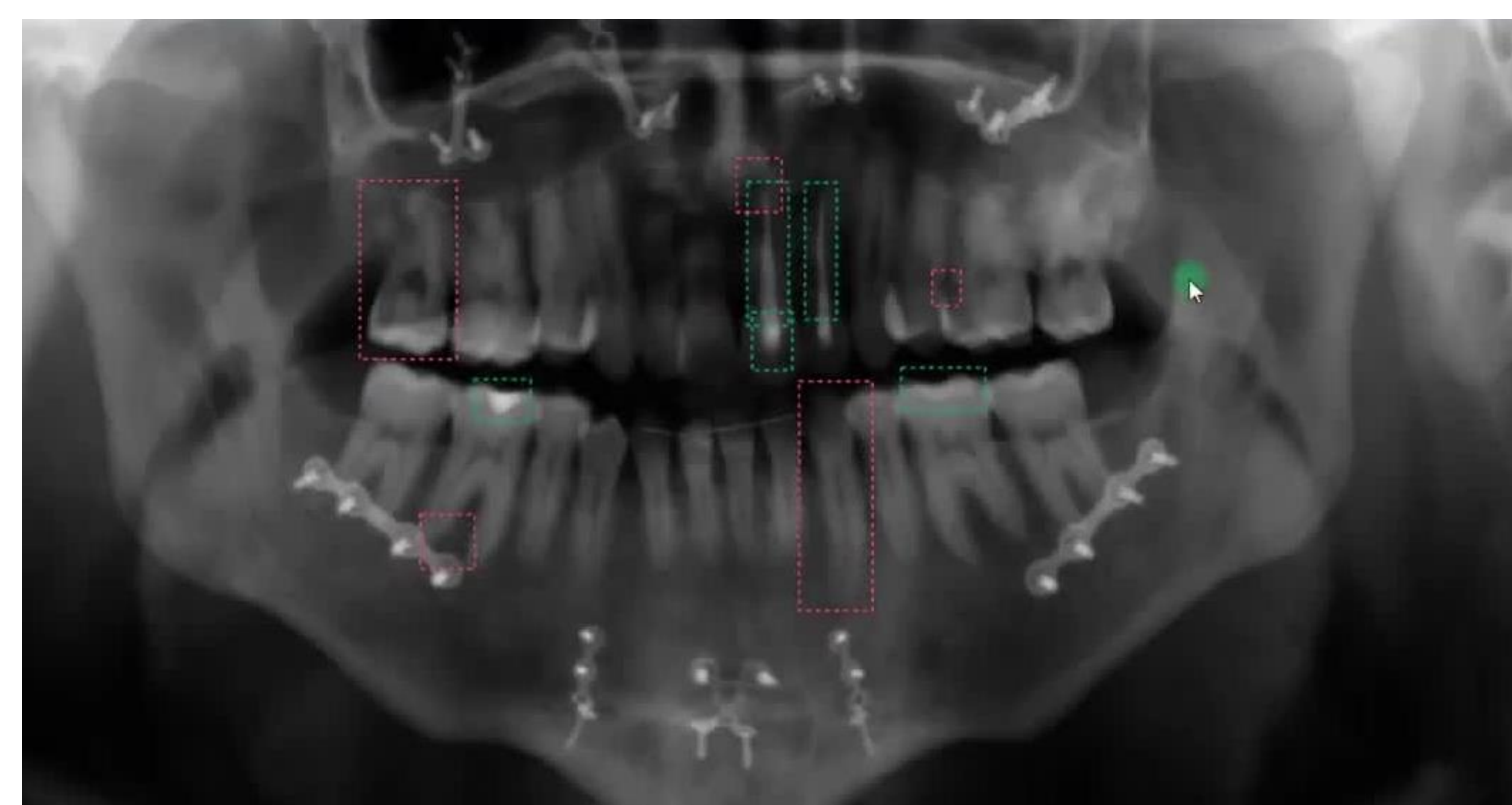


Detection of dental caries and the rate of progress toward pulp in panoramic radiography based on deep learning by Convolutional neural network/CNN method

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Introduction

Over the past decade, there has been a remarkable breakthrough in technological advancement with the evolution of artificial intelligence (AI), which refers to the concept of machines being capable of performing human tasks.^{1,2} The field of dental science, like many others, has embraced AI with great enthusiasm, owing to the massive increase in patient documented information and data. From taking a patient's history to data processing and extracting information for diagnosis, AI has numerous applications in dental and medical science.³ Several surveys have been published in recent years addressing the use of AI in dentistry, indicating that AI has developed rapidly and has the potential to be applied in routine dentistry.⁴ Tooth decay is the most common chronic disease worldwide, affecting nearly 3.5 billion people globally, according to data from the World Health Organization (WHO).^{5,6} It impacts between 60% and 90% of children and the majority of adults globally, causing significant financial strain and impacting the quality of life.⁷ While wide cavities of tooth decay can easily be detected using a probe and mirror, X-rays must be used for the detection of hidden or inaccessible lesions.⁸ In recent years, computer systems and AI have been developed to assist healthcare providers in medical and dental imaging diagnosis, and scientists have attempted to use machine learning techniques to detect dental diseases.^{9,10} The present study aims to design an AI platform for detecting tooth decay and the likelihood of pulp involvement using panoramic images. The software is designed in the Python environment and trained using panoramic images. The second part of the study evaluates the software's capabilities, with the null hypothesis being that the software does not have the accuracy and sensitivity of a dentist in detecting tooth decay, and training with panoramic images is not sufficient to achieve the study's goal of designing an accurate and efficient software. This article discusses the potential of AI in routine dentistry and highlights the growing body of research on the use of AI in dentistry. It also emphasizes the importance of early detection of tooth decay and the limitations of current diagnostic methods. The study's findings could have significant implications for improving dental diagnosis and treatment, ultimately leading to better patient outcomes.



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