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Editorial

Current advances in artificial intelligence in radiographic interpretation and reporting

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Radiographic imaging reflects changes in the density of hard tissues by utilizing the properties of X-rays to capture images. Teeth are situated within the alveolar bone, and conditions such as periodontal disease and periapical lesions can alter the density of the surrounding bone. These changes affect how much radiation is absorbed, depending on the volume of surrounding tissue, particularly bone tissue. Therefore, the number of X-ray photons that reach the radiographic film or sensor varies, leading to differences in radiographic density. The human eye visually detects these images, and the brain processes this information to recognize and interpret the radiographic images.

Dentists interpret conventional radiographs, such as periapical or panoramic radiographs, through a series of processes. For dental implant placement or the diagnosis of cysts, benign tumors, and malignant tumors, computed tomography (CT) or cone beam CT is commonly used [1]. Unlike conventional radiographs, which consist of a single image, CT comprises multiple image layers. These images can be viewed collectively, and specific areas can be reconstructed using reconstruction software [2]. In the dentist's mind, these areas are reconstructed as a 3-dimensional structure, allowing for the analysis of bone changes or lesion characteristics. Therefore, this process is somewhat more complex than interpreting a conventional radiograph.

Interpreting radiographic images and preparing reports are routine tasks for dentists in their daily practice. However, these activities not only demand considerable time but also require that the reports be meticulously maintained as medical records. Furthermore, if a dentist is not specialized in oral and maxillofacial radiology, the detection of lesions may vary based on their experience. Additionally, the outcomes of these interpretations play a crucial role in planning patient treatment.

Among deep learning models, convolutional neural networks (CNNs) are well-suited for image processing. In deep learning, convolution involves applying a filter to an image, which allows for the extraction of features and facilitates image analysis. Different filters can be used to extract various features from the image. The model learns by using multiple training sets and adjusting the coefficient that determines each node in the neural network. Various studies are currently being conducted to validate the modules learned in this manner by using real images to detect or segment specific objects.

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ChatGPT, developed by OpenAI, is a generative artificial intelligence (AI) that has significantly influenced people since its introduction in late 2022. It features advanced natural language generation capabilities. This service has elevated previously inadequate AI technologies, improving users' experience by enabling the generation of human-like sentences. When a question is posed to ChatGPT, it utilizes a vast dataset to produce responses that closely mimic human writing. OpenAI continues to refine this technology, offering services that generate increasingly sophisticated sentences based on improvements to the initial version of ChatGPT.

AI has traditionally been developed for specific tasks; however, current research is focusing on multimodal AI. This type of AI is anticipated to facilitate complex tasks, such as employing the CNN module to generate interpretations of radiographic images alongside ChatGPT, or alerting dentists to significant changes in these images [3]. Specifically, when a patient's radiographic image is input into a multimodal AI system, the CNN module can analyze the image to identify dental caries, periodontitis, cystic lesions, benign tumors, or malignant tumors [4,5]. Subsequently, a generative AI module like ChatGPT can produce a radiological report based on these findings [6]. The use of this technology is expected to significantly reduce the time traditionally required for radiographic interpretation and report generation.

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