

Analysis and Approaches of Artificial Intelligence in Medical Science

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ABSTRACT: In Computer Science and the field of Computers the word “Artificial Intelligence” has been playing a very prominent role and off late this term has been gaining much more popularity due to recent Advancements in the field of Artificial Intelligence and Machine learning. Artificial Intelligence is Extending its frontier in Technology and Knowledge. People have been much addicted to the upcoming inventions of machine with intelligence which has been improving our lives. During developing phase Artificial Intelligence uses computer techniques to perform clinical diagnosis and suggests treatments. Artificial intelligence makes computer more useful to solve problematic health care challenges and helps in interpreting data which is obtained by various chronic diseases in medical field. The Paper examine the Analysis of Artificial Intelligence approach in Medical Science from theory to practice highlighting major themes and Advances.

KEYWORDS: Artificial-Intelligence, Machine-learning, Health Care, Technology

I. INTRODUCTION:

The term Artificial Intelligence was first coined by John McCarthy in 1956 when he held the first Academic Conference. From 1950's forward many scientists, programmers, logicians and theorists aided in solidifying the modern understanding of Artificial Intelligence as a whole. Artificial Intelligence is a subset of computer science that focuses on machine-driven Intelligence (i.e non-human intelligence). In Layman's term Artificial-Intelligence is the understanding that machine can interpret, mine and learn from external data in a way where machine functionally imitate cognitive practices normally attributed to humans. Artificial Intelligence is based on the notion that humans thought processes have the ability to both be replicated and mechanized.



Fig 1.1 Artificial Intelligence

II. OBJECTIVES

1. To know the history and overview of Artificial Intelligence.
2. To understand different Impacts of Artificial Intelligence in Medical field.
3. To Analyze the use of Artificial Intelligence in Medical Science.

III. STAGES OF ARTIFICIAL INTELLIGENCE:

From the broad analysis it is found that Artificial Intelligence has three stages.

1. Artificial Narrow Intelligence:

Artificial Narrow Intelligence is known as Weak Artificial Intelligence. Artificial Narrow Intelligence is the stage of involving machine that can perform only a narrowly defined set of specific tasks. At this stage machine does not possess any thinking ability it just performs a set of predefined functions. Different examples of Artificial Narrow Intelligence are Alpha Go, Sophia, Alexa, Self driving cars, Humanoid so on.



Fig 3.1 Artificial Narrow Intelligence

2. Artificial General Intelligence:

Artificial General Intelligence is also known as Strong Artificial Intelligence. Artificial General Intelligence is the stage in the evolution of Artificial Intelligence where in machine will possess the ability to think and make decisions like humans. Artificial General Intelligence would be able to think on the same level as a humans, much like Sonny the Robot in the featuring decades. In the upcoming future Artificial General Intelligence will be able to create machines that are as smart as humans.



Fig 3.2 Artificial General Intelligence

3. Artificial Super Intelligence:

Artificial Super Intelligence is the stage of Artificial Intelligence when the capacity of computers will surpass human beings. Artificial Super Intelligence is currently a hypothetical situation as depicted in movies and science, fiction books where machines have taken over the world.



Fig 3.3 Artificial Super Intelligence

IV. TYPES OF ARTIFICIAL INTELLIGENCE:

1. Reactive Machines Artificial Intelligence

This type of Artificial Intelligence includes machines that operate solely based on the present data, taking into account only the current situation. Reactive Artificial Intelligence machines cannot form inferences from the data to evaluate their future actions. They can perform a narrowed range of predefined tasks. An example of Reactive Artificial Intelligence is the famous IBM Chess program that beat the world champion, Garry Kasparov.



Fig 4.1 Reactive Machine Artificial Intelligence

2. Limited Memory Artificial Intelligence

Limited memory types refer to an Artificial Intelligence's ability to store previous data and predictions using the data to make better predictions. With Limited Memory, machine learning architecture becomes a little more complex. Every machine learning model requires limited memory to be created, but the model can get deployed as a reactive machine type. Self-driving cars are Limited Memory AI, that uses the data collected in the recent past to make immediate decisions. For example, self-driving cars use sensors to identify civilians crossing the road, steep

roads, traffic signals and so on to make better driving decisions. This helps to prevent any future accidents.



