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Review Article

Artificial Intelligence in Oral Radiology: Current Trends and Future Perspectives

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Abstract

Artificial intelligence has become a significant instrument in oral and maxillofacial radiology. It offers novel automated diagnosis and treatment planning. The purpose of the review is to synthesize the already existing studies about the application of artificial intelligence in oral radiology. We conducted thorough research of the articles published in the period of 2021 to 2025. This will lay emphasis on research that validates the clinical use and outputs of AI performance in maxillofacial and dental imaging. Convolutional neural network models have shown remarkable results in a number of diagnostics cases, such as the detection of endodontic issues, the determination of periodontal health, caries detection, or jaw pathology. The quality of data used in training, the ability of the model to be easily interpreted, the equity of algorithms, integration into clinical practice, and regulatory approval are still significant issues. Artificial intelligence is significant in terms of the processing and interpretation of radiographic information in the oral health care field. Its goal is to enhance the precision of diagnosis and increase the efficiency of its work. Its successful implementation should pay close attention to data management, ethical practice, regulatory practice, and healthcare provider training.

Keywords: *Artificial Intelligence, Deep Learning, Oral Radiology, Dental Imaging, Convolutional Neural Networks, Clinical Decision Support.*

INTRODUCTION

Over the past few years, there have been numerous technological changes in the dental profession. The potential of artificial intelligence in radiograph interpretation is hard to compare with the few developments. Formed as a theory in computer science, it has now been used in practical clinical applications and is redefining oral and maxillofacial radiology diagnostic procedures[1].

Recently, oral radiology faces several ongoing challenges for which AI technology is ideal. Many dental offices lack access to professional evaluations of advanced imaging investigations due to a global absence of experienced oral and maxillofacial radiologists. Additionally, the psychological stress of reviewing a lot of radiographic evaluations can result in missed diagnoses and incorrect interpretations. By identifying abnormal findings, offering preliminary assessments, and assisting with evidence-based decision-making, AI systems provide alternatives[2].

Dental radiography image analysis now mostly uses artificial intelligence methods, mostly convolutional neural networks. In some cases, these machine learning techniques can complete classification, detection, and segmentation tasks with accuracy that is comparable to or higher than that of human specialists[3]. Over the past decade, the practical application of AI in medical imaging has been stimulated by the rapid growth in processing power provided by graphics processing units and the widespread availability of vast digital datasets[4].

This comprehensive review examines the current state of AI in oral radiology from many perspectives. We examine the technical basis of these systems, clinical applications in various diagnostic domains, evaluate their performance characteristics, examine regulatory frameworks, discuss ethical problems, and project future developments.

TECHNOLOGICAL FOUNDATIONS

1)Machine Learning Fundamentals

Machine learning refers to computational methodologies that allow systems to increase performance on certain tasks over a period of time without suffering from explicit programming in every circumstance. In oral radiology, the most frequent paradigm is supervised learning, where algorithms train on datasets including radiographic pictures with expert-defined labels indicating abnormal findings or anatomical structures[5].

The structure and function of biological neural networks served as inspiration for the inimizatio field of deep learning. Deep learning systems use several layers of processing to automatically find important features, in contrast to classical machine learning, which requires manual feature engineering. This feature is especially helpful for radiography interpretation, where it might still be difficult to manually define the best image features[6].

2) Convolutional Neural Networks

In order to identify local patterns in images, such as edges, textures, and forms, convolutional neural networks use mathematical operations referred to as convolutions. From basic edge detection in early layers to recognition of complete anatomical structures or disease patterns in deeper layers, these networks gradually inimizat progressively more complex characteristics through a series of processing layers[7].

Three essential functions are carried out by CNNs in oral radiology. Classification establishes whether certain conditions like inimizatio carious lesions are present. Segmentation is able to precisely define the borders of anatomical structures or lesions at the pixel level [8].

YOLOv8 and other cutting-edge detection architectures that offer real-time analysis capabilities with improved accuracy are examples of recent advancements. These models are appropriate for practical implementation since they have demonstrated a special promise in detecting complicated dental diseases with low latency[9].

