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ARTIFICIAL INTELLIGENCE AND ITS ROLE IN PHARMACEUTICAL INDUSTRY.

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Abstract:

Artificial intelligence is an area of computer science that deals with ability to Slove problems using symbolic programming. It can help to solve health care issues with large scale applications. It is technology-based system that uses variety of advanced tools & networks to stimulate human intelligence[1]. It makes use of systems & software, can read and learn from data & to make independent judgement in order to achieve certain goals. AI the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings.

Artificial intelligence use in pharmaceutical technology has increased over the years, and the use of technology can save time and money while providing a better understanding of the relationships between different formulations and processes parameters.

AI in the clinical data management system is widely used to manage the data that is collected during the clinical trials. This system offers various comfortable methods via which the data can be collected, managed and stored easily for further use. As an endpoint, various future challenges and options are considered which give a detailed idea about the growth of clinical data management in the Pharmaceutical Industry.

Keywords: *Artificial Intelligence, Innovation, drug design and development, transforming pharma, Global Market.*

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INTRODUCTION:

The pharmaceutical industry has been a create powerful in data digitization in past few years digitalization means challenge of gathering evaluating and utilizing knowledge to solve complicated healthcare problems arises with the digitalization. It encourages to usage of more AI to handle vast amounts of data with greater efficiency.

THE MC-KINSEY GLOBAL INSTITUTE that predicts that significant developments of AI guided automation would fundamentally alter society's work culture.

The AI contains two types of learning:

- Machine learning.
- Deep learning.

MACHINE LEARNING: It is an area of AI that employs statistical methods with ability to learn with (or) without being explicitly programmed.

This learning divided into 3 types:

1. Supervised learning
2. Unsupervised learning
3. Reinforcement learning

DEEP LEARNING: It is subfield of machine learning that use artificial neural networks to adapt & learn from huge amounts of data.it has ability to discover new drugs (or) uncover (or) repurpose drugs that consists of more potent when used in individually (or) in combination.

Designed by Newell and Simon in 1995, it may be considered the first AI program. The person who finally coined the term artificial intelligence and is regarded as father of AI is John McCarthy.

AI was Introduced:

• In 1956, the beginning of AI can be traced to classical philosopher's attempts to describe human thinking as a symbolic system.

• But the field of AI wasn't formally founded until 1956, at a conference at Dartmouth College, in Hanover, New Hampshire, where the term AI was coined.

HISTORY OF AI

Maturation of AI (1943-1952) Year 1943-The first work which is now recognized as AI was done by Warren McCulloch and Walter pits in 1943.They proposed model of artificial neurons. In the Year 1949-Donald Hebb demonstrate an updating rule for modifying the connection strength between neurons. His rule is now called Hebbian learning.

THE BIRTH OF AI (1952-1956)

In the Year 1956-The word AI first adopted by American computer scientist John McCarthy at Dartmouth conference. For the first time, AI coined as an academic field. During AI winter, an interest of publicity on AI was decreased. In the Year 2006 – AI came in the Business world till the year 2006. Companies like Facebook, Twitter, and Netflix also started using AI. Deep learning, big data and artificial general intelligence (2011-present). In the Year 2018 – The "Project Debater" from IBM debated on complex topics with two master debaters and also performed extremely well. Google has demonstrated an AI program "Duplex" which a virtual assistant.

ARTIFICAL INTELLIGENCE IN DRUG DISCOVERY

Drug discovery often takes a long time to test compounds against samples of diseased cells. Finding compounds that are biologically active and are worth investigating further requires even more analysis. As computers are far quicker compared to traditional human analysis and laboratory experiments in uncovering new data sets, new and effective drugs can be made available sooner, while also reducing the operational costs associated with the manual investigation of each compound. Drug discovery-pharma companies in conjunction with software companies are trying to implement the most cutting – edge technologies in the costly and extensive process of drug discovery.

