**ARTIFICIAL INTELLIGENCE IN PROSTHODONTICS**

Artificial intelligence is field of computer science in which machines are capable of understanding information, make judgements, and even communicate with humans. The ability of AI to learn and detect patterns and relationships from vast multidimensional and multimodal datasets is its strength; for example, AI systems could transform a patient's full medical record into a single number that signifies a likely diagnosis. Furthermore, AI systems become dynamic and self-sufficient, learning and adapting as more data becomes available.

Healthcare systems around the world have significant problems in meeting the 'quadruple objective' for healthcare: improving population health, improving patient experience of care, improving clinicians experience, and lowering rising healthcare costs. Ageing populations, an increasing burden of chronic diseases, and rising healthcare expenditures globally are putting pressure on governments, payers, regulators, and providers to innovate and reform healthcare delivery models. The epidemic has also highlighted healthcare workers shortages and discrepancies in access to care, as previously expressed by the World Health Organisation.

Some of these supply-and-demand issues can be addressed by the use of technology and artificial intelligence (AI) in healthcare. The growing availability of multi-modal data (genomics, economic, demographic, clinical, and phenotypic) combined with technological advancements in mobile, internet of things (IoT), computing power, and data security mark a moment of convergence between healthcare and technology that will fundamentally transform healthcare delivery models through AI-augmented healthcare systems.

Cloud computing, in particular, is facilitating the integration of effective and safe AI systems into mainstream healthcare delivery. When compared to traditional 'on premises' infrastructure of healthcare institutions, cloud computing provides an increased capacity for the analysis of significantly large amounts of data at faster speeds and lower costs.

**Application of AI in Prosthodontics-**

AI uses machine-learning models based on based on analysis of previous data to simulate human intellect and behaviour. Such digital data is generated at an exponential rate, which helps to train AI systems to produce more precise results. The development of artificial intelligence-based technologies in prosthodontics resulted in major modifications in their application to automatic diagnostics, predictive assessments. Prosthodontics incorporates nearly every aspect of current dental technology. The more traditional methods of impression-making were replaced with digital impressions made with an intraoral scanner. Intraoral scanners are trustworthy enough for daily use, especially when only a single crown or a short-span FPD has to be made. Recently this scanning technology is helping in complete denture manufacture and maxillofacial intraoral scans.

Following an intraoral scan, AI was used to detect margins in fixed prosthodontics. Various fields of dentistry are currently using digital tools to assist patients in obtaining the beautiful new smiles they have always desired. 3D face tracking and low-cost virtual 3D data hybrids such as fragmented cone beam computed tomography (CBCT), intraoral scans, and face scans are examples. Any therapeutic intervention that alters a patient's smile is based on virtualizing their anatomy.

AI applications in prosthetic dentistry and its integration with other branches of dentistry have resulted in a wide range of innovative opportunities, including the generation of occlusal morphology in crown contemplation of opposing teeth even in cases of wear or fracture, programmed teeth setting for dentures, and automatic framework designs for removable dental prostheses.

Use of AI in Implant Prosthodontics-

The most effective dental implant treatment planning utilises both the CBCT image and intraoral scan. The use of AI in implantology has the ability to combine both and create the prosthetics of the future.

AI based model can automatically identify the exact position of the mandibular canal for dental implant operations. In a study conducted by Lee J et al., panoramic and periapical radiography were used to categorise implants using AI-based convolutional neural networks (CNNs). Based on the findings of this investigation, the AI-CNN system is nearly as effective as humans in categorising implant procedure. Lerner et al. developed an AI model to reduce the risk of errors in implants such as inappropriate placement, inadequate cementation, incorrect occlusion. Takahashi et al. conducted a systematic investigation to establish an AI framework that would categorise dental arches and use CNN to aid in denture production. The training dataset was categorised using computer-based autonomous learning algorithms.

AI based deep CNN model helps in for implant type recognition using 2-dimensional (2D) radiograph and 3D  [cone beam computed tomography](https://www.sciencedirect.com/topics/medicine-and-dentistry/volume-ct) (CBCT) images as the input data set. Clinicians attempting to restore an unidentified implant would benefit from the clinical applicability of such an AI tool. Additionally, implant dentistry specialists who lack expertise in the field can benefit from adopting software that can identify implants.