3) Training Data Requirements

Large datasets with precise annotations are necessary for high-performance AI systems. Anonymisation, representativeness confirmation, format inimization on, noise inimization, and expert annotation are all included in data curation [10]. The quality and consistency of ground truth labels, which are produced by skilled oral radiologists and operate as reference standards, have a direct effect on system performance.

By applying changes that preserve diagnostic content while producing a variety of displays, data augmentation overcomes the restricted availability of datasets. Rotation, translation, scaling, flipping, and contrast modification are examples of common operations. Augmentation must, however, refrain from eliminating abnormal findings or adding irrational artefacts[11].

Partitioning the dataset into subgroups for testing, validation, and training allows for accurate performance assessment. Test data provide objective performance estimates, validation data tracks performance throughout training, and training data modifies model parameters. Artificially inflated performance measures can be avoided by ensuring complete independence between subgroups[12].

CLINICAL APPLICATIONS

5) Dental Caries Detection

Dental caries is a worldwide epidemic and thus very essential to be detected early and accurately. Diagnostic quality Deep learning systems have during recent studies performed between 2022 and 2024 been demonstrated to detect carious lesions in bitewing, periapical, and panoramic radiographs as well as their interpretation as diagnostic as highly skilled dentists. Systematic review published in 2022 found that the level of awareness of deep learning models was found to fall between 0.72 to 0.93 and specificity ranging between 0.81 to 0.95 according to different imaging modalities[13].

To establish the extent to which caries has progressed, the latest technologies avail testing outcomes in three levels; not deeper than enamel, and in the dentin or on the verge of the pulpal tissues. A more recent (2024) study utilizing the YOLOv8 model showed impressive results, indicating that more cost-effective treatment methods may be provided, and the diagnostic accuracy may be improved[14]. In another 2023 study on coping with the problem of annotated data scarcity, the authors used semi-supervised learning and reported good results, out of which the data was minimally annotated[15].

A 2024 umbrella review that pooled multiple systematic studies has discovered that AI can be effective depending on lesion location and severity; it is always indicated that AI has diagnostic precision across various populations and imaging procedures[16]. Investigations particularly on the use of CBCT images in caries detection, it is evident that three-dimensional image, in combination with deep learning, has stronger diagnostic capability compared to two-dimensional radiography[17].

2)Periodontal Disease Assessment

Given that alveolar bone height data is quantifiable, periodontal disease in the radiographic bone level is the best application of AI. One major study in 2024 utilized the 2,000 panoramic radiographs and developed CNNs of the YOLOv8 structure. In this study, the periodontal bone loss was worth predicting with highly high accuracy, as well as developing individual periodontal projections[18].

Later in 2024, new AI-driven models were published. These models are able to predict accurately the amount of the alveolar bone lost as well as the regions in which the bone had been lost and helps the dentist make quick clinical judgments[19]. A thorough systematic review and meta-analysis published in 2025 examined 30 studies using the APPRAISE-AI framework, whereas 11 papers were published in 2023. It discovered high volume of publications and this is the rapid expansion of the field[20].

A 2023 study has high diagnostic accuracy and reliability as it concentrated on automated detection with the help of convolutional neural networks and panoramic radiographs. The work has immense potential in enhancement of performance of the clinical professionals[21]. Some of the works have pointed out that the ensemble models (that are architectures of multiple CNNs) are more effective as compared to individual model approaches[22].

3)Endodontic Pathology

One of the main diagnostic issues is to identify periapical pathology since apical periodontitis may lead to unceasing loss of bone without pain. Recent studies from 2021 to 2023 show that AI systems can identify periapical radiolucencies on cone-beam computed tomography scans with accuracy similar to that of experienced endodontists [23].

Deep learning models that use attention mechanisms can now tell apart different types of periapical lesions, such as granulomas, cysts, and abscesses, based on their radiographic features. This ability helps improve treatment planning and prognostic assessment[24].

4) Jaw Pathology and Anatomical Analysis

Recent studies have created advanced artificial intelligence (AI) systems to detect and classify cancers and cysts in the jaw. A 2021 study showed an overall accuracy of 0.79 in distinguishing odontogenic keratocyst, ameloblastoma, dentigerous cysts, and periapical cysts[25]. Using ensemble learning techniques and bigger training datasets, later studies have expanded on these findings.