TOOLS OF AI

ROBOT PHARMACY

The objective of improving the safety of patients, UCSF Medical Centre uses robotic technology for the preparation and tracking of medications.

The abilities of the robotic technology include preparation of oral as well as injectable medicines which include chemotherapy drugs that are toxic.

This has given freedom to the pharmacists and nurses of UCSF so that they can utilize their expertise by focusing on direct patient care and working with the physicians.

MEDI ROBOT

Medi is a short form for medicine and engineering designing intelligence. Tools of AI The pain management robot was developed as part of a project led by Tanya Beran, professor of Community Health Sciences at the University of Calgary in Alberta.

The robot first builds a rapport with the children and then tells them what to expect during a medical procedure, although the robot cannot think, plan, or reason, it can be programmed such that it shows to have AI.

ERICA ROBOT

Erica is a new care robot that has been developed in Japan by (Hiroshi Ishiguro, a professor at Osaka University). It can speak Japanese and has a blend of European and Asian facial feature. Erica is the "most beautiful and intelligent" android as Ishiguro fixed up the features of 30 beautiful women and used the average for designing the robot's nose, eyes, and so on.

TUG ROBOTS

Aethon TUG robots are designed to autonomously travel through the hospital and deliver medications, meals, specimens, materials, and haul carry heavy loads such as linen and trash. It has two configurations, i.e., fixed and secured carts as well as exchange base platform that can be used to carry racks, bins, and carts.

BERG

Berg is Boston-based biotech and is one of the key players employing AI in its various processes. It has an AI-based platform for drug discovery, which has a huge database of patients and this is used to find as well as validate the various biomarkers responsible for causing diseases and then decides therapies according to the obtained data.

MANUFACTURING EXECUTION SYSTEM (MES)

The benefits of using MES include compliance with guaranteed legal regulations, minimized risks, increased transparency, shortened production cycles, optimized resource utilization, controlled, and monitored production steps, and optimized up to batch release.

AI APPROACHES FOR DRUG DISCOVERY

The drug discovery procedure begins from the available results attained from different resources like high throughput screening modelling, fragment screening modelling, computational modelling and existing data reported. The drug discovery interchanges amongst induction and deduction processes. Thus, the interchangeable cycle of inductive–deductive process ultimately guides to attain the optimized lead molecules.

AI supercomputers are able to receive and examine the information for identification the association in-between the compounds to offer newer drug molecules.

The aim of de novo design in the drug discovery is the invention of newer active molecules without the uses of reference molecules. Finally, the active learning algorithms permit the discovery of new molecules with the potential actions against the target-setting of diseases or disorders.

Several in silico methods for the selection of profiles like ligand-based design approaches or molecular structure-based design approaches may be employed along with the accessible information on the small molecule modulator probes or the features of structural biology. In silico molecules is obtaining the next generation AI.

ARTIFICIAL INTELLIGENCE IN DRUG DEVELOPMENT PROCESS

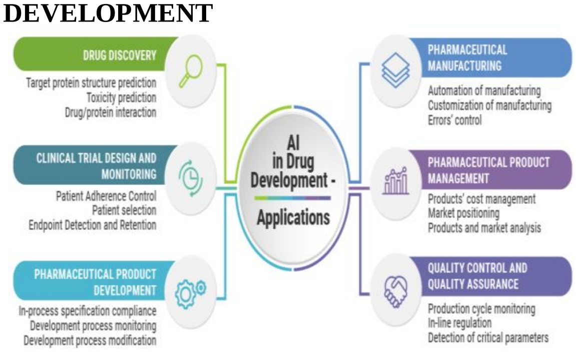
The feedback-driven drug development process starts from existing results obtained from various sources such as high-throughput compound and fragment screening, computational modelling and information available in the literature. De novo design methods require knowledge of organic chemistry for in silico compound synthesis and virtual screening models that function as surrogates for biochemical and biological tests of efficacy and toxicity.

