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Editorial

AI Applications in Dentistry

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Artificial intelligence (AI) is the ability of a computer system to mimic human intelligence, such as learning and problem solving. AI has been used in various fields of dentistry including prosthodontics, orthodontics, and periodontics. AI applications in dentistry are based on machine learning, a subset of AI, and are broadly classified as computer-aided diagnosis (CAD) and computer-aided design (CADe):

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AI-based CAD systems can be used for detection and diagnosis of various diseases and abnormalities of the oral cavity.

Caries

Caries is a highly prevalent chronic disease, and it is the leading cause of tooth loss. It is characterized by demineralization of tooth enamel due to prolonged exposure to fermentable carbohydrates [1].

Conventional caries detection relies on visual examination and radiographic imaging [2]. Visual examination is a subjective method with a high probability of false positives and false negatives. Radiographic imaging is an objective method, but it exposes patients to ionizing radiation [2]. AI-based CAD systems can assist clinicians in diagnosing caries.

AI-based CAD systems are based on either machine learning or deep learning. Machine learning is a subset of AI in which a computer program is trained to make predictions using labeled data [3]. Deep learning is a subset of machine learning in which the computer program learns from unlabeled data [3]. Deep learning has become more popular than machine learning in recent years [4].

Machine learning and deep learning methods are used for detection and diagnosis of caries [2]. Machine learning methods include support vector machine, logistic regression, and random forest [Pretty, 2006]. Deep learning methods include convolutional neural network (CNN), region-based CNN, and recurrent neural network [2].

AI-based CAD systems are based on digital radiography and intraoral imaging. Digital radiography is based on the projection of a beam of X-rays onto a sensor, which captures the image. Digital radiography includes digital intraoral radiography and digital panoramic radiography. Intraoral imaging is based on the use of a digital camera to capture an image of the oral cavity [2].

Digital intraoral radiography is used for the detection and diagnosis of caries in the proximal surface of a tooth [2]. A digital image is taken of the tooth surface, and the image is analyzed by an AI-based CAD system. The AI-based CAD system analyzes the image for caries and outputs the results.

Intraoral imaging is used for the detection and diagnosis of caries in the occlusal surface of a tooth [2]. A digital image is taken of the tooth surface, and the image is analyzed by an AI-based CAD system. The AI-based CAD system analyzes the image for caries and outputs the results.

Digital panoramic radiography is used for the detection and diagnosis of caries in the entire dentition [2]. A digital image is taken of the dentition, and the image is analyzed by an AI-based CAD system. The AI-based CAD system analyzes the image for caries and outputs the results.

Periodontitis

Periodontitis is an inflammatory disease of the periodontium. It is characterized by progressive destruction of the periodontium due to the host inflammatory response to the presence of microorganisms in the dental plaque [5].

AI-based CAD systems can assist clinicians in diagnosing periodontitis.

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AI-based CAD systems are based on digital radiography and intraoral imaging. Digital radiography includes digital intraoral radiography and digital panoramic radiography. Intraoral imaging is based on the use of a digital camera to capture an image of the oral cavity.

Digital intraoral radiography is used for the detection and diagnosis of periodontitis in the interproximal area of a tooth [2]. A digital image is taken of the tooth surface, and the image is analyzed by an AI-based CAD system. The AI-based CAD system analyzes the image for periodontitis and outputs the results.

Intraoral imaging is used for the detection and diagnosis of periodontitis in the buccal and lingual areas of a tooth [2]. A digital image is taken of the tooth surface, and the image is analyzed by an AI-based CAD system. The AI-based CAD system analyzes the image for periodontitis and outputs the results.

Digital panoramic radiography is used for the detection and diagnosis of periodontitis in the entire dentition [2]. A digital image is taken of the dentition, and the image is analyzed by an AI.

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