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Artificial Intelligence in Pharma Sector, Applications and Future Scope

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ABSTRACT: Artificial intelligence (AI) could be a branch of applied science involved with building sensible machines capable of playing tasks that usually need human intelligence. It replicates or simulates human intelligence in machines. It is often astonishingly helpful in move knowledge and presenting results that promotes higher higher cognitive process and facilitate saving human effort, value and time whereas providing higher results to the formulations and processes parameters within the development of medication. AI plays a very important role in varied fields of pharmacy like History of AI, Classifications, Technologies, Devices worked on company trade, AI Applied in prime company firms in world like Pfizer: immune medicine, Novartis, Jonssen prescription drugs etc. and so delineate in several variety of treatment utilized in AI like cancer treatment, uropathy and COVIDE19. The article is delineating regarding the benefits and drawbacks of AI in Pharmaceutical trade, and delineate well Application of AI in company sector and future scope of computer science.

Keywords: Computer science, Drug development, Pharmacy, Drug discovery, Company trade.

I.INTRODUCTION:

The term "Artificial Intelligence" was coined in 1956 by a somebody, John McCarthy UN agency is taken into account as father of computing.[1] computing (AI) could be a stream of science associated with intelligent machine learning, primarily intelligent pc programs, that provides ends up in the similar thanks to human attention method.[2] This method usually contains getting information, developing economical systems for the uses of obtained information, illustrating definite conclusions and self corrections.[3] AI simplifies tasks by creating machines learn from past experiences, mapping efforts and actions to results, distinguishing errors, correcting them, adjusting to new and random input values, and effortlessly activity human-like tasks through in-depth situation analysis.[4] computing is as a field that deals with the planning and application Algorithms for analysis of learning from and deciphering information. computing associate degree compasses several branches of applied math and machine learning, pattern recognition, and clump, similarity based mostly ways Over the last 5 years, the utilization of computing within the company and biotech business has redefined however scientists develop new medication, Tackle sickness. It will be astonishingly helpful in move information and presenting results that promotes higher higher cognitive process and facilitate saving human effort, forged and time.[4]

II. HISTORY OF AI:

Artificial intelligence (AI) was first described in 1950; however, several limitations in early models prevented widespread acceptance and application to medicine. In the early 2000smany of these limitations were overcome by the advent of deep learning now that AI system are capable of analyzing complex algorithm and selflearning we enter a new age in medicine where AI can be applied to clinical practice through risk assessment models, improving diagnostic accuracy and workflow efficiency. This presents a brief historical perspective on the evolution of AI over the last several decades and the introduction and development of AI in medicine in recentyears. [5]

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III. CLASSIFICATION OF AI:

AI can be classified into two different ways: according to calibre and their presence (Figure 1)