The first step in drug development is the identification of novel chemical compounds with biological activity. The identification of a lead molecule is the second step in drug development. A lead is a chemical compound that shows promising potential that can lead to the development of a new drug as a treatment for a disease.

R&D EFFICIENCY AND ATTRITION RATE IN DRUG DEVELOPMENT

The R&D efficiency is simply a term used to describe the number of new drugs approved by the FDA per billion US$ spent on R&D alone. The cost for drug development includes the entirety of failure; thus, the estimated cost is an average estimate for a new drug to be introduced into the clinic.

APPLICATIONS OF AI IN DRUG DEVELOPMENT



- In understanding pathway or finding molecular target.
- AI in synthesis of drug like compounds.

- AI in selection of population for clinical trials.
- AI in poly pharmacology.

AI BASED ON CLINICAL DATA MANAGEMENT SYSTEM

Introduction

The analysis and authorization of new pharmaceuticals is based upon the trust that clinical trials will intend to find the answers to the investigation problems by providing clinical data which further proves or disapproves a particular hypothesis. The type and quality of the clinical data plays an imperative task in the conclusion of the study performed. Therefore, this clinical data so obtained is appropriately managed to obtain the accurate results of the clinical study thus, a system Clinical Data Management (CDM) is needed for the authentication of the study.

Clinical Data Management forms a fundamental part in the clinical trial studies. CDM is implied in all the facets of operating computers, dispensation of the clinical data, managing the subject data and database systems to support the collection of the data. Clinical Data Management is precisely defined as the collection, integration and validation of the trial data. The key objective of CDM is to offer high quality data by observing the errors and missing data and keeping it as low as possible to congregate maximum data for analysis.

In clinical data management, software's are generally required to address the electronic data capture, preparation of the electronic FDA submission, acceleration of the clinical trial management processes.it also include high quality data. A high-quality data is defined as the data which is suitable and accurate for statistical quantification. The data should satisfy the protocol specific parameters should be compliable with the protocol necessities.

CASE REPORT FORMS

A case report form can be electronic or a paper-based system and is generally abbreviated as CRF. It is widely used tool by the sponsor for the collection of the data from the patients participating in a clinical trial.

The data regarding the participation of a patient in a clinical trial is documented in the case report forms which also includes the adverse events. The CRF is usually developed by the sponsor to collect the data that would be required for testing the hypothesis in a clinical trial or it can also be used for answering a plethora of questions regarding the clinical testing.

CRF DESIGNING

A CRF is made by for the collection of data from the protocol. A CRF may be paper based or in the form of EDC. There is a proper coding given to the CRF to communicate the collection of data which is to be stored in the database. A CRF should be constructed in such a way that it must be concise and the data must be stored in high quality. The header and the footer given in the CRF must be made in such a way that it should give the details about the study. During the designing of the CRF the discrepancies in the data can be avoided by making a proper layout of the CRF that should be of basically three types that is, time dependent, non-time dependent and cumulative layout.

DATA MANAGEMENT

Data acquisition is usually referred to as that gadget that is used to attain the data from the clinical trial without any omission from the set of rules that are given to conduct the trial. The quality of the data acquires depends entirely upon the quality of the instrument used to acquire data. Therefore, the design, quality assurance and development of such an instrument must be given paramount importance. Collection or acquisition of the clinical data may be brought by using various technicalities that may include but not necessarily be limited to paper forms, interactive voice response systems, electronic or paper medical proceedings, central web-based systems or electronic data capture systems. For the proper reference of these systems the ICH guidelines on good clinical practices use the term "Case Report Form" which is utilized for the eminence and uprightness of the data. One of the systems that is used for data acquisition is explained below