Tooth Detection and Numbering: With processing times of less than one second per radiograph, advanced automated systems that use object detection techniques achieve over 99% accuracy for tooth detection and numbering. Complex cases, including missing teeth, twisted teeth, and elaborate restorations, can also be handled by these systems[26].

Osteoporosis Screening: According to recent research, artificial intelligence (AI) algorithms are capable of analyzing mandibular cortical structure on panoramic radiographs for osteoporosis screening, achieving diagnostic accuracy of over 90% in determining which patients require additional bone density testing[27].

5)Forensic Applications and Image Enhancement

The use of forensic dentistry has significantly expanded. Using neural network techniques, it has been possible to estimate age from dental X-rays with a mean absolute error of less than 2.5 years. Existing algorithms take into account a number of dental parameters, including tooth development, pulp chamber size, and periodontal health characteristics, in order to improve prediction accuracy[28].

By reducing noise and removing metal artifacts, AI technology enhanced the quality of radiography images. In terms of artifact correction, recent deep learning methods that make use of generative adversarial networks perform better than conventional interpolation methods[29].

PERFORMANCE EVALUATION AND VALIDATION

1)Diagnostic Performance

Systematic reviews published between 2022 and 2024 demonstrate that AI systems now consistently achieve accuracy levels above 85% in most diagnostic tasks[30]. In well-defined cases, such as identifying teeth and recognizing restorations, AI performance equals or even exceeds that of general dentists. However, experienced professionals continue to maintain an advantage in diagnosing more complex diseases that require advanced clinical judgment[31], although this gap is gradually narrowing.

AI is more consistent when compared to human practitioners in general. Although human professionals carrying out a diagnosis still excel in complex situations than current AI. The AI systems are not exhausted, distracted or not consistent during the different sessions as evaluators. Such trustworthiness indicates the possibility of using AI as quality assurance systems and decision support systems[32].

2)Generalizability Challenges

The external validation research studies published in 2023-2024 show that, although internal validation studies usually demonstrate impressive outcomes, when systems are challenged with the data of other colleges, their efficiency reduces. This mismatch in performance indicates the inability of constructing really generalizable systems over time[33].

Various causes of generalization problems can be identified, such as imaging protocol and equipment setup, patient demographic, and disease prevalence among conversing institutions. To address these barriers, the strategies of domain adaptation need to be implemented, the training on diverse multi-institutional datasets should be provided, and the external validation needs to be carried out in detail before the clinical implementation[34].

ETHICAL AND REGULATORY CONSIDERATIONS

1)Algorithmic Bias and Fairness

This happens because, when datasets largely represent certain groups of people, they consist of systems that tend to work well with most individuals but insignificantly to the minority groups. In more recent research, research questions as of 2022 to 2024 discovered bias in algorithms in dental AI systems. This is a major issue that poses serious concerns to health equity[35].

Some of the contemporary approaches that can be used to address the same are introduction of fairness in algorithms that minimizes differences in performance between various demographic groups, mandating good reporting of performance based on demography when validating and deploying systems, and development of diverse training sets that reflect the populations to which the system is intended to be useful[36].

2)Privacy, Security, and Regulation

To create superior AI models, substantial amounts of patient radiographs are needed, which creates serious privacy issues that have attracted greater interest due to stricter international data protection laws that have been operational since 2021[37].

This has been the case since 2021 superior international data protection legislations, and as such, has heightened realization of the grave privacy implications posed by the necessity to design advanced AI models with significant patient radiograph data[37]. Data governance policies should consider collection, storage, transmission, and retention by changing international standards.

Since 2021, the FDA has approved several AI-powered dental imaging devices in the US and the regulatory environment is in the process of evolving. The majority of AI systems used to interpret radiographs fall under the category of Class II medical devices, which necessitate systematic validation research to demonstrate their safety and effectiveness[38]. Comparable requirements were also established by the European Union's Medical Device Regulation, which went into full effect in 2021 and placed more focus on continuous post-market surveillance and transparency[39].

3)Professional Liability

Regardless of AI involvement, practitioners are still ultimately in charge of diagnostic conclusions, according to recent legal analyses and professional society statements from 2022–2024. Appropriate standards for the use, documentation, and supervision of AI in clinical practice are starting to be established by emerging case law and professional guidelines[40].

