The use of Artificial Intelligence in Dentistry

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Recent advancements in artificial intelligence (AI) has revolutionized many scientific fields including medicine and its associated fields. AI is defined as "the ability of a digital computer or computer controlled robot to execute different tasks commonly associated with intelligent beings". AI can mimic the intellectual processes of human beings, i.e. the ability to reason, comprehend and learn from previous experience. The two key techniques are artificial neural networks (ANNs), through which machines can learn to recognize patterns within data and convolutional neural networks (CNNs) through which we analyze visual images.[1]

Dental caries is usually detected through a clinical examination and dental radiographs. While radiograph analysis offers initial objective assessment and characteristics of tooth, the incipient and recurrent decay are commonly determined by tactile sensation. AI techniques in these scenarios have shown to provide a more efficient diagnostic process when used in conjunction with clinical assessment.[2] Several AI investigational devices and dental software that can apply learning by seeing actual data are now available. These software automatically highlights areas of dental decay found on digital radiographs making it useful in prediction of dental caries.

CNN techniques can also provide image classification and segmentation thus it has beneficial role in detection and treatment of periodontal disease on radiographs. CNNs can capture patterns from images of periodontally compromised teeth and perform edge detection.[3]

AI can also be used to analyze images of oral cancer lesions therefore effectively used for early detection and diagnosis. To assist with early diagnosis of oral cancers, mobile applications have been developed and used for image capture of oral lesions for remote diagnosing and by making use of a system which will differentiate between pictures with or without signs of oral cancer. In fact, the algorithm distinguishes the different histopathological grade of a tumor.[4]

NLP (Natural Language processing) is the capability of a computer program to recognize and analyze the human language and process that information to perform various tasks. Voice-activated systems are being developed that can be used for taking digital dental radiographs. The use of NLP to expose digital radiographs allows the clinician to capture the image, as well as view and compare images hands free.[5] As a result, voice-activated systems can ultimately improve the dental workflow by optimizing infection control protocols, as well as saving clinician's time and reducing the patient's time in the chair.

AI is also being used in dental practice management for communicating with patients, scheduling appointments, analyzing data from patient records and also for marketing agendas. For scheduling, it contacts the patient based on the person's appointment preference and matches the patient preference with an available appointment.[6] The neural network can also mine data and find periods of decreased productivity and determine the most effective marketing campaign.

Although AI has shown promises in periodontal disease diagnosis, dental caries detection, oral cancer diagnosis and overall dental practice managements yet future research needs to focus on improving the accuracy and real world application of these techniques. To conclude, the use of AI in dentistry has a bright future and can assist dental practitioners in the diagnosis, treatment progress and prognosis of various oral diseases.

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