Data redundancy is usually used to assess data validity when other practical forms of data collection are not available. When redundancy is used to validate the data, the dimensions are usually obtained via sovereign resources. Data that is recorded via same amount should not be collected in more than one place or more than once as this would create superfluous work for the research site and would develop the requirement to check the moldabilities between the two data levels. Also, if the data is to be shared to develop an end point, the initial data must not be collected more than once. Only one out of the two that is the raw data or the acquisition made by the raw data must be collected and generally raw data is preferred. The redundant data may also cause analytical inconsistencies say; site variations in the arithmetic method can cause inconsistencies. Thus, the raw material should be used to calculate the average in the first algorithm and the average collected should be utilized for second algorithm. Until the consistency in the data is developed, both the algorithms can produce variable results. The data management of the clinical trials is usually conduct in two ways, one being the paper-based system and the other being the electronic data-based system and they are explained further in this review.

PAPER BASED SYSTEMS

In the paper-based systems the case report forms are filled manually at the site and are then mailed to the company. The data that has been collected is further sent to the CDMS tool that is, Clinical Data Management System through data entry. For this matter, the most common method used is the double data entry method wherein, two diverse data entry operators enter the data in the system separately and both the entries made are compared by the system. In case, if there is any divergence in the entry the system sends alerts and the verification can be done manually. Also, a single data entry method is widely used in which a single operator enters the data in the system. The data in the CDMS are further given for validation purposes also, during the data validation the data explanation is done from various sites through paper forms, which contain the problem description and are then send to the investigator site and it responds by answering them through mails.

ELECTRONIC DATA CAPTURE

With a slow and a steady pace pharmaceutical companies are moving forward towards capturing the data of the patient record information from the source to the electronic system which has the function of submitting the data to the sponsors or the consumers. This shift of collection of data from paper to electronic system is referred to as electronic data capture. Electronic data system or EDC is a software system that is used to store the patient's or a participant's data that is unruffled during clinical trials. Before transcribing into the system, the data is first recorded on the paper and then saved as electronic case report form (eCRF). EDC system software is used to conduct both complex and simple clinical trials in all aspects of research. Not all EDC systems are equal in nature and technicality and not every technicality offers a solution to needs of every organization.

It also includes:

- Data collection
- CRF tracking
- Data entry
- Data validation
- Discrepancy management
- Database locking

CLINICAL DATA SOFTWARE'S:

- EZ-entry
- Oracle clinical software
- TCS-CLIN-E2E software
- SAS- clinical software
- Cognos 8 business software a) reporting b) analysis
- Symmetric software

TCS-CLIN-SOFTWARE

Tata consultancy services established in 1968, has grown as one of the largest IT companies in Asia. It has its alliance with most of the leading IT companies such as Microsoft, Oracle, SAP, HP and IBM. This software addresses all the four phases of clinical trials. The secure electronic environment of the software captures the electronic data that integrates the sites and the laboratories with the sponsors. Through this software the pharmaceutical companies are able to create CRFs which investigates the clinical data and monitors global trial sites. Key features of the software include:

- It is driven by the protocol mentioned.
- Can handle both paper and electronic CRFs.
- Creates study templates and CRFs that can be reused which reduces the study time period.
- Modification and correction of the data. & Has a greater compliance with 21 CFR part 11 of the GCP.

SYSTEMIC SOFTWARE

Symmetric software has been developed by symmetric life sciences organization which is a cost-effective system for the purpose of clinical trial data collection and management which fully abides by the international standards and has a proper client base all over the world. Various organizations in which Symmetric Sciences has a membership are:

- The society for clinical trials
- Drug Information Association
- The American Statistical Association
- The International Biometric Society
- The Association for Clinical Data Management
- The Regulatory Affairs Professional Society.

