Artificial Intelligence in Health Care: Enhancement of Clinical Research

VR Singh[1]* and Kanika Singh[2]

[1]*Professor, Chair, IEEE IMS/EMBS, National Physical Laboratory, New Delhi, India*

[2]*Pusan National University, Busan, South Korea*

*Corresponding Author: VR Singh, Professor, Chair, IEEE IMS/EMBS, National Physical Laboratory, New Delhi, India.

Abstract

With the development of science, biomedical technologies are also progressing, day by day, in every field of medicine. Artificial intelligence (AI) which is human intelligence in machines, has also accelerated every aspect of life, to advance clinical research further. Health care with AI is presented here. AI-based sensor systems are described. Enhancement of clinical research is analysed and presented, to give better results with reliable output.

Keywords: *Artificial Intelligence; Health Care; Clinical Trial; Drug Discovery*

Introduction

Human intelligence in machines is termed as Artificial Intelligence (AI), that mimics their actions, for learning and problem solving. Clinical research involves big data and AI together for various clinical applications [1-6]. Figure 1 shows the human brain and intelligence behaviour [1,2].

Figure 1a: Intelligence systems.   *Figure 1b: Human intelligence.*

If primary care is considered, patient information can be entered into EMR systems very easily to analyse the needs of the patients and doctors.

It is evident that natural biologically inspired systems are important for the development of different clinical materials, sensing devices and instruments for inter-disciplinary research in industry, medicine and environmental controls. Several biomedical systems are thus evolved for health care applications [4,5].

AI in clinical development

The AI has many applications in clinical development to reduce the cost and time, with reduction of the risks. Machine learning (ML) can be used to enhance the availability of clinical data to drive further, which is very useful in the drug industry to get good products, viz, new drugs. Data science and higher analytics give good information of the patients for proper and reliable decisions about diagnosis and treatment. By using AI., the data is useful for the patients and clinicians to know about financial aspects also for sponsors and payers, in an innovative manner. Human health problems are solved with minimum errors with quick decisions. Clinical analysis is shown in figure 2 for clinical screening, diagnosis and treatment for AI with machine learning, heuristic analysis and natural language processing.
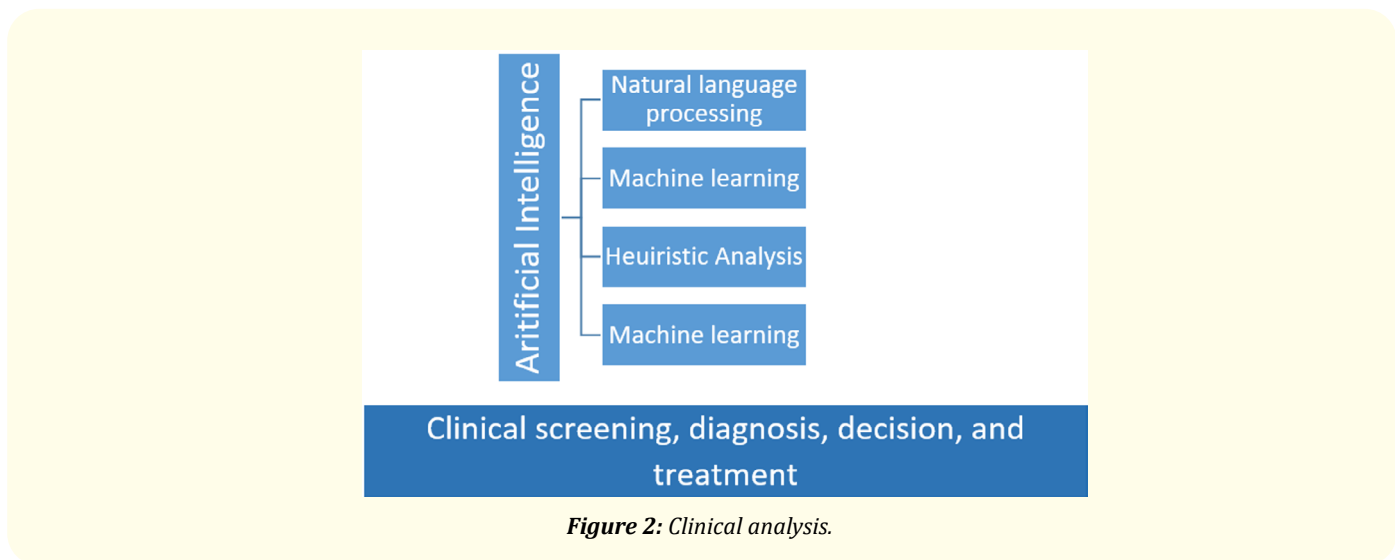

Figure 2: *Clinical analysis.*

Expanding use of AI in clinical research

Modelling and simulation are pursued for analysing the data obtained from AI technologies and Big Data by pattern recognition, for say modern therapy at near and long-term clinical trials.

Examples of AI are given as i) Face Detection and Recognition, ii) Text Editors, iii) Chatbots, iv) Search and Recommendation Algorithms, v) Digital Assistants, vi) Social Media, vii) E-Payments and viii) Autocorrect [5].

The following are the uses of AI in clinical research [2-4]:

1. Minimising of costs.
2. Better trial quality.
3. Better trial time to almost half.

4. Exploring biomarkers for gene signatures causing diseases.

5. Study of trial patients within no time.

6. Identifying volumes of text and data within seconds

7. Quick use of appropriate diagnostic tools and treatment techniques for critical diseases like cancer, Alzheimer's problem, etc.

