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Convolutional neural networks for automated tooth numbering on panoramic radiographs: A scoping review
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Abstract
Purpose: The objective of this scoping review was to investigate the applicability and performance of various convolutional neural network (CNN) models in tooth numbering on panoramic radiographs, achieved through classification, detection, and segmentation tasks. Materials and Methods: An online search was performed of the PubMed, Science Direct, and Scopus databases. Based on the selection process, 12 studies were included in this review. Results: Eleven studies utilized a CNN model for detection tasks, 5 for classification tasks, and 3 for segmentation tasks in the context of tooth numbering on panoramic radiographs. Most of these studies revealed high performance of various CNN models in automating tooth numbering. However, several studies also highlighted limitations of CNNs, such as the presence of false positives and false negatives in identifying decayed teeth, teeth with crown prosthetics, teeth adjacent to edentulous areas, dental implants, root remnants, wisdom teeth, and root canal-treated teeth. These limitations can be overcome by ensuring both the quality and quantity of datasets, as well as optimizing the CNN architecture. Conclusion: CNNs have demonstrated high performance in automated tooth numbering on panoramic radiographs. Future development of CNN-based models for this purpose should also consider different stages of dentition, such as the primary and mixed dentition stages, as well as the presence of various tooth conditions. Ultimately, an optimized CNN architecture can serve as the foundation for an automated tooth numbering system and for further artificial intelligence research on panoramic radiographs for a variety of purposes. (Imaging Sci Dent 2023; 53: 271-81)

Author Keywords
Artificial Intelligence; Deep Learning; Dentition; Radiography, Panoramic; Technology Transfer

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