SURVEY ON AI APPROACHES FOR DATA VISUALIZATION

DATA visualizations use visual representations of abstract data to amplify human cognition. Researchers traditionally investigate visualizations as artifacts created for people. This paper revisits this traditional perspective in line with the growing research interest in applying artificial intelligence (AI) to visualizations. Similar to common data formats like text and images, visualizations are increasingly created, shared, collected, and reused with the power of AI. Thus, we see that visualizations are becoming a new data format processed by AI. For instance, this trend was evident at the 2020 IEEE Visualization Conference, where multiple techniques were proposed for automating the creation of visualizations retargeting visualizations and analysing visualization ensembles. In light of this trend, new concepts and research problems are emerging, raising the need to organize existing literature and clarify the research landscape. This survey describes the research vision of formalizing visualizations as an emerging data format and reviews recent advances in developing AI approaches for visualization data (AI4VIS). We define visualization data as the digital representations of visualizations in computers and focus on data visualization. Different from common formats, visualization data contains multimodal information such as visual encodings, encoded data, text, and images. Those characteristics pose new challenges in developing tailored AI approaches (e.g., how to represent visualization data).

VISUALIZATION OF DATA

It includes explanation by visualization data and by representation. visualization data formats into graphics, programs, and hybrid that blends the benefits of both. In addition to raw data, we note visualizations are sometimes represented as carefully designed internal representation formats in surveyed systems. Internal representations are usually proposed to facilitate the computing by removing unnecessary information, e.g., the VQL format only stores data transformation and encoding without style information. As such, internal representations are usually not exposed (outputted and shared). Finally, we review feature presentations, including feature engineering and feature learning. Feature presentations are vital for machine learning tasks by concerting visualizations into features that are mathematically and computationally convenient to analyse. We discuss them due to the increasing interest in applying machine learning to visualizations.

APPLY AI IN VISUALIZATION DATA

The goals of applying AI to visualization data cover a wide spectrum, pursued by research efforts from different areas. We adopt a deductive classification method to create a mutually exclusive and collectively exhaustive taxonomy that better structures our discussion. Specifically, we subdivide goals along two axes deductively: whether visualizations are the input or output and whether visualizations are single or many. We further merge outputting single visualization and outputting many visualizations from an inductive perspective, i.e., we observe that they share the same sub-categorization. Therefore, we finally classify goals into 3 categories, which are further subdivided:

- Visualization Generation: outputs single or many visualizations given different user inputs.
- Visualization Enhancement: processes and applies enhancement to an input visualization.
- Visualization Analysis: concerns organizing and exploiting a visualization collection.

It should be noted that some work is a technique paper that introduces a novel algorithm without practically demonstrating the applications We do not label the goals for those techniques but instead discuss their tasks in section.

VISUALIZATION GENERATION

One of the central research problems in the visualization community is to ease the creation of visualizations. This is important since authoring effective visualizations is often time-consuming and challenging even for professionals. As such, the ultimate goal of work in this category is to automatically generate visualizations. We identified four subcategories that distinguish visualization generation approaches by user input

Data-based generation outputs visualizations given a database or a data-table. These approaches assist in visual data analysis and have been extensively studied over the last decades. Early research dates back to 1986, while it still remains an important question nowadays. Recent work like Draco Deep Eye, Vim, and Data Shot make efforts on the direction.

Visual analysis is an iterative process where the next step of analysis often depends on earlier insights, motivating the research on anchor-based generation. The problem is to recommend a visualization given an anchor visualization. For instance, Seed intelligently recommends visualizations with large deviation to the anchor visualizations, since they deem most “interesting” to users. Similarly, Dive aims to vary the visualization recommendation, while Dzib a target at maintaining consistency. It is related to anchor-based generation, design-based generation studies the problem of generating visualizations by injecting the target data into a reference design. This is referred to as style transfer or visualization-by-example. Another recent example is Retrieve-Then-Adapt that applies pre-defined design templates to user information. The last category is context-based generation, where the input only provides some contextual information such as a natural language description or news articles. An important task for context-based generation is to recommend data that is mostly related to the given context.

