

AI-Powered Diagnostic and Treatment Approaches for Oral Cancer Using CNN and Medical Imaging: A Comprehensive Review

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Abstract: Oral cancer continues to pose a critical global health challenge, particularly in low- and middle-income countries where tobacco, alcohol consumption, and poor oral hygiene are predominant risk factors. Traditional diagnostic methods, though widely used, often suffer from invasiveness, subjectivity, and delays, thereby limiting their effectiveness in early detection. Recent advancements in Artificial Intelligence (AI), especially Convolutional Neural Networks (CNNs) integrated with multimodal imaging (MRI, CT, PET), have revolutionized diagnostic approaches. This review conducted a bibliometric and thematic analysis of global research contributions from 2013–2025, highlighting publication growth, influential studies, methodological frameworks, and clinical applications. Results demonstrate that AI-powered systems outperform or complement clinical experts in accuracy, sensitivity, and risk stratification, offering transformative potential for diagnosis, treatment planning, and monitoring. Despite significant progress, challenges remain in standardizing datasets, achieving clinical validation, and ensuring large-scale implementation. The findings underscore AI's growing role in predictive oncology while emphasizing the urgent need for translational research and policy integration.

Keywords: Oral Cancer, Artificial Intelligence, Convolutional Neural Networks, Early Detection, Medical Imaging