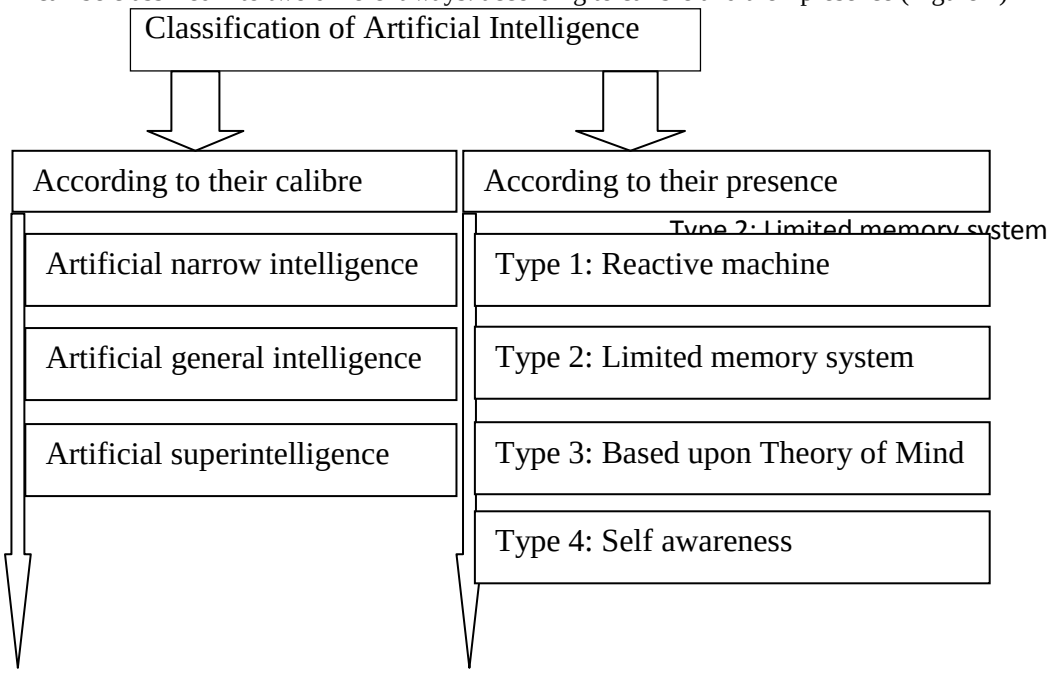

Fig.1: Classification of Artificial Intelligence

According to their ability, AI can be categorizedas:

- **Artificial Narrow Intelligence (ANI) or WeakAI**:

It performs a narrow range task, i.e., facial identification, steering a car, practicing chess, traffic signalling, etc.

- **Artificial General Intelligence (AGI) or StrongAI:**

It performs all the things as humans and also known as human level AI. It can simplify human intellectual abilities and able to do unfamiliar task.

- **`Artificial Super Intelligence(ASI):**

It is smarter than humans and has much more activity than humans drawing, mathematics, space, etc

According to their presence and not yet present, AI can be classified asfollows:

- **ReactiveMachines:**

The IBM chess program that beat Garry Kasparov in the 1990s. Deep Blue can identify pieces on the chessboard and make predictions, but it has no memory and cannot use past experiences to inform future ones. It analyzes possible moves its own and its opponent and chooses the most strategic move. Deep Blue and Google's Alpha GO were designed for narrow purposes and cannot easily be applied to another situation.

- **LimitedMemory:**

These AI systems can use past experiences to inform future decisions. Some of the decision-making functions in selfdriving cars are designed this way. Observations inform actions happening in the not-so-distant future, such as a car changing lanes. These observations are not stored permanently.

- **Theory of Mind:**

This psychology term refers to the understanding that others have their own beliefs, desires, and intentions that impact the decisions they make. This kind of AI does not yet exist.

- **Self-awareness:**

In this category, AI systems have a sense of self, have consciousness. Machines with self-awareness understand their current state and can use the information to infer what others are feeling. This type of AI does not yet exist.[6]

IV. TECHNOLOGIES USED IN AI: [7]

1] Natural language processing (NLP)
2] Support vector machine (SVM)

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3] Heuristics
4] Artificial neural networks (ANN)
5] Machine Learning(ML)
6] Natural Language Processing (NLP)
7] Robotics

V. DEVICES WORKED ON ARTIFICIAL INTELLIGENCE:

1] Smartphones.
2] Smart cars anddrones.
3] Social media feeds (FB, TWITTER, and INSTA).
4] Music and Media streamingservices.
5] Videogames.
6] Online adds network.
7] Navigation and travel. 8] Bankingfinance.
9] Search engines (GOOGLE, BING, YAHOO etc.).
10] Siri Link
11] Alexa.
12] Tesla.
13] Cogito.
14] Boxever.
15] John Paul

VI. ARTIFICIAL INTELLIGENCE APPLIED IN TOP PHARMA COMPANIES IN WORLD:[8]

- Pfizer: immuneoncology.
- Novartis: decode cancer pathologyimages.
- Johnson Johnson: stroke related death, skin scanner Merck & co MSD: emphasis on diabetic at cancerprevention.
- Sanofi: drug repurposing identifies new uses of some of its clinical strength molecule for geneticdisease.