VISUALIZATION ENHANCEMENT

The proliferation of visualizations gives rise to research efforts in enhancing the use of existing visualizations. An important question is to retarget visualizations to different environments. For example, Vis Code and Chattem encode additional information in visualization images. It is also common to summarize visualizations to generate natural language descriptions such as captions and annotations. This approach transforms visualizations from visual to non-visual modality, whereby enabling multimodal interactions [63] or enabling people with vision impairments to consume charts. Related to natural language, recent research challenges machines to perform question answering on visualizations, that is, to generate answers given a question. Finally, some work explores adding interactions to visualizations to improve the legibility and interactivity, e.g., Graphical Overlays uses layered elements to aid chart reading.

Visualization analysis

With the increasing availability of visualization data, recent research has constructed visualization databases and investigated methods for managing and analysing these collections (14 papers). Retrieval has been largely studied in the field of information systems and databases, helping users search for visualizations that match their needs. For instance, Retrieve-Then-Adapt assists users in finding an example chart suitable for encoding their data. Saleh et al. developed a search engine that returns stylistically similar visualizations given a query visualization.

Another promising set of work has started to mine visualization collections to derive useful information such as the visualization usage on the web or in the scientific literature, as well as design patterns in visualizations, and multiple view systems. The mined patterns provide evidence for recommending visualizations. Related to mining, some work facilitates visual data analysis. Specifically, they consider charts to be the analytical object and propose a visual analytic approach for analysing data from charts ensembles by providing analytical guidance for effective visual analysis, e.g., which charts to examine next.

APPLY OF AI TO VISUALIZATION DATA

In this section, we focus on common tasks that researchers apply to visualization data. We organize the observed tasks into seven primary tasks as follows where the number indicates the count:

• **Transformation** coverts visualization data from one modality (e.g., graphics) to another (e.g., program) (35/98).

• **Assessment** measures the absolute or relative quality of a visualization in terms of scores or rankings (19/98).

• **Comparison** estimates the similarity or other metrics between two visualizations (12/98).

• **Querying** finds the target visualization relevant with a user query within visualization collections (10/98).

• **Reasoning** challenges AI to interpret visualizations to derive high-level information like insights and summaries (22/98).

• **Recommendation** automates the creation of visualizations by suggesting data and/or visual encodings (38/98).

• **Mining** discovers insights from visualization databases (7/98). Most of those tasks originate from well-known terminology.

ARTIFICIAL INTELLIGENCE IN THE MEDICAL DEVICE INDUSTRY

Artificial intelligence (AI) is coming of age the use AI in medical device industry has skyrocketed in recent years. Its expansion throughout the sector coincides with advances in DNA research and automated manufacturing capacities.

Artificial intelligence takes healthcare/life sciences technologies to a more sophisticated level, but it comes at a cost. Here's why investing in life sciences AI technologies pays off over longer term.

Common artificial intelligence (AI) applications in the life sciences sectors include:

- Remote patient monitoring (connected devices and automatic data uploads)
- Wi-Fi- enabled monitors.
- Predictive analytics, trends monitoring
- CAPA evaluations Automated 'AI-driven visual inspections of finished products (high volume scanning)
- Drug development/technology transfer in pharmaceutical manufacturing.
- Surgical robotics
- Radiology imaging assements.

Overall, the use of AI in medical device & pharmaceutical industries is one of the fastest-growing pharma 4.0 manufacturing trends.

AI IN MEDICAL DEVICES& PHARMACEUTICALS

Personalised healthcare incorporating AI technologies has been prove to enable:

- Higher rate of diagnostic accuracy
- er diagnostic reports

- Reduced trial-and-error when selecting from available treatments/surgical interventions or medical devices.
- AI can also reduce the stress of practitioner burnout and improve healthcare access in rural areas.

USES OF AI IN THE PHARMACEUTICAL INDUSTRY

AI technology is rapidly expanding enabling the delivery of precision medicines & safer interventions. The use of artificial intelligence in the pharmaceutical industry.

Healthcare sectors has capacity to

- Identify treatment targets/molecules explore protein target interactions.
- Evaluate cytotoxicity & other formulations issues
- Improve clinical trials &data analysis.
- Enhance operational efficiency
- Capture real-time data [automatic/accurate record keeping] accurately drug development initiatives e.g.: prescribing medicines based on DNA.