Early-stage breast cancer is detected and surgery is made with the drug tamoxifen and radiation therapy. Thus, AI is the ability of a computer or a robot controlled by a computer to take tasks that are usually done by humans, as they require human intelligence and discernment.

It is evident that AI will be very useful in the pandemic research in future.

Types of clinical AI

After detailed clinical studies, AI is classified in three categories, i) process automation, to transfer the data from CT or MRI sites to a storage system, or transferring data from email or call to the storage, ii) gaining insight into data through data analysis, by using AI driven method to take say MRI scan; and iii) decision making from large volume data i.e. big data, for the patients and clinicians [4,5].

AI and sensors

Sensors are used in clinical research for different measurements [6-10]. Smart sensors [5-7] and intelligent instrumentation systems [11-17] with AI give knowledge-based tools for control- robotics and fast computers, etc [9-13]. Sensors sense the information from the human system which is processed further for the analysis of the AI data., with appropriate signal processing and development of materials.

There are many challenges which are shown in figure 3 as AI chasm for further research, better security, error free measurement and improved security, etc. [18].

Figure 3: AI chasm.
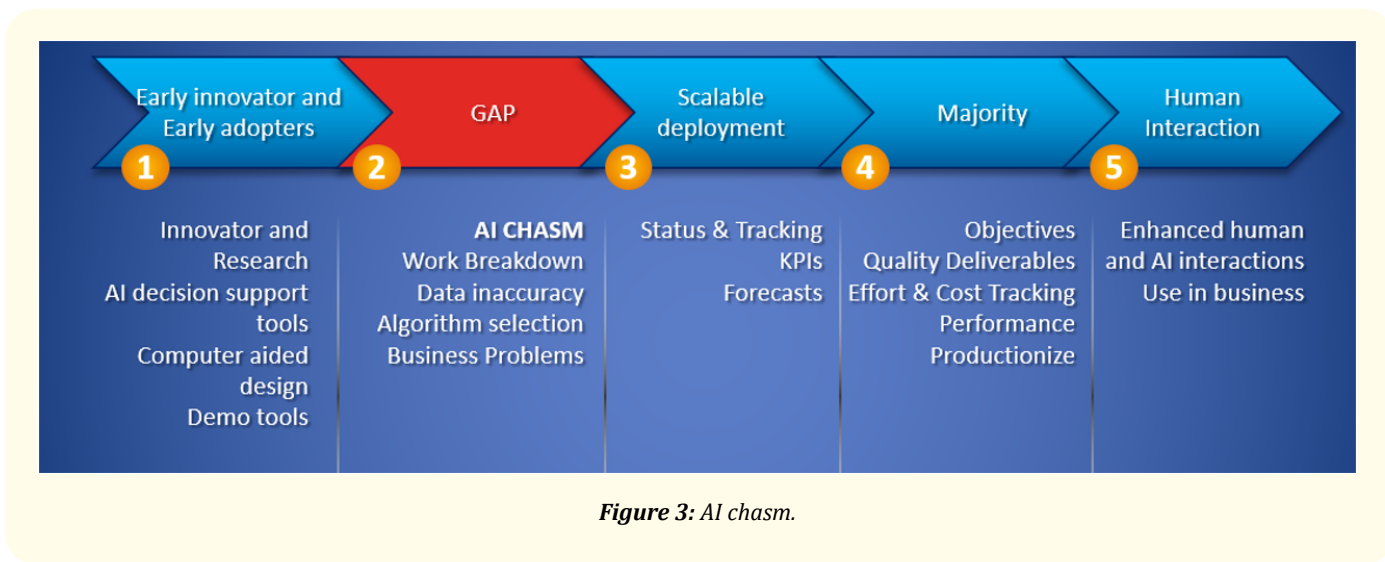
AI in future applications

AI has several future clinical applications to enable enhance the health care field. The AI becomes the accelerator of big data, IOT and robotics, etc [4-6] for various applications. Some of the future developments with AI can be in health management, tourism, financial planning and social media etc.

Prediction can be made for the basis of the need of the use of a ventilator. Images of: RADLogics using CT scans from a single coronavirus patient gives the RADLogics algorithm to quantify the amount of recovery with a "corona score" with AI tools.

Thus, AI is very important for the future technologies world over.

AI is used very effectively in the drug development, which is used in a ubiquitous manner to the process and use of the drugs or any other medicine or technique for the diagnosis and therapeutic treatment, on any patient, anywhere and anytime [3-5].

Optimisation of the drug usage may be made for conditions during the treatment or after the treatment of the patient, by adopting digital health plan prepared well to give optimum output.

The AI is changing the Clinical World very rapidly impacting the future of virtually for every industry and every human being. AI is to change both marketing strategies and customer behaviours, to make it finally, more effective if it augments human managers.

AI enhances the medical signals when used for telehealth or biotelemetry applications [19,20] for say, cancer hyperthermia.

Conclusion and Significance

Artificial intelligence technology has been discussed by giving working details, types of AI and its applications with future scope. Virtual trials give faster results in an effective manner. Appropriate guidelines and regulations are formulated for continuous work in the biomedical field for better health care. Development of sensors and robotic systems with AI has also been discussed. Drug development with AI has been described to give better and reliable results with quick decisions about the condition of the patient, to enhance clinical research.

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