Pfizer: immune oncology:

Pfizer is associate yank transnational pharmaceutical corporation, and one among the world's 2019s largest pharmaceutical firms. the corporate develops and produces medicines and vaccines for a good vary of medical disciplines, including immunology, oncology, cardiology, medicine, and neurology. In 2019, Pfizer proclaimed a partnership with Concreto Health AI, so as to advance the add preciseness medical specialty victimisation AI and real-world knowledge. "Pfizer believes real-world knowledge has tremendous potential to tell however we have a tendency to develop and use medicines to enhance patient outcomes", By combining Pfizer's real-world knowledge with computer science and knowledge science, the corporate aims to spot new and a lot of precise treatment choices, fully redefine study styles, and speed up the completion time of the outcomes studies.

Janssen Pharmaceuticals:

Janssen Pharmaceutical could be a pharma headquartered in Beerse, Belgium, and is an element of the Johnson & Johnson family of firms. In 2019, Janssen proclaimed collaboration with a French take off so as to develop associate AI hopped-up drug style system. supported its capability to explore chemical house (the house covering all attainable molecules and chemical compounds) with speed and potency, the new AI system ought to modify the identification of molecules that meet the required criteria in every scientific research.

Novartis:

Novartis could be a Swiss transnational pharma primarily based in city, Swiss Confederation. it's one among the most important pharmaceutical firms by each capitalization and sales. As a number one international pharma, Novartis uses innovative science and digital technologies to form transformative treatments in areas of medical would like. In Sept 2019, Novartis and Microsoft proclaimed a multiyear partnership which will leverage knowledge and computer science to rework however medicines ar discovered, developed, and commercial. Novartis aims to deal with a number of the largest challenges facing the pharmaceutical trade these days, by conveyance AI experience to each worker in order that they will work to get new medicines at scale and scale back prices.

Sanofi:

Sanofi could be a French transnational pharma headquartered in Paris, France. the corporate works within the field of development, producing, and promoting of pharmaceutical medication. Sanofi covers seven major therapeutic areas enclosed vas, central system, diabetes, oncology, medical specialty, thrombosis, and vaccines. In 2018, Sanofi partnered with associate AI take off so as to make associate AI answer which might modify medical literature review. The AI document process answer is victimisation tongue process (NLP) to scan and review scientific articles, summarize them, and verify to that departments they're most relevant. The business profit is obvious: "Reviewing scientific info is key

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to everything we have a tendency to do, and AI is disrupting however that happens, creating it a lot of quicker, way easier, and far a lot of accurate" – explained a Sanofi representative taking part within the project pilo

VII. AI USED FOR THE TREATMENT OF DISEASES:

- **Advancing the utilization of therapy for Cancer Treatment:**

Immunotherapy is one in every of the foremost promising avenues for treating cancer. By victimisation the body's own system to attack malignancies, patients could also be ready to beat stubborn tumors. However, solely alittle range of patients reply to current therapy choices, and oncologists still don't have an explicit and reliable technique for distinguishing that patients can take pleasure in this selection.[9]

- **Artificial Intelligence in excretory organ Disease:**

Kidney disease may be a major unhealthiness partially thanks to its common etiology caused by diabetics, high blood pressure, avoirdupois & aging the incidence of those condition is increasing. AI may be a science of pc simulated thinking processes & human behaviors, that involves engineering science, psychology, philosophy & linguistics. Electronic medical records that is that the basis for developing AI technology within the clinic.[10]

- **Artificial Intelligence for COVID-19:**

COVID-19, caused by SARS-CoV-2, was initial discovered in Gregorian calendar month 2019 and has since become a worldwide pandemic. associate rising infectious agent pandemic like COVID-19 exerts vital. Digital strategies like computing (AI) hold the potential to greatly enhance medical aid. AI implies the utilization of a pc to model intelligent behavior while not human intervention. it's been applied to several areas of drugs, particularly to assist the detection and hindrance of illness. AI techniques getting used in medication are broad, starting from pc vision to deep learning techniques.[11]

VIII. ADVANTAGES & DISADVANTAGES OF ARTIFICIAL INTELLIGENCE: ADVANTAGES OF AI:

➢ **Reduction in HumanError:**

- One of the biggest advantages of Artificial Intelligence is that it can significantly reduce errors and increase accuracy and precision. The decisions taken by AI in every step is decided by information previously gathered and a certain set of algorithms. When programmed properly, these errors can be reduced tonull.