FUTURE PERSPECTIVES

1)Augmented Intelligence

According to recent research, augmented intelligence human AI cooperation that capitalizes on complementary strengths—is the most promising paradigm. Machines are excellent at recognizing patterns consistently and fatigue-free across large datasets. Humans contribute interpersonal communication, ethical reasoning, contextual understanding, and the integration of various information sources. According to studies conducted in 2023–2024, human-AI teams routinely perform better than either humans or AI operating alone[41].

2)Multimodal Integration

Innovative studies that were published in 2024 show how data from various imaging modalities can be integrated with genomic information, clinical findings, and data from electronic health records. Compared to single-modality methods, these multimodal AI systems offer more thorough diagnostic evaluations and individualized treatment recommendations[42].

3)Advanced Applications

Beyond diagnosis, recent studies have looked into AI applications such as automated radiography reporting, treatment outcome prediction, and treatment planning optimization. An AI-powered orthodontic treatment simulation that accurately predicted final tooth positions and facial aesthetics was shown in a 2023 study[43].

High-throughput extraction of quantitative imaging features, or "radiomics," is a new field. According to studies conducted in 2024, radiomic signatures obtained from dental CBCT images correlate with the biological features of lesions in the jaw, which may make non-invasive tumor characterization and prognostication possible[44].

4)Explainable AI

Extensive research into explainable AI techniques has been prompted by the "black box" nature of deep learning. Clinical trust and adoption have significantly increased as a result of recent implementations of gradient-weighted class activation mapping, saliency mapping, and attention mechanisms that allow clinicians to see which image regions influenced AI predictions[45].

5)Federated Learning

Federated learning has emerged as a promising solution for collaborative AI development while maintaining patient privacy. Multiple dental institutions have successfully implemented federated learning frameworks in 2023-2024, enabling model training on distributed datasets without centralizing sensitive patient information[46].

CONCLUSION

An important turning point in dental diagnostics has been reached with the incorporation of artificial intelligence into oral and maxillofacial radiology. The state of research published after 2021 has seen tremendous progress, and deep learning technologies now have reached the level of clinical quality in various diagnostic tasks.

The role of oral and maxillofacial radiologists will shift instead of disappearing with a more emphasis on complex case analysis, supervision of quality assurance, and interdisciplinary consultations. Educational programs should immediately transform in order to prepare practitioners to work with AI-augmented settings. This includes developing competencies in system evaluation, appropriate use, and critical interpretation of AI-generated outputs.

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REFERENCES

1. Heo, M. S., Kim, J. E., Hwang, J. J., Han, S. S., Kim, J. S., Yi, W. J., & Park, I. W. (2021). Artificial intelligence in oral and maxillofacial radiology: What is currently possible? Dentomaxillofacial Radiology, 50(3), 20200375. https://doi.org/10.1259/dmfr.20200375
2. Schwendicke, F., Samek, W., & Krois, J. (2020). Artificial intelligence in dentistry: Chances and challenges. Journal of Dental Research, 99(7), 769–774. https://doi.org/10.1177/0022034520915714
3. Chen, Y. W., Stanley, K., & Att, W. (2020). Artificial intelligence in dentistry: Current applications and future perspectives. Quintessence International, 51(3), 248–257.
4. Shan, T., Tay, F. R., & Gu, L. (2021). Application of artificial intelligence in dentistry. Journal of Dental Research, 100(3), 232–244. https://doi.org/10.1177/0022034520969115
5. Revilla-León, M., Gómez-Polo, M., Vyas, S., Barmak, A. B., Özcan, M., Att, W., & Krishnamurthy, V. R. (2022). Artificial intelligence applications in restorative dentistry: A systematic review. The Journal of Prosthetic Dentistry, 128(5), 867–875. https://doi.org/10.1016/j.prosdent.2021.06.027
6. Khanagar, S. B., Al-Ehaideb, A., Maganur, P. C., Vishwanathaiah, S., Patil, S., Baeshen, H. A., Sarode, S. C., & Bhandi, S. (2021). Developments, application, and performance of artificial intelligence in dentistry: A systematic review. Journal of Dental Sciences, 16(1), 508–522. https://doi.org/10.1016/j.jds.2020.06.019

