed by the rapid growth of data. Today, more healthcare data is generated than at any other point in history. Data management and integrating issues have arisen as a result of large amounts of health-related data coming from a number of sources. By 2020, the size of medical information will have doubled every 73 days, with an anticipated 80% of it being unstructured.

Because of their fragmentation, these rising pools of healthcare-related data, such as EHRs, clinical research, pathology reports, lab results, radiological pictures, voice recordings, and external data, are difficult to communicate. Furthermore, these data sources may not conveniently incorporate essential information about a person's nonclinical problems, which might have a significant impact on their health. As a consequence, individuals and their healthcare practitioners are compelled to make judgments based on a small amount of data. For the vast majority of human history, health care has been given using a one-size-fits-all strategy, with treatment and diagnostic decisions based on the "average" patient. Resultant differences between groups are to be expected. Medical professionals can better serve their patients' needs by considering additional factors specific to each one of them, such as their personal histories, current settings, and genetics, while making medical decisions. The use of cognitive computing allows for a more personalized approach to healthcare. Machine learning, on the other hand, is able to improve health care by analyzing many kinds of data and much more cases than even the largest teams of doctors.

In addition to enhancing patient health, cognitive healthcare decision support can reduce the expenses of missed diagnosis and treatment regimens that are not ideal. Cognitive computing in healthcare is ultimately about offering quality, best-practice, judgement information to everyone in the healthcare system. For medical professionals, this includes being able to continue providing patients with better, more accurate diagnoses and potential treatments based on the most recent medical evidence available around the world. As a conclusion of this paper, we can predict that cognitive computing is the future of healthcare sector. Cognitive computing is going to make healthcare operations more and more advance.

7. Future Scope

In the age of cognitive health care, a new human-technology cooperation aimed at globalizing health care. Cognitive systems that perceive, analyze, and learn assist people learn more, be more productive, and become more expert. With cognitive computing, we can now access previously unavailable health data and have a greater impact on health care than ever before. From personal fitness monitors and mobile apps to electronic medical records and genetic and clinical studies, humans generate a lot of health data. Sadly, most of this data is lost or misused, and most patients don't even have accessibility to their own.

This paper only suggests small amount of information that is happening in the world of healthcare with the help of cognitive computing. There are many more instances that were not covered in this paper such as Memorial Sloan Kettering in New York and MD Anderson in Houston are currently using cognitive computing. Its use with unstructured data, which is mostly text-heavy and not organized in a specified fashion, allows it to look at vast volumes of data to help diagnose and treat patients. It has now become a key clinical decision aid for clinicians. And also, Cognitive Scale has created a health app called Cognitive Concierge that targets certain ailments. It collects data from several sources and provides insights on the user's health and the surroundings. If you have asthma or COPD, Cognitive Concierge will warn you when the pollen count is high. Health systems tend to customize and deploy it to incorporate into care management operations.

Medical transcription outsourcing companies providing doctors and emergency clinic settings profit from trendsetting innovation. To provide the finest treatment and service to patients and other healthcare consumers, it is critical to keep abreast of all technology developments. There are way more practices that had taken place in the world of healthcare with the help of cognitive computing and this paper has only covered small area of this vast topic. There could be more research that could be added in this paper.

8. Limitations

The biggest problem encountered when working on the project was a lack of data. The library used to extract the data from Twitter didn't do it justice, despite the fact that there is a lot of data there. For the months of January and December of the year 2021, I was unable to extract data pieces that would have produced a more precise forecast. Data was too much of relevant for the paper. The paper is don’t really have a specific problem statement. This paper is written to introduce and make readers aware of the work that is done in the healthcare sector by the help of cognitive computing.

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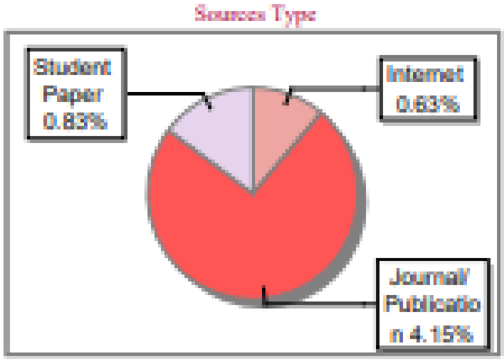

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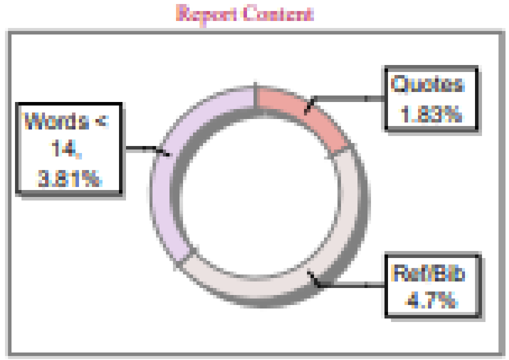

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