

ABSTRACT

This study aims to develop a Convolutional Neural Network (CNN) model to classify panoramic dental radiographic images into two categories, namely impacted and non-impacted teeth. The dataset consists of 2000 panoramic radiographic images (1000 impacted and 1000 non-impacted) obtained from Prof. Dr. Margono Soekarjo Regional General Hospital, Purwokerto, and a public Kaggle dataset. Image preprocessing was applied to standardize data quality, including resizing, grayscale conversion, and normalization. In addition, image augmentation was performed to increase the diversity of the training data using Gaussian blur, Gaussian noise, sharpening, histogram equalization, and Contrast Limited Adaptive Histogram Equalization (CLAHE) techniques. The CNN model was evaluated under two experimental conditions: with augmentation and without augmentation. The experimental results indicate that the CNN model trained with image augmentation achieved superior performance, with an accuracy of 94.51%, precision of 93.64%, recall of 95.62%, and an F1-score of 94.62%. In contrast, the model trained without augmentation achieved an accuracy of only 76.62%, with precision, recall, and F1-score values of approximately 76%. These results demonstrate that image augmentation plays a significant role in improving the generalization capability of the CNN model when handling variations in panoramic dental radiographic images. Based on these findings, it can be concluded that the integration of CNN with appropriate preprocessing and image augmentation techniques has strong potential to be implemented as a clinical decision support system for impacted teeth detection. Nevertheless, further studies involving larger and more diverse datasets are required to validate the robustness and clinical applicability of the proposed model.

Keywords: *Convolutional Neural Network, panoramic radiograph, impacted teeth, preprocessing, image augmentation, image classification*