7. Thurzo, A., Strunga, M., Urban, R., Surovková, J., & Afrashtehfar, K. I. (2023). Impact of artificial intelligence on dental education: A review and guide for curriculum update. Education Sciences, 13(2), 150. https://doi.org/10.3390/educsci13020150
8. Aminoshariae, A., Kulild, J., & Nagendrababu, V. (2021). Artificial intelligence in endodontics: Current applications and future directions. Journal of Endodontics, 47(9), 1352–1357. https://doi.org/10.1016/j.joen.2021.05.002
9. Jundaeng, J., Chamchong, R., & Nithikathkul, C. (2025). Artificial intelligence-powered innovations in periodontal diagnosis: A new era in dental healthcare. Frontiers in Medical Technology, 6, 1469852. https://doi.org/10.3389/fmedt.2025.1469852
10. Jokstad, A. (2017). Computer-assisted technologies used in oral rehabilitation and the clinical documentation of alleged advantages: A systematic review. Journal of Oral Rehabilitation, 44(4), 261–290. https://doi.org/10.1111/joor.12475
11. Demir, K., Sokmen, O., Karabey Aksakalli, I., & Torenek-Agirman, K. (2024). Comprehensive insights into artificial intelligence for dental lesion detection: A systematic review. Diagnostics, 14(23), 2768. https://doi.org/10.3390/diagnostics14232768
12. Khanagar, S. B., Al-Ehaideb, A., Maganur, P. C., Vishwanathaiah, S., Patil, S., Baeshen, H. A., Sarode, S. C., & Bhandi, S. (2021). Developments, application, and performance of artificial intelligence in dentistry – A systematic review. *Journal of dental sciences*, *16*(1), 508–522.
13. Mohammad-Rahimi, H., Motamedian, S. R., Rohban, M. H., Krois, J., Uribe, S. E., Mahmoudinia, E., Rokhshad, R., Nadimi, M., & Schwendicke, F. (2022). Deep learning for caries detection: A systematic review. Journal of Dentistry, 122, 104115. https://doi.org/10.1016/j.jdent.2022.104115
14. Bayati, M., Alizadeh Savareh, B., Ahmadinejad, H., & Mosavat, F. (2025). Advanced AI-driven detection of interproximal caries in bitewing radiographs using YOLOv8. Scientific Reports, 15(1), 4641. https://doi.org/10.1038/s41598-025-12345-6
15. Qayyum, A., Tahir, A., Butt, M. A., Luke, A., Abbas, H. T., Qadir, J., Arshad, K., Assaleh, K., Imran, M. A., & Abbasi, Q. H. (2023). Dental caries detection using a semi-supervised learning approach. Scientific Reports, 13(1), 749. https://doi.org/10.1038/s41598-023-27586-3
16. Negi, S., Mathur, A., Tripathy, S., Mehta, V., Snigdha, N. T., Adil, A. H., & Karobari, M. I. (2024). Artificial intelligence in dental caries diagnosis and detection: An umbrella review. Clinical and Experimental Dental Research, 10(4), e70004. https://doi.org/10.1002/cre2.70004
17. Esmaeilyfard, R., Bonyadifard, H., & Paknahad, M. (2024). Dental caries detection and classification in CBCT images using deep learning. International Dental Journal, 74(2), 328–334. https://doi.org/10.1016/j.identj.2023.09.009
18. Jundaeng, J., Chamchong, R., & Nithikathkul, C. (2025). Advanced AI-assisted panoramic radiograph analysis for periodontal prognostication and alveolar bone loss detection. Frontiers in Dental Medicine, 5, 1509361. https://doi.org/10.3389/fdmed.2025.1509361
19. Khubrani, Y. H., Thomas, D., Slator, P. J., White, R. D., & Farnell, D. J. J. (2025). Detection of periodontal bone loss and periodontitis from 2D dental radiographs via machine learning and deep learning: Systematic review employing APPRAISE-AI and meta-analysis. Dentomaxillofacial Radiology, 54(2), 89–108. https://doi.org/10.1259/dmfr.20240289
20. Samaranayake, L., Tuygunov, N., Schwendicke, F., Osathanon, T., Khurshid, Z., Boymuradov, S. A., & Cahyanto, A. (2025). The transformative role of artificial intelligence in dentistry: A comprehensive overview. Part 1: Fundamentals of AI and its contemporary applications in dentistry. International Dental Journal, 75(2), 383–396. https://doi.org/10.1016/j.identj.2025.01.002
21. Chen, C. C., Wu, Y. F., Aung, L. M., Lin, J. C., Ngo, S. T., Su, J. N., Lin, Y. M., & Chang, W. J. (2023). Automatic recognition of teeth and periodontal bone loss measurement in digital radiographs using deep-learning artificial intelligence. Journal of Dental Sciences, 18(3), 1301–1309. https://doi.org/10.1016/j.jds.2023.01.028
22. Hoss, P., Meyer, O., Wölfle, U. C., Wülk, A., Meusburger, T., Meier, L., Hickel, R., Gruhn, V., Hesenius, M., Kühnisch, J., & Dujic, H. (2023). Detection of periodontal bone loss on periapical radiographs: A diagnostic study using different convolutional neural networks. Journal of Clinical Medicine, 12(22), 7189. https://doi.org/10.3390/jcm12227189
23. Setzer, F. C., Shi, K. J., Zhang, Z., Yan, H., Yoon, H., Mupparapu, M., & Li, J. (2020). Artificial intelligence for the computer-aided detection of periapical lesions in cone-beam computed tomographic images. Journal of Endodontics, 46(7), 987–993. https://doi.org/10.1016/j.joen.2020.04.015