➢ **ZeroRisks**

- Another big advantage of AI is that humans can overcome many risks by letting AI robots do them for us. Whether it be defusing a bomb, going to space, exploring the deepest parts of oceans, machines with metal bodies are resistant in nature and can survive unfriendly atmospheres. Moreover, they can provide accurate work with greater responsibility and not wear outeasily.

➢ **24x7 Availability:**

- There are many studies that show humans are productive only about 3 to 4 hours in a day. Humans also need breaks and time offs to balance their work life and personal life. But AI can work endlessly without breaks. They think much faster than humans and perform multiple tasks at a time with accurate results. They can even handle tedious repetitive jobs easily with the help of AIalgorithms.

➢ **DigitalAssistance:**

- Some of the most technologically advanced companies engage with users using digital assistants, which eliminates the need for human personnel. Many websites utilize digital assistants to deliver user-requested content. We can discuss our search with them in conversation. Some chatbots are built in a way that makes it difficult to tell whether we are conversing with a human or achatbot.

➢ **AI in RiskySituations:**

- One of the main benefits of artificial intelligence is this. By creating an AI robot that can perform perilous tasks on our behalf, we can get beyond many of the dangerous restrictions that humans face. It can be utilized effectively in any type of natural or man-made calamity, whether it be going to Mars, defusing a bomb, exploring the deepest regions of the oceans, or mining for coal andoil.

Disadvantages of Artificial Intelligence:

➢ **High Costs:**

- The ability to create a machine that can simulate human intelligence is no small feat. It

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requires plenty of time and resources and can cost a huge deal of money. AI also needs to operate on the latest hardware and software to stay updated and meet the latest requirements, thus making it quitecostly.

➢ **Nocreativity:**

- A big disadvantage of AI is that it cannot learn to think outside the box. AI is capable of learning over time with pre-fed data and past experiences, but cannot be creative in itsapproach.

➢ **Unemployment:**

- One application of artificial intelligence is a robot, which is displacing occupations and increasing unemployment (in a few cases). Therefore, some claim that there is always a chance of unemployment as a result of chatbots and robots replacing humans.
- For instance, robots are frequently utilized to replace human resources in manufacturing businesses in some more technologically advanced nations like Japan. This is not always the case, though, as it creates additional opportunities for humans to work while also replacing humans in order to increaseefficiency.

➢ **Make HumansLazy:**

- AI applications automate the majority of tedious and repetitive tasks. Since we do not have to memorize things or solve puzzles to get the job done, we tend to use our brains less and less. This addiction to AI can cause problems to futuregenerations.

➢ **No Ethics:**

- Ethics and morality are important human features that can be difficult to incorporate into an AI. The rapid progress of AI has raised a number of concerns that one day, AI will grow uncontrollably, and eventually wipe out humanity. This moment is referred to as the AIsingularity.

➢ **Emotionless:**

- Since early childhood, we have been taught that neither computers nor other machines have feelings. Humans function as a team, and team management is essential for achieving goals. However, there is no denying that robots are superior to humans when functioning effectively, but it is also true that human connections, which form the basis of teams, cannot be replaced bycomputers.

Application of artificial intelligence in pharmacy:[12,13]

