

## Classification of Dental Lesions Using Camera-Captured Images with Convolutional Neural Networks

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Oral cavity is a central part of the appearance of a person and their health condition and oral care is crucial. The consideration of good habits and the early identification of lesions are paramount, and their diagnosis is normally performed with the help of visual examination, radiographies and biopsies. While these methods are widely used, they present several challenges. Early lesions are often small or resemble healthy tissue, making detection difficult. Diagnosis is further limited by the subjectivity of visual assessment and the time-consuming nature of radiograph interpretation. Because of these challenges, researchers are increasingly looking at how artificial intelligence can help detect periapical lesions. Many studies have focused on identifying teeth or dental diseases using X-ray images, but research using RGB (color) images is rare. RGB images are easy to capture, non-invasive, and more accessible during routine dental check-ups, making them useful for practical AI-based diagnostic tools. To fill this gap, the objective was to use deep learning model to automatically detect dental lesions and improve diagnostic accuracy. In this approach, we evaluate and compare different convolutional neural network (CNN) architectures for identifying three major dental lesions namely, Gingivitis, Calculus, and Hypodontia from 4000 optical color images captured in front of the mouth. After pre-processing and extracting features, the dataset was trained with three pre-trained architectures: EfficientNetB0, DenseNet121, and ResNet50. The findings indicate obvious variations in performance, and DenseNet121 has always got the maximum accuracy of 86.91% and higher precision, recall values, f-measure values compared to other models. The future dental industry may benefit from this research as it will be easier to detect issues early and offer cheap equipment to improve oral health. The research compares the CNN performance on dental lesion classification and prepares the way to predict the severity and medical application in the future.

**Keywords:** Artificial intelligence, Calculus, CNN, CNN architectures, Deep learning