Artificial Intelligence in Dentistry

A year spent in artificial intelligence is enough to make one believe in GOD.

-Alan Perlis.

Recently came across this movie Bicentennial Man again, in which this robot man follows the 200 years life of robot and is searching for his identity, friendship, love, and ultimately humanity.

How regular updates and mechanical inputs with electrical fixtures makes this robot almost human like, even with human skin and expressions is intriguing. This is way back in 1999 and Hollywood was experimenting in this new genre called "artificial intelligence (AI)."

So what is AI? It is sometimes called as machine intelligence and is demonstrated by machine, in contrast to the natural intelligence displayed by humans and other animals. AI alternatively may be stated as a subject dealing with computational models that can think and act rationally.[1] In computer science, AI research is defined as the study of intelligent agents, any device that perceives its environment and takes action that maximize its chance of successfully achieving its goals (Russell and Norvig 2003). Colloquially, the term "AI" is applied when a machine mimics, cognitive functions that human associates with other human minds, such as "learning and problem solving."[2]

The term AI and official pursuit of intelligent machines in the scientific community actually dates to a 1956 conference of researchers from Dartmouth and IBM. AI methodologies have shown great capabilities and capacities in recognition of meaningful data patterns and thus been widely experimented as tools for clinical trials, especially, to aid in the decision-making in each phase for diagnosis and subsequent treatment, as well as prognosis and projection.

AI in general and AI in dentistry or medicine, in particular, started gaining its foothold with the advent of data computing as well as cloud computing ability and availability of vast amount of data collected. With the vast amount of data, for example in field of radiology, a specific algorithm was created which further helped for diagnosing and suggesting probable treatment options.

In the field of dentistry, AI is slowly nudging its head in the field of radiology with more emphasis on

diagnostic records in terms of digital IOPAS/RVGS, three-dimensional (3D) scans and cone beam computed tomography. Lots of information can be gathered and computed to create an AI for aiding quick diagnosis and treatment planning. The machines do have a slightly upper edge over humans in terms of amount of working hours they can put in without fatigue. Whereas human intellect and mind needs break before they perform competitive tasks.

The most talked about recent innovation is in AI-driven customized orthodontic treatment. AI is now available for orthodontic diagnosis, treatment planning, and treatment monitoring. With precise 3D scans and virtual models, it is easy to 3D print the aligners with customized treatment plan. As the vast data get computed, it creates an algorithm which in terms intelligently decides how a patient's tooth or teeth should be moved, with how much pressure, even identifying pressure points for that particular tooth or teeth. The AI-aided aligners not only deliver precise treatment execution but also helps in monitoring the progress as well and claim to reduce treatment time as well as appointment schedules.

Another breakthrough in the field of restorative and prosthetic dentistry is the use of computer-aided design computer-aided manufacturing technology for precision fit of prosthesis, but with innovation in generative adversarial networks, laboratories are using AI to automatically generate advanced dental restoration, designed to perfect fit and ideal function while exceeding aesthetic expectations. This not only will help dentistry but will have a huge potential and impact on orofacial or craniofacial prosthesis.[3]

Thus in every field, be it endodontics for apex location or implantology for making precise surgical guides and identifying type of bone to cortical thickness, AI has major role to play.

We are already experiencing its impact in our day-to-day life, in terms of various office and practice management softwares. Various applications, such as Siri, Alexa, and voice command gadgets, have used AI technologies to build intelligent conversational interface for any device, application language, or environment.

The most intriguing applications of AI are on the horizon and about to enrich the field of dentistry. The integral part of Dental practice, The Dental Chair, saw a tremendous transformation from manual pump style, hydraulic pressure chairs, physiologic to electric chairs with sensors. The recent addition is voice command dental chair which do not need any physical input from doctor at all. All the operations are on voice command. As all the intelligent minds are working vehemently on AI, the day is not far when a dental chair can sense individual patients weight, vital signs, level of anxiety, length of the procedure giving comfort to the patient, alerting the operating doctors if some variation are detected, so on and so forth.

Thus, AI application-based dentistry is not a myth but turning into a reality. Although numerous sci-fi movies depict the invasion of AI on humankind, all optimistic human mind end up with victory of humankind on AI.

"I often tell my students not to misled by the name 'AI' there is nothing artificial about it, AI is made by humans, and ultimately to impact human lives and human society."

-Fei-Fei Li.

Sonali Vijay Deshmukh
Editor-in-Chief,
Journal of International Clinical Dental Research Organisation,
Department of Orthodontics,
Dr. D. Y. Patil Dental College and Hospital,
Dr. D. Y. Patil Vidyapeeth, Pune, Maharashtra, India
E-mail: editor@jicdro.org

References

1. Khanna SS, Dhaimade PA. Artificial intelligence: Transforming dentistry today. Indian J Basic Appl Med Res 2017;6:161-7.
2. Russel S, Norvig P. Artificial Intelligence: A Modern Approach. 3rd ed. New Jersey: Pearson Education; 2010.
3. Hwang JJ, Sergei A, Efros AA, Yu SX. Learning Beyond Human Expertise with Generative Models for Dental Restoration. CoRR abs/1804.00064; 2018.

Access this article online

Quick Response Code:

Website: www.jicdro.org

DOI: 10.4103/jicdro.jicdro_17_18

How to cite this article: Deshmukh SV. Artificial intelligence in dentistry. J Int Clin Dent Res Organ 2018;10:47-8.