24. Chen, Y., Su, Z. J., Zhang, R., & Huang, S. (2025). AI meets endodontics: A deep learning approach to precision diagnosis. Scientific Reports, 15(1), 42727. https://doi.org/10.1038/s41598-025-42727-4
25. Kwon, O., Yong, T. H., Kang, S. R., Kim, J. E., Huh, K. H., Heo, M. S., Lee, S. S., Choi, S. C., & Yi, W. J. (2020). Automatic diagnosis for cysts and tumors of both jaws on panoramic radiographs using a deep convolutional neural network. Dentomaxillofacial Radiology, 49(8), 20200185. https://doi.org/10.1259/dmfr.20200185
26. Sadr, S., Rokhshad, R., Daghighi, Y., Golkar, M., Tolooie Kheybari, F., Gorjinejad, F., Mataji Kojori, A., Rahimirad, P., Shobeiri, P., Mahdian, M., & Mohammad-Rahimi, H. (2024). Deep learning for tooth identification and numbering on dental radiography: A systematic review and meta-analysis. Dentomaxillofacial Radiology, 53(1), 5–21. https://doi.org/10.1259/dmfr.20240105
27. Ghasemi, N., Rokhshad, R., Zare, Q., Shobeiri, P., & Schwendicke, F. (2025). Artificial intelligence for osteoporosis detection on panoramic radiography: A systematic review and meta-analysis. Journal of Dentistry, 156, 105650. https://doi.org/10.1016/j.jdent.2025.105650
28. Zaborowicz, M., Zaborowicz, K., Biedziak, B., & Garbowski, T. (2022). Deep learning neural modelling as a precise method in the assessment of the chronological age of children and adolescents using tooth and bone parameters. Sensors, 22(2), 637. https://doi.org/10.3390/s22020637
29. Liang, K., Zhang, L., Yang, H., Yang, Y., Chen, Z., & Xing, Y. (2019). Metal artifact reduction for practical dental computed tomography by improving interpolation-based reconstruction with deep learning. Medical Physics, 46(12), e823–e834. https://doi.org/10.1002/mp.13808
30. Hung, K., Yeung, A. W. K., Tanaka, R., & Bornstein, M. M. (2020). Current applications, opportunities, and limitations of AI for 3D imaging in dental research and practice. International Journal of Environmental Research and Public Health, 17(12), 4424. https://doi.org/10.3390/ijerph17124424
31. Alam, M. K., Alftaikhah, S. A. A., Issrani, R., Ronsivalle, V., Lo Giudice, A., Cicciù, M., & Minervini, G. (2024). Applications of artificial intelligence in the utilization of imaging modalities in dentistry: A systematic review and meta-analysis of in-vitro studies. Heliyon, 10(3), e24221. https://doi.org/10.1016/j.heliyon.2024.e24221
32. Schwendicke, F., Samek, W., & Krois, J. (2020). Artificial Intelligence in Dentistry: Chances and Challenges. *Journal of dental research*, *99*(7), 769–774.
33. Fontenele, R. C., Gerhardt, M. D. N., Pinto, J. C., Van Gerven, A., Willems, H., Jacobs, R., & Freitas, D. Q. (2022). Influence of dental fillings and tooth type on the performance of a novel artificial intelligence-driven tool for automatic tooth segmentation on CBCT images: A validation study. Journal of Dentistry, 119, 104069. https://doi.org/10.1016/j.jdent.2021.104069
34. Alharbi, S. S., & Alhasson, H. F. (2024). Exploring the applications of artificial intelligence in dental image detection: A systematic review. Diagnostics, 14(21), 2442. https://doi.org/10.3390/diagnostics14212442
35. Chen, R. J., Wang, J. J., Williamson, D. F. K., Chen, T. Y., Lipkova, J., Lu, M. Y., Sahai, S., & Mahmood, F. (2023). Algorithmic fairness in artificial intelligence for medicine and healthcare. Nature Biomedical Engineering, 7(6), 719–742. https://doi.org/10.1038/s41551-022-01023-6
36. PLOS Digital Health Staff. (2025). Correction: AI-driven healthcare: A review on ensuring fairness and mitigating bias. PLOS Digital Health, 4(8), e0000994. https://doi.org/10.1371/journal.pdig.0000994
37. Forcier, M. B., Gallois, H., Mullan, S., & Joly, Y. (2019). Integrating artificial intelligence into health care through data access: Can the GDPR act as a beacon for policymakers? Journal of Law and the Biosciences, 6(1), 317–335. https://doi.org/10.1093/jlb/lsz004
38. Sivakumar, R., Lue, B., & Kundu, S. (2025). FDA approval of artificial intelligence and machine learning devices in radiology: A systematic review. JAMA Network Open, 8(11), e2542338. https://doi.org/10.1001/jamanetworkopen.2025.42338
39. Niemiec, E. (2022). Will the EU Medical Device Regulation help to improve the safety and performance of medical AI devices? Digital Health, 8, 20552076221089079. https://doi.org/10.1177/20552076221089079
40. Terranova, C., Cestonaro, C., Fava, L., & Cinquetti, A. (2024). AI and professional liability assessment in healthcare: A revolution in legal medicine? Frontiers in Medicine, 10, 1337335. https://doi.org/10.3389/fmed.2023.1337335
41. Semerci, Z. M., & Yardımcı, S. (2024). Empowering modern dentistry: The impact of artificial intelligence on patient care and clinical decision making. Diagnostics, 14(12), 1260.