IMPACT OF AI ON HEALTHCARE

This technology pertaining to personalised healthcare, development, monitoring &drug safety monitoring.

In pharmaceutical and medical devices manufacturing sector, AI increasingly being used in relation to

- Drug development research and clinical trials.
- clinical process for medical devices &pharmaceutics.
- Complaints management pharmacovigilance recall.

Background to AI in life sciences industries

Machines learning has been around since the early 1950's there have been myriad innovations in hard ware /firmware software since, then overcoming earlier limitations relating to computational power, processing speed and exorbitant equipment costs.

Life sciences AI trend increases adoption of AI

Adoption of AI in the pharmaceutical industry. It is for increased use of AI technologies during products development, technology transfer, manufacturing, supply chain management, storage distribution logistics & overall quality management. And includes examples & new requirements.

AI trend big data gets even bigger pharmaceutical industry, clinical trials &AI

Automatic data collection is one of the key benefits of global interconnectivity via in the internet things. Data collection along with smaller, faster, & more affordable computerised system, is growing up & growing larger.

For pharmaceutical & medical device manufacturing industries. Having reliable data &faster processing capacity has helped manufacture better manage of the following:

- Drug development process.
- Clinical trials.
- Supply chain disruptions related to the pandemic.

AI In Drug development

Personalised medicine & DNA specific drug development

Pharmaceutical products & medical devices can affect individuals differently when it comes to healthcare one size (or) one medicines doesn't fit all while we may only be on the cup of personalised medicine [DNA specific product development] DNA analysis using AI technologies will play an even greater role in pharmaceutical testing& medical device engineering.

AI in clinical trial recruitment clinical studies of new medicines or medical devices

Another trend in AI in drug development includes using AI for clinical trials including pharmaceutical study recruitment, consenting randomisation, data analysis &clinical evidence reporting activities.

Life sciences of AI trend in efficiency analysis

AI is commonly used in laboratories during drug development & batch testing process.AI is also used for comparing complex case study scenarios when making changes to production process (or) equipment.

A Connected approach to a Pharma Diagnosis of disease

Artificial Intelligence (AI) has shown great potential in improving disease diagnosis by analysing medical data and images. AI algorithms can analyse large amounts of data and recognize patterns that may not be apparent to human doctors. AI can also help reduce errors and improve accuracy by eliminating human error and providing a standardized approach to diagnosis. One example of AI in disease diagnosis is in the field of radiology. AI algorithms can analyse medical images such as X-rays, MRIs, and CT scans to detect and identify abnormalities that may indicate a disease or condition. AI can also assist in image interpretation by providing computer-aided detection (CAD) that highlights potential areas of concern for the radiologist to investigate further. AI can also be used to analyse patient data such as electronic health records (EHRs) to identify patterns and risk factors for certain diseases.

Detection of disease

Detection of diseases by AI is a rapidly growing field with potential applications in various medical areas, including radiology, dermatology, ophthalmology, and pathology. AI algorithms can be trained on large datasets of medical images, electronic health records, and genetic data to identify patterns and features that are associated with specific diseases. By analysing these data, AI can help clinicians to make more accurate diagnoses, develop personalized treatment plans, and identify patients who are at risk of developing certain diseases. In ophthalmology, AI can help to detect early signs of eye diseases, such as age-related macular degeneration, by analysing images of the retina. Overall, the use of AI for disease detection has the potential to revolutionize medical diagnosis and improve patient outcomes by enabling earlier and more accurate identification of diseases. However, it is important to note that AI is still in the early stages of development and requires further validation and testing before it can be fully integrated into clinical practice. New approach in new entity development - Artificial intelligence (AI) is transforming the drug development process in a significant way by offering new approaches to identify and develop new drugs. Traditionally, drug development is a time-consuming and expensive process that involves identifying a target, designing a molecule that interacts with that target, and then testing it in vitro and in vivo to assess its safety and efficacy.

