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Effectiveness of Machine Learning Algorithms for the Detection of Soft Tissue Calcifications in Panoramic Radiographs

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Introduction. Previous studies have tested the use of AI technologies for diagnosing different conditions such as caries, periodontal pathology, sinusitis, osteoarthritis, facial and jaw cysts, and tumors. However, there is a lack of data on the detection of soft tissue calcifications. **Material and methods.** The present study aimed to identify soft tissue calcifications in 1,100 panoramic radiographs of patients who visited Vilnius University Hospital Zalgiris Clinic from 2014 to 2016 for clinical purposes. The study protocol was approved by the Vilnius Regional Biomedical Research Ethics Committee. The radiographs were analyzed using Romexis Planmeca Viewer software. After annotating all the images, machine learning algorithms were developed for automatic assessment of soft tissue calcification in radiographs, using the Python 3.8 programming language. Model performance was evaluated using the F1-score metric and other data-dependent methods. **Results.** Detection of salivary gland calcification in the radiographs yielded an intersection over union (IoU) of 0.803 and an accuracy 90.2%. Identification of calcifications of the elongated styloid process and carotid artery calcifications resulted in IoU of 0.7194 and an accuracy of 90%. **Conclusion.** The initial machine learning algorithms model demonstrated promising results, indicating the potential for improved diagnostic effectiveness in detecting salivary gland, elongated styloid process, and carotid artery calcifications using the appropriate application of artificial intelligence technologies. To enhance the development of the model, it is recommended to include a larger number of panoramic radiographs containing soft tissue calcifications.