Maxillofacial Prostheses and AI-

Dental professionals can develop the most attractive prosthesis for patients with the use of AI and specific designing tools, taking into account anthropological calculations, face measurements, ethnicity, and patients demand. AI employs convolutional neural networks (CNNs) that mimic human neurons. Patients with vision impairments previously tried the prosthetic eye, which was created in the United States. These AI-powered gadgets can help individuals see without surgery. For people who are blind or have visual impairments, there are smart reading glasses available. It is an advanced voice-activated device that can be mounted on practically any set of glasses. It is primarily intended to assist those who are blind or visually impaired. Its user can live an independent life by being able to read text from a book, smartphone screen, or any other surface quickly, recognize faces, work more efficiently.

Patients who had lost their sight tried the bionic eye, which was created in the United States. The user can read text or identify faces using a smart camera on specialized eyewear. It analyses the camera data and transforms it into sound. A wireless earpiece then transmits this sound to the blind person's ears.

Artificial olfaction or Machine olfaction (**automated simulation of the sense of smell** )plays a crucial role in robotics because it closely resembles the human olfactory system, which is capable of identifying various odours in a variety of fields including disease diagnosis, environmental monitoring, concerns with public safety, the food business, and agricultural production.

People who have had limbs amputated could no longer be able to feel changes in temperature. Researchers created synthetic skin that altered this image. The tissue, which is composed of a thin, transparent layer of pectin and water, can detect temperature changes between 5 and 50 °C. It is done by capturing images using specialized thermal cameras or infrared cameras. AI algorithms extract relevant features from the thermal images. Features could include temperature gradients, temperature patterns, or specific regions of interest on the skin. Convolutional Neural Networks (CNNs) are commonly used for thermal image analysis.

In order to explore the potential of AI to augment, automate, and modify dentistry, we present a non-exhaustive set of applications for AI in healthcare for today and in next 5-10 years.

AI today-

AI systems are not yet capable of reasoning in the same way as doctors, who can rely on "common sense" or "clinical intuition and experience. AI, on the other hand, works more like a signal translator by translating patterns from datasets. Healthcare organisations are now starting to use AI technologies to automate time-consuming, repetitive procedures with huge volume. Additionally, there has been significant development in showing the application of AI in precision diagnoses such as planning radiotherapy.

AI in next 5–10 years-

In the medium term, we predict that there will be significant advancements in the creation of effective algorithms that can combine various types of structured and unstructured data, including imaging, electronic health data, multi-omic, behavioural, and pharmacological data, and are efficient (i.e., require less data to train). Additionally, medical practises and healthcare organisations will progress from using AI platforms as adopters to working with technology partners to construct cutting-edge AI systems for precision therapies.

AI helps doctors and patients in every profession, and in the future, AI will be able to generate a forecast that can be combined with human diagnosis to increase the likelihood of appropriate diagnostics, leading to a higher rate of correct diagnoses. AI is transforming everything from space research to dentistry. The clinical and dental patient experience will improve because to AI. The system will learn preferences in order to enhance patient experience. Increased access to adequate oral health treatment will improve dental patient experiences, improving systemic health. The software will provide partial edentulism RPD designs. Dental implant therapy will be modernised by means of techniques and technology that have been tested in clinical settings. When there is only partial edentulism, the software will help with partial denture design.

In conclusion, incorporation of artificial intelligence (AI) in prosthodontics offers a revolutionary advance in the fields of dental prostheses and oral healthcare. A more accurate, effective, and patient-centred approach to healthcare is being offered by AI-powered systems that are transforming diagnosis, treatment planning, and the development of personalized prosthetic solutions. AI is enabling prosthodontists to deliver higher-quality care while improving patient comfort and satisfaction. It can analyse large datasets, optimize treatment outcomes, and expedite administrative operations. As AI develops, prosthodontic procedures have the potential to change, becoming more accessible, efficient, and customised to meet the individual needs of each patient.

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