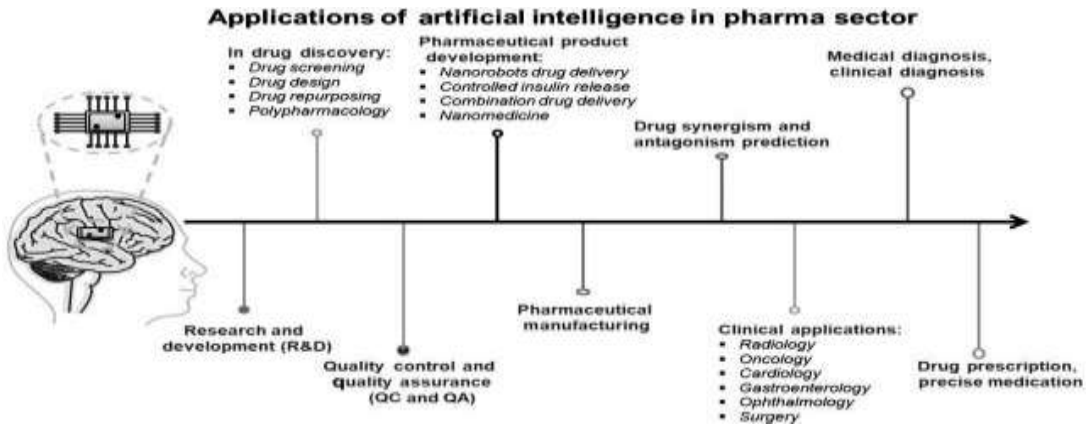

Fig.2: Application of AI in pharma sector

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Drug Discovery:

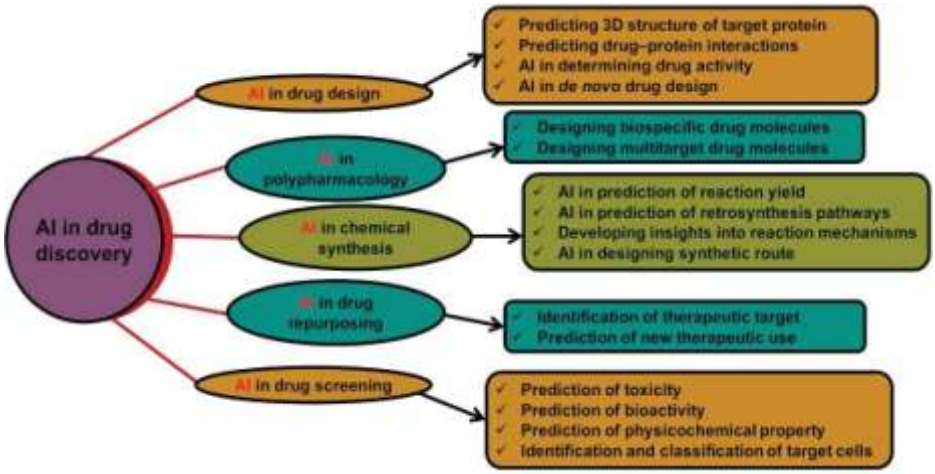

Fig.3: AI in drug discovery

- This phase of R&D is focused on finding new drug molecules effective against a particular diseased biologicaltarget.
- To increase the success rates of new drugs while decreasing operational costs at the sametime.
- AI can be used to find candidate molecules for drugs, develop compounds from scratch, and aid the process of the molecules, with betterefficacy.
- AI also helps in better understanding the disease'smechanisms.

Drug Development:

- Drug development through clinical trials runs a high risk of failure due to human errors in data processing and candidatemonitoring.
- AI systems and algorithms process vast amounts of information quicker and with precision, maintain proper records and ensure transparency when it comes to clinical trialdata.
- It can be used to optimize the entire trial process, including trial designing and site selection.
- AI also enables faster and accurate gathering of clinical data, identification and monitoring suitable candidates for trials, predicting risk and toxicity, and monitoring drug adherence in trialcandidates.

Manufacturing:

- The drug manufacturing process, again, can take longer when not optimized through technology.
- AI can be used for pharma quality control, reducing design time, inventory management, predictive maintenance, demand forecasting, logistics optimization and end-to-end-visibility.
- AI also makes the entire manufacturing process more accurate through proper planning of the supplychain.
- Pharma companies can implement AI in manufacturing process for higher productivity, improved efficiency, and faster production of lifesaving drugs. AI can be used to manage and improve all aspects of the manufacturing process,including:
- Qualitycontrol.
- Predictivemaintenance.
- Wastereduction.
- Designoptimization.
- Processautomation

Sales and Marketing:

- End-to-end visibility provided by AI for drug commercialization is a great value-add for pharmacompanies.
- AI can help pharma companies coordinate product launches better, provide physician decision support and marketing operations, predict market access, and aid pricing decisions.
- Some pharma marketers are using AI to

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understand customer journeys at a deeper level.