Medical imaging

Medical imaging with AI involves the use of artificial intelligence techniques such as deep learning algorithms to analyse medical images. Medical imaging includes a variety of techniques such as X-ray, computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound. The use of AI in medical imaging can help clinicians to make more accurate and timely diagnoses, and develop personalized treatment plans for patients. For example, a deep learning algorithm can be trained to identify specific structures in an MRI scan of the brain, such as the hippocampus, which is often affected in patients with Alzheimer's disease. AI can also be used to analyse medical images in real-time during medical procedures, such as during surgery or endoscopy. This can help clinicians to identify and locate areas of interest, such as tumours or lesions, with greater precision and accuracy. Overall, the use of AI in medical imaging has the potential to revolutionize the field of radiology and improve patient outcomes by enabling earlier and more accurate diagnoses, and more personalized treatment plans.

Cancer research

AI is playing an increasingly important role in cancer research, particularly in the areas of diagnosis, prognosis, and treatment. AI algorithms can analyse large volumes of medical imaging data and assist doctors in detecting early-stage cancers, which can improve the effectiveness of treatment and patient outcomes. AI can also be used to predict a patient's prognosis by analysing various data sources, including medical images, electronic health records, and genomic data. This can help doctors develop personalized treatment plans for their patients. In addition, AI can assist in drug development for cancer treatment. By analysing large amounts of genomic data, AI can identify potential new drug targets and predict the effectiveness of drugs in specific patient populations. This can accelerate the drug discovery process and bring new treatments to patients more quickly. Overall, AI has the potential to revolutionize cancer research and improve patient outcomes by assisting doctors in making more accurate diagnoses, developing personalized treatment plans, and accelerating the drug discovery process.

Future of Artificial Intelligence

Companies like Google and Uber are already using AI capabilities to power self-driven cars. AI will have a great bearing on the automated transportation field by aiding handicapped drivers and preventing accidents. Coming to Pharma Industry, AI is the future of pharma but the technology is available now. Artificial Intelligence can cut costs down, create new. effective treatments and above all else, help save lives. So, biotech companies should start making use of the advantages of AI at the earliest. Terms of compound design, scope and increase given to us by AI and machine learning will mean that we can tap into a much wider chemical space, giving us a much wider and more diverse range of chemicals to better enable us to pick the best drug discovery molecules. In terms of the industry's choice of patients for clinical trials, the software will also help companies detect any problems with drugs far earlier in terms of efficacy and safety. The industry therefore has a lot to gain from embracing solutions to AI and machine learning. It can be used to create a strong, sustainable pipeline of new medicines to good effect. Using the power of modern supercomputers and machine learning would make it possible for us to produce medicines faster and at reduced costs.

Advantages of AI:
The potential advantages of AI technology are as follows:

- Error minimization.
- Difficult exploration.
- Daily application
- Digital assistants

Disadvantages of AI:
The important disadvantages of AI technology are as follows:

- Expensive.
- No replicating humans.
- No improvement with experience.
- No original creativity.

Artificial Intelligence (AI) has diverse applications across various industries. Some key areas include:

- **Health care:** AI aids in medical diagnosis, personalized treatment plans, and drug discovery.
- **Finance:** AI is used for fraud detection, risk assessment, algorithmic trading, and customer service.
- **Education:** AI enhances personalized learning, automates administrative tasks, and provides intelligent tutoring systems.
- **Retail:** AI powers recommendation engines, demand forecasting, and improves supply chain management.
- **Automotive:** AI is integral in autonomous vehicles, traffic management, and predictive maintenance.
- **Manufacturing:** AI optimizes production processes, quality control, and predictive maintenance in manufacturing settings.
- **Customer service:** Chatbots and virtual assistants powered by AI improve customer interactions and support.

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