

Artificial Intelligence in Dentistry

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Technology has always been met with mixed reactions, especially advancements like artificial intelligence (AI). Many remain skeptical, wondering whether AI is a friend or a foe, particularly when it comes to its implications for employment and professional roles. In dentistry, a critical question arises: should we view AI as a threat to our jobs or an opportunity to enhance patient care and practical efficiency?

AI has already permitted various aspects of life. Applications like Siri and Alexa assist us with simple tasks such as making calls, controlling home appliances, or playing music. This paper examines how AI has influenced dentistry, explores its current applications and discusses its potential to transform patient management in the near future.

Aim and Objectives

The aim of this paper is to raise awareness of AI's role in dentistry by demonstrating how the collective intelligence of humans and computers can collaboratively solve problems, enhance diagnosis and provide optimal treatment plans. Additionally, it highlights the applications of AI in dental practice management and patient care.

History

The concept of AI originated in 1956 when John McCarthy introduced the term at a conference where researchers from Dartmouth College and IBM laid the groundwork for intelligent machines. However, the roots of AI can be tracked back much further, including Leonardo da Vinci's drawings of mechanical devices and the antikythera mechanism- a Greek orrery considered the first analog computer used for astronomical predictions.

AI gained momentum after World War II with the invention of the first practical computers. The famous Turing test designed by British mathematician Alan Turing established that a machine could mimic human behavior if it could communicate indistinguishably from a human. Since then, AI has evolved rapidly, especially with projects like Google brain in 2011, which utilized deep learning to analyze massive data sets.

AI, machine, learning and deep learning: Machine learning (ML) and deep learning (DL) are subsets of AI. While ML relies on human crafted rules to analyze data, DL creates its own algorithms using neural networks. For example, in face recognition, traditional ML identify

a person using prefabricated features like facial symmetry and dimensions. In contrast, DL independently analyzes, millions of data points, extracting patterns to identify faces more accurately and efficiently. Advances in deep learning have dramatically reduced errors in tasks like image and speech recognition with error rates in image recognition dropping from 30% to below 5%, and speech recognition errors falling from 25% to under 5%.

Applications of AI in dentistry

AI is revolutionizing dental care in several ways. AI can detect patterns in data to diagnose conditions, predict outcomes, and assist in treatment planning. It is already being used to interpret cephalometric analysis, CT scans, and MRI scans. AI streamlines administrative tasks, such as patient scheduling and communication. For instance, it can identify patient preference and automatically book appointments based on prior patterns, improving efficiency, and patient satisfaction. AI helps manage patient relationships by analyzing feedback and suggesting improvements and service delivery. For instance, if a patient is dissatisfied with their interaction with the dentist, AI can recommend assigning a different practitioner to maintain patient trust and loyalty.

AI enables remote consultations by tele dentistry. For example, a caregiver can send a photo of a patient oral condition for AI assisted preliminary assessment which the dentist can later view to determine the next steps. The dentist can also provide palliative therapy and book an appointment for physical visit.

Research area has benefited immensely from this technology. AI can generate concise summaries or highlight key points from the latest publication on any topic selected by the doctor, keeping them updated. Additionally, current regulations govern the ethical use of AI in academic writing, allowing its outputs to be cited as references in bibliography when appropriately acknowledged.

In maxillofacial surgery AI driven nano bots deliver anesthesia and assist in complex procedures like TMJ surgeries. In orthodontics, neural networks help analyze, cephalometric data and assess bone loss. In proper antics, CAD-CAM systems and AI integrated 3-D printing, enhances precision and prosthetic design. In Endodontics AI aids locating canal, orifices, measuring working lengths, and identifying missed canals without requiring x-rays. AI out performs dentists in detecting caries with faster and more consistent radiology report and without any bias. Platforms like cloud dentistry use AI use AI to match job seeker with dental practices, optimizing staffing solutions based on demand and availability.

Despite its advantages AI poses certain challenges. While AI delivers fast results, its accuracy is not always guaranteed and requires further refinement. Implementing AI technology in practice in wall, significant investment and frequent updates raising concerns about cost-effectiveness. Ensuring compliance with data protection regulations and safeguarding. Patient information are critical considerations. Additionally, service indicate that patients still prefer human interaction in clinical settings, particularly when it involves invasive procedures.

Conclusion

AI should be seen as a powerful tool to augment human capabilities rather than a replacement. By integration of AI into workflow, dental practices can enhance patient care, streamline operations and improve overall efficiency. However, successful implementation requires proper infrastructure, robust cyber security measures, and an understanding of its limitations. Collaboration between technology

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