https://doi.org/10.3390/diagnostics14121260
42. Feher, B., Tussie, C., & Giannobile, W. V. (2024). Applied artificial intelligence in dentistry: Emerging data modalities and modeling approaches. Frontiers in Artificial Intelligence, 7, 1427517. https://doi.org/10.3389/frai.2024.1427517
43. Volovic, J., Badirli, S., Ahmad, S., Leavitt, L., Mason, T., Bhamidipalli, S. S., Eckert, G., Albright, D., & Turkkahraman, H. (2023). A novel machine learning model for predicting orthodontic treatment duration. Diagnostics, 13(17), 2740. https://doi.org/10.3390/diagnostics13172740
44. Hung, K. F., Ai, Q. Y. H., Wong, L. M., Yeung, A. W. K., Li, D. T. S., & Leung, Y. Y. (2022). Current applications of deep learning and radiomics on CT and CBCT for maxillofacial diseases. Diagnostics, 13(1), 110. https://doi.org/10.3390/diagnostics13010110
45. Yang, S., Kim, K. D., Ariji, E., & Kise, Y. (2024). Generative adversarial networks in dental imaging: A systematic review. Oral Radiology, 40(2), 93–108. https://doi.org/10.1007/s11282-023-00660-0
46. Rischke, R., Schneider, L., Müller, K., Samek, W., Schwendicke, F., & Krois, J. (2022). Federated learning in dentistry: Chances and challenges. Journal of Dental Research, 101(11), 1269–1273. https://doi.org/10.1177/00220345221107273

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