Fig 4.2 Limited Memory Artificial Intelligence

3.Theory Of Mind

The Theory Of Mind Artificial Intelligence is a more advanced type of Artificial Intelligence. This category of machines is speculated to play a major role in psychology. This type of Artificial Intelligence will focus mainly on emotional intelligence so that human beliefs and thoughts can be better comprehended.



Fig 4.3 Theory of Mind Artificial Intelligence

4. Self Aware

Self Aware Artificial Intelligence is the stage where machines have their own consciousness and become self-aware. This type of Artificial Intelligence is a little far fetched given the present circumstances. However, in the future, achieving a stage of super intelligence might be possible. A self-aware intelligence beyond the human has an independent intelligence, and likely, people will have to negotiate terms with the entity it created.



Fig 4.4 Self Aware Artificial Intelligence

V. KEY TECHNOLOGIES OF ARTIFICIAL INTELLIGENCE:

1. Biometric:

Biometric is one of the most widely adopted technology trends that uses computerized techniques to recognize a person by identifying their unique physical or behavioral traits. Fingerprints and face or eye ‘maps’ are considered the critical identification features for this technique. Biometric is one of the constituting technologies laying the foundation for proper implementation of artificial intelligence. Some of the common applications of this technology include building access and laptop security for identifying IDs and passports.



Fig 5.1 Bio-Metric

2. Natural Language Processing:

Natural language processing is the communication method for artificial intelligence. It facilitates the communication with intelligent systems utilizing a natural language such as English. This aspect of AI is concerned with the interactions between computers and humans. Statistical and machine learning techniques are devised by this technology to comprehend sentence structure and meaning, sentiment, and intent

easily. Natural language processing is currently being utilized mostly for fraud detection and security.



Fig 5.2 Natural Language processing

3. Machine Learning:

Machine learning is a type of artificial intelligence that has become one of the most popular technology trends in the recent times. It furnishes computers with the ability to learn, without being explicitly programmed. Machine learning facilitates Artificial Intelligence by providing algorithms, APIs, development and training toolkit and data.



Fig 5.3 Machine Learning

4. Planning Scheduling Optimization:

Planning scheduling optimization is a branch of Artificial Intelligence that deals with strategies or action sequences designed to be executed by intelligent agents, autonomous robots, and unmanned vehicles. Due to the complexity of these solutions, they must be discovered and optimized in a multidimensional space. Planning scheduling optimization is considered as an essential link in the Artificial Intelligence buildup.



Fig 5.4 Planning Scheduling Optimization

5. Robotics:

Robotics is concerned with the study of designing intelligent and efficient robots. It is a mixture of several different domains such as electrical engineering, mechanical engineering, and computer science, which aids in designing and constructing robots. Robotics is one of the most revolutionary technology trends known to man. It uses scripts and other techniques to automate human efforts and support efficient business processes. Some of the prominent vendors of this technology include Blue Prism, UiPath, and WorkFusion, Advanced Systems Concepts, and Automation Anywhere.



Fig 4.5 Robotics

6. Virtual Assistants:

Virtual assistants provide professional, technical, creative and administrative assistance to clients. Over the last couple of years, we have seen the birth of several unique and simple virtual agents like chat bots or advanced systems that can network with humans. They are being used for customer service and support as a smart home manager. Some of the key vendors of this technology include Amazon, Google, IBM, IPsoft, and Microsoft.



Fig 5.6 Virtual Assistants

VI. ARTIFICIAL INTELLIGENCE IN MEDICAL SCIENCE:

AI offers a number of advantages over traditional analytic and clinical decision-making techniques. Learning algorithms can become more precise and accurate as they interact with training data, allowing humans to gain unprecedented insights into diagnostics, care processes, treatment variability, and patient outcomes.



Fig 6.1 Artificial Intelligence in Medical Field

In the year 2018 World Medical Innovation Forum (WMIF) on artificial intelligence presented by Partners Health-care, a leading researchers and clinical faculty members showcased the twelve technologies and areas of the health-care industry that are most likely to see a major impact from artificial intelligence within the next decade. There is already an incredible amount of technology and automation play in medicine, whether we realize it or not medical records are digitized, appointments can be scheduled online, patients can check in to health centers or clinics using their phones or computers. As technology usage has increased in all areas of life, so too has it quietly changed the ways in which we seek medical care.

