**AI IN DENTAL**

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**Abstract**

Artificial intelligence (AI) has grown dramatically in importance and use across many industries, including dentistry. It can imitate human intelligence to make complex predictions and decisions in the healthcare sector, particularly in endodontics. In endodontics, convolutional neural networks and/or artificial neural networks have shown a variety of applications, including studying the anatomy of the root canal system, predicting the viability of dental pulp stem cells, measuring working lengths, locating root fractures and periapical lesions, and forecasting the success of retreatment procedures.

Artificial intelligence (AI) technology is utilized in dentistry to give information that improves clinical decision-making by swiftly comprehending massive amounts of data. This study aims to thoroughly review the areas of clinical dentistry where AI is currently playing a significant role. Documents from 1990 to 2022 that cover the major topics of artificial intelligence-assisted dentistry were compiled.

Artificial intelligence (AI) is a rapidly evolving technology that can surely replace physical competence in dentistry. To reduce oversight and error, these technologies must also be employed carefully and under human control. The earliest and most accurate identification of oral problems leads to better results for patients.

**Background**

The brain is one of the most fascinating organs in the human body, and scientists and researchers have always been interested in it. The perfect mimic of the human brain has eluded scientists' grasp for too long. Scientific research has been heavily focused on the creation of "artificial intelligence" (AI) for a long time. The field of applied computer science presently referred to as artificial intelligence was initially mentioned by John McCarthy in 1956. Artificial intelligence is another name for it. Artificial intelligence, sometimes known as the "fourth industrial revolution," uses computer technology to simulate human-like judgment, intelligent behavior, and reasoning.

Various AI models were used in the literature evaluation, and factors related to dental care were investigated. This work adds to the body of knowledge in two different ways. We applied the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) technique to map the literature on current trends in AI in dental care delivery systems. Additionally, it offers academics future perspectives by presenting various technological methods for foreseeing oral disorders. The focus of the remaining study is on obtaining answers to these three research objectives.

**Introduction**

Artificial intelligence (AI) is the study of intelligent machines or any system that understands its environment and acts in a way that maximizes its chances of success. When a computer replicates analytical abilities, such as "learning and problem-solving," that people normally associate with other human brains, the phrase "Artificial Intelligence" is employed. Artificial intelligence algorithms have undergone extensive testing as clinical trial aids, particularly to assist in decision-making for prognosis and projection, as well as each stage of diagnosis and subsequent therapy. In terms of identifying significant data patterns, artificial intelligence algorithms have shown great capabilities and powers. It has been demonstrated that artificial intelligence can more quickly and cost-effectively raise precision, accuracy, and efficiency to those of medical practitioners.

Because of various office and practice management software, it already affects our daily lives. Siri, Alexa, and other voice command devices are only a few software programs that have developed sophisticated conversational user interfaces for any device, application language, or environment. Artificial intelligence has uses in both the virtual and physical worlds (that is, robotics). The mathematical formulae for medication dosage, diagnosis and prognosis, appointment scheduling, drug interactions, electronic health records, and imaging are the core areas of the virtual type. The physical side also includes telepresence, robotic surgery support, rehabilitation, and companion robots for elderly care.

The majority of dental applications use supervised learning, where the training data is made up of numerous samples, each with a different characteristic or feature (such as images of the patient, their sex, age, how many cavities they have, and so on) and determination of ground truth (e.g., whether or not there had previously been an endodontic visit). Artificial neural networks (ANNs) mimic the organic neuron system with numerous connections between neurons that are used in "learning" and used in their algorithm to comprehend the connection between attributes and reality.

Artificial intelligence (AI) has the potential to completely transform the areas of medicine and dentistry by providing solutions to a range of clinical problems and making doctors' jobs simpler. Applications of artificial intelligence in the dental industry are still very rare. Electronic recordkeeping, radiography and pathology, caries detection, robotic assistance, dental imaging diagnostics, and caries detection have all been impacted by the development of these technologies. As other dental specialties have advanced, so has research into endodontic artificial intelligence. Regarding the use of artificial intelligence, endodontists' knowledge needs to be updated.

As a result of technological advancements, dental practices are using digital dentistry and more effective visualization for diagnosis. Dental informatics, which is related to information management, communication, and the use of new technology in clinical practice and research, is a field of dentistry. The information generated while interacting with patients, scheduling appointments, and managing dental practices is managed in a dental office by preserving and using such information.

In a clinical information system, clinical data regarding patients are recorded, stored, and modified using computers. These information systems may be used separately or collectively by the healthcare industry. Integrating, acquiring, and managing data from various sources are all parts of the function played by clinical information systems in supporting healthcare management and managing patient data. Dental offices use information systems that can store a lot of data and facilitate data processing. With the use of a clinical information system, additional information regarding a patient's diagnosis and care can be quickly retrieved. Typically, these systems combine web-based technology with email communication, Internet searching, and marketing techniques, followed by virtual reality training, practicing, and further training.