Clinical Application of AI:

➢ **Cardiology:**

- Cardiovascular diseases represent one of the leading causes of morbidity and mortality worldwide, requiring expensive treatments and posing a burden on both patients and the healthcare system [14].Introducing AI technology to the field of cardiology holds great promise for improving the prediction and diagnosis of cardiac events and visualizing cardiac anomalies that anticipate patients' needs and provide personalized medical care. This is particularly appealing in cardiology due to the large amount and variety of available biological data. By properly analyzing and interpreting images, pulse waves, electrocardiograms, and sound information, various algorithms can identify patterns that lead to disease offset or aggravation, helping the cardiologists in choosing the best treatment alternative [15].

➢ **Neurology:**

- The benefits of AI have also attracted attention in the area of clinical neurosciences, as newly developed tools can ensure early detection and improve the management of neurologicalconditions.[16]

➢ **Oncology:**

- Cancer comprises a group of more than a hundred types of diseases characterized by abnormal cell growth in different body parts and requires prompt and adequate treatment to prevent serious health issues and increase patients' survival rates [17]. As cancer poses tremendous burdens on patients and healthcare systems worldwide, there is no surprise that AI has started being investigated in relation to oncology. AI may assist with collecting and evaluating data, diagnose the information on the basis of health, match it with prior information and expertise, and choose adequate diagnostic treatment plans. Thus, it has been studied for improving the diagnosis and management of many forms of cancer, including breast, lung, thyroid, oral, gastric, colorectal, liver, and skin cancers[18].

➢ **Hematology:**

- AI approaches have also gathered interest in benign and malign hematology settings, being researched for applications in the diagnosis and prognosis of various forms of leukemia, lymphoma, anemias, and genetic blood disorders[19

IX. FUTURE SCOPE OF ARTIFICIAL INTELLIGENCE:

- AI in science andresearch.
- AI in cybersecurity.
- AI in dataanalysis.
- AI intransport.
- AI in health careetc.

➢ **AI in science and research:**

- AI is making lots of progress in the scientific sector. Artificial intelligence can handle large quantities of data and processes it quicker than human minds. This makes it prefect for research where the sources contain high data volumes. AI is already making breakthroughs in this field[20].

➢ **AI in cybersecurity:**

- Cyber security is another field that's benefitting from AI. As organizations are transferring their data to IT networks and cloud, the threat of hackers is becoming moresignificant.

➢ **AI in dataanalysis:**

- Data analysis can benefit largely from AI and ML. AI algorithms are capable of improving with iteration, and this way, their accuracy, and precision increase accordingly. AI can help data analysts with handling and processing largedatasets.

➢ **AI in transport:**

- The transport sector has been using AI for decades. Airplanes have been using autopilot to steer them in the air since 1912. An autopilot system controls the trajectory of a plane, but it isn't restricted to aircraft alone. Ships and spacecraft also use autopilot to help them maintain the correct course.

➢ **AI in healthcare:**

- The medical sector is also using this technology for its advantages. AI is helping medical researchers and professionals in numerousways.[21]

X. CONCLUSION:

AI is at the center of a new enterprise to build computational models of intelligence. The main assumption is that intelligence (human or

otherwise) can be represented in the terms of symbol structures and symbolic operations which can be programed in a digital computer. AI researchers need not wait for the conclusion to that debate, not for the hypothetical computer that could model all of human intelligence. Aspects of human intelligent behavior, such as Disease Identification, Radiology & Radiotherapy, Clinical Trial Research, Drug Discovery, Personalized Medicine & Rare Disease Identification & Treatment Robotic pharmacy, and medical robots that are going to be the most important fields of research in Pharma and healthcare. Artificial Intelligence can lead to the development of various technologies and software that would help improve the pharmaceutical productdevelopment.

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