Below are some of the ongoing example being used in medicine today:

❖ **Decision support systems** - When given a set of symptoms, DXplain comes up with a list of

possible diagnoses which help in giving specific decisions support systems in medical field.

- ❖ **Laboratory information systems** - Germwatcher is designed to detect, track and investigate infections in hospitalized patients
- ❖ **Robotic surgical systems** - The da Vinci robotic surgical system, with robotic arms, precise movement and magnetized vision, allows doctors to precision surgery that wouldn't be possible with an entirely manual approach
- ❖ **Therapy** - AI Therapy is an online course for people struggling with social anxiety
- ❖ **Reducing human error** - Babylon is an online application where patients in the UK can book appointments and routine tests, plus consult with a doctor online, check for symptoms, get advice, monitor their health and order test kit.

Artificial intelligence in health-care uses complex algorithms and software in other words Artificial Intelligence (AI) is used to emulate human cognition in the analysis, interpretation, and comprehension of complicated medical and healthcare data. Specifically, Artificial Intelligence is the ability of computer algorithms to approximate conclusions without direct human input. Artificial Intelligence programs have been developed and applied to practices such as diagnosis processes, treatment protocol development, drug development, personalized medicine, and patient monitoring and care. Medical institutions such as The Mayo Clinic, Memorial Sloan Kettering Cancer Center, and the British National Health Service, have developed AI algorithms for their departments.

VII. IMPACT OF ARTIFICIAL INTELLIGENCE IN HEALTH-CARE

1. Unifying Mind And Machine Through Brain-Computer Interfaces:

Neurological diseases and trauma to the nervous system can take away some patients' abilities to speak, move, and interact meaningfully with people and their environments. Brain-computer interfaces (BCI's) backed by artificial intelligence could restore those fundamental experiences to those who feared them lost forever. By using a Brain Computer Interfaces and Artificial Intelligence, we can decode the neural activities associated with the intended movement of one's hand, and we should be able to allow that

person to communicate the same way as many people have communicated at least five times over the course of the morning using a ubiquitous communication technology like a tablet computer or phone. Brain-computer interfaces could drastically improve quality of life for patients with ALS, strokes, or locked-in syndrome, as well as the 500,000 people worldwide who experience spinal cord injuries every year.

2. Developing The Next Generation Of Radiology Tools:

Radio-logical images obtained by MRI machines, CT scanners, and x-rays offer non-invasive visibility into the inner workings of the human body. But many diagnostic processes still rely on physical tissue samples obtained through biopsies, which carry risks including the potential for infection. Artificial intelligence will enable the next generation of radiology tools that are accurate and detailed enough to replace the need for tissue samples in some cases, experts predict. Artificial intelligence is helping to enable “virtual biopsies” and advance the innovative field of radio mics, which focuses on harnessing image-based algorithms to characterize the phenotype and genetic properties of tumors.

3. Bringing Intelligence To Medical Devices And Machines: Smart devices are taking over the consumer environment, offering everything from real-time video from the inside of a refrigerator to cars that can detect when the driver is distracted. In the medical environment, smart devices are critical for monitoring patients in the ICU and elsewhere. Using artificial intelligence to enhance the ability to identify deterioration, suggest that sepsis is taking hold, or sense the development of complications can significantly improve outcomes and may reduce costs related to hospital-acquired condition penalties. Inserting intelligent algorithms into these devices can reduce cognitive burdens for physicians while ensuring that patients receive care in as timely a manner as possible.

4. Advancing The Use Of Immunotherapy For Cancer Treatment:

Immunotherapy is one of the most promising avenues for treating cancer. By using the body’s own immune system to attack malignancies, patients may be able to beat stubborn tumors. However, only a small number of patients respond to current immunotherapy options, and Oncologists still do not have a precise and reliable method for identifying which patients will benefit from this option. Machine learning algorithms and their ability to synthesize highly complex data-sets may be able to illuminate new options for targeting therapies to an individual’s unique genetic makeup.