The dentistry industry has made great progress as a result of information systems and technological improvements. Dental-related apps still require specialized development even though unique information technologies have been created for dental specialties. Dentists and physicians will have access to patient medical information via standardized dental software. It might be argued that artificial intelligence is widely used to diagnose diseases with an accuracy comparable to that of medical professionals. Dentistry has benefited greatly from artificial intelligence, particularly dental radiography, and artificial intelligence oral imaging scans. The most prevalent disease affecting humans is dental caries. The fundamental goals of the dentistry profession still revolve around prevention, early diagnosis, and fast treatment of dental caries. Artificial intelligence is now a crucial tool in the diagnosis and prognosis of diseases.

The societal perspective and technological projection may influence how artificial intelligence is seen in dentistry. Information systems and artificial intelligence will undoubtedly produce precise diagnostics of prevalent mouth disorders. Additionally, patient trust can boost dentists' confidence in their diagnostic abilities but it can also breed skepticism and hesitation regarding their use. The growth of health information systems, particularly standardized clinical coding systems, has significantly aided researchers and quality assurance procedures. Clinical decision support systems that take advantage of electronic dental data have received little research. Additionally, little research has been done on health information systems' instructional value or their impact on the working conditions of dental professionals.

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**Discussion**

This systematic study aims to provide light on the evolving role of artificial intelligence in the detection and management of dental diseases. We realized that dental professionals might benefit from artificial intelligence at every stage of diagnosis and treatment because it is widely used in the field. According to some statistics, artificial intelligence models may help with dental diagnosis. A variety of techniques were used to compile and evaluate data as well as create artificial intelligence systems. As a result, comparing the studies was difficult. By doing this, dentists may more precisely identify dental problems while minimizing human error. Although access to vast databases and more thorough analysis is made feasible by artificial intelligence, its application in daily life is constrained by social, technological, and ethical

**Conclusion**

In endodontics, artificial intelligence technology is frequently used. According to studies on the application of artificial intelligence in endodontics, neural networks performed with more precision and accuracy than dental specialists. In several research, artificial intelligence models have also performed better than experts. The results suggest that these applications might be more beneficial to beginners and non-specialists than professional advice.

By complementing and, occasionally, relieving dentists of their more helpful responsibilities, such as integrating patient data and developing professional relationships, artificial intelligence should be viewed as an enhancement tool. Today's artificial intelligence is quite good at analyzing organized data and deriving conclusions from massive amounts of data. It cannot create associations, though, and in a therapeutic situation, it is only partially capable of making complex decisions. Higher-level understanding is notably needed in ambiguous situations to conduct physical examinations, including medical histories, assess aesthetic results, and promote conversation. This understanding is reliant on dentists' expertise.

For patient-dentist communication to be effective, it is imperative to comprehend the patient's hopes, worries, and expectations through nonverbal cues. This holds despite the contentious discussions around whether or not empathy should be incorporated into the algorithms employed by affective robots to mimic human emotions. These lines of communication are illogical and impulsive.

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As part of their diagnostic process, dental experts take bitewing radiographs in addition to visual and tactical examinations of the oral cavity. Radiographs of the bitewing are not reliable or valid for diagnosing tooth decay. Bitewing X-rays were found to have a low sensitivity of 0.24–0.42 in detecting dental cavities in one experiment. When using dental X-rays to diagnose caries, false positive and false negative results are also common. Recent research suggests that artificial intelligence-based technologies are better than dentists at identifying cavities on dental radiographs.

Near-infrared scans are more accurate than bitewing X-rays for detecting carious lesions inside the mouth. The development of algorithmic software systems that support dental diagnostics and data management typically makes use of artificial intelligence. Access to dental care has improved thanks to dental artificial intelligence, and AI-based solutions can offer medical practitioners competent counsel during clinical exams. In the field of healthcare, artificial intelligence has made great achievements, as evidenced by the publication of numerous studies.

Even though artificial intelligence is reliable in dental analysis, practitioners still interpret it incorrectly. Some dentists may even view the technology as a risk until it is widely adopted by the field. Despite common worries in other industries, dentists shouldn't be concerned about artificial intelligence taking over their jobs. An AI assistant can assist them similarly to how a torch might because they are not certified radiologists and examining X-rays is only a tiny portion of their job. Dentists are expected to continue treating patients and providing care while the diagnostic process is underway. But to promote trust in this cutting-edge method, dentists and dental students must be educated.

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