5. Monitoring Health Through Wearable And Personal Devices:

Almost all consumers now have access to devices with sensors that can collect valuable data about their health. From smart-phones with step trackers to wearable that can track a heartbeat around the clock, a growing proportion of health-related data is generated on the go. Collecting and analyzing this data and supplementing it with patient-provided information through apps and other home monitoring devices can offer a unique perspective into individual and population health. Artificial intelligence will play a significant role in extracting actionable insights from this large and varied treasure trove of data.

VIII. FUTURE OF ARTIFICIAL INTELLIGENCE:



Fig 8.1 Future of Artificial Intelligence

Artificial Intelligence is one of the most popular technologies on the planet, thanks to its versatility and advanced solutions, It has been growing at a fast pace, and turning the broad views of the changing world. The future of artificial intelligence is more fascinating than ever. People seem to have indulged in this debate for years now. Some say robots are the future and they will replicate humans completely. Artificial Intelligence's future technologies could include different high demand in health-care tools from simple to complex. Another opinion is a human dependency on this sector will increase manifold. However, one thing is for sure, Artificial Intelligence is progressing faster than ever, and no one knows what might come next.

IX. CONCLUSION:

Artificial Intelligence is one of the most prominent new technology of 21st century. Artificial Intelligence is at the centre of a new enterprise to build computational models of intelligence. The main assumption is that intelligence (human or robotics) can be represented in terms of symbol structures and symbolic operations which can be programmed in a digital computer. Aspects of intelligent behaviour, such as solving problems, making inferences, learning, and understanding the language, have already been coded as computer programs, and within very limited domains, such as identifying diseases of different theories. Artificial Intelligence programs can perform human experts. It has evolved many industries on a vast level including medical field. Artificial Intelligence is definitely improving the health-care industry from predictive medical care to more accurate diagnosis. Artificial Intelligence is maturing science which have applications in different fields including medicinal services framework. The essential part of Artificial Intelligence in patient care is quiet finding and picture examination, the future holds incredible potential for stay because of the well-being information's size and intricacy; however the Artificial Intelligence's approaches in meeting the difficulties by growing new examples such as recognition methods, adaptable calculations, and novel methodologies that can utilize enormous amounts of well being information to answer the general inquiries applying Artificial Intelligence to enhance numerous parts of the patient care handle

incredible difficulties calculations, and novel methodologies that can utilize enormous amounts of well being information to answer the general inquiries applying Artificial Intelligence to enhance numerous parts of the patient care handle incredible difficulties.

REFERENCES:

- [1]. Oppenheim M. Stephen Hawking: artificial intelligence could be the greatest disaster in human history. Independent. 2016. Oct 20, <http://www.independent.co.uk/news/people/stephen-hawking-artificial-intelligence-disaster-human-history-leverhulme-centre-cambridge-a7371106.html> (accessed 15 Jan 2017)
- [2]. Mahanta, J. (2017, July 10). Introduction to Neural Networks, Advantages and Applications. Retrieved November 23, 2017.
- [3]. Masnikosa, V.P. The fundamental problem of an artificial intelligence realization. *Kybernetes* 1998, 27, 71–80.
- [4]. Raynor, W.J. The international dictionary of artificial intelligence. *Ref. Rev.* 2000, 14, 1–380.
- [5]. Stefanuk, V.L.; Zhzhikashvili, A.V. Productions and rules in artificial intelligence. *Kybernetes* 2002.
- [6]. Gupta, N.A. Literature Survey on Artificial Intelligence 2017. Available online: <https://www.ijert.org/research/a-literature-survey-on-artificial-intelligence-IJERTCONV5IS19015.pdf> (accessed on 7 June 2020).
- [7]. Daniel B. Neill, “Using Artificial Intelligence to Improve Hospital Inpatient Care”.
- [8]. Holland JH, “Adaptation in Natural and Artificial Systems”, 1975.
- [9]. S.N. Deepa, B. Aruna Devi, “A survey on artificial intelligence approaches for medical image classification”, *Indian Journal of Science and Technology*, Vol. 4 No. 11 (Nov 2011).
- [10]. Cbinsights From Virtual Nurses To Drug Discovery: 106 Artificial Intelligence Startups In Healthcare, 2017, [online] Available: www.cbinsights.com/blog/artificial-intelligence-startups-healthcare/