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Reading between the Pixels: The Transformative Impact of Artificial Intelligence in Radiology and Pathology

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1. Abstract

This paper examines the profound and rapidly evolving integration of Artificial Intelligence (AI), particularly deep learning, into the fields of radiology and pathology. It explores how AI algorithms are moving from research tools to clinical partners, capable of detecting, segmenting, and characterizing abnormalities in medical images with superhuman speed and, in some cases, accuracy. In radiology, we analyze applications in chest X-rays, mammography, CT, and MRI for tasks ranging from triage and detection to prognostication. In pathology, we delve into whole-slide image analysis for cancer grading, tumor microenvironment assessment, and predictive biomarker discovery. The paper details the foundational technologies, presents compelling clinical validation studies, and addresses the significant implementation challenges, including data quality, algorithmic bias, regulatory hurdles, and the critical need for human-AI collaboration. Ultimately, we argue that AI is not an agent of replacement but a catalyst for the transformation of radiologists and pathologists into "information specialists", enhancing diagnostic precision, personalizing treatment pathways, and improving workflow efficiency. The future lies in seamless, explainable AI systems integrated into clinical ecosystems, fundamentally reshaping the practice of diagnostic medicine.

2. Keywords

Artificial Intelligence, Deep Learning, Convolutional Neural Networks (CNNs), Radiology, Pathology, Medical Imaging, Computer-Aided Diagnosis (CAD), Digital Pathology, Precision Medicine

3. Introduction: The Pixelated Frontier of Medicine

Medical imaging constitutes over 90% of all healthcare data. For over a century, radiologists and pathologists have served as the expert interpreters of this visual data-radiologists reading the body's macro-structure through X-rays, CTs, and MRIs, and pathologists deciphering its micro-structure through tissue slides. However, human interpretation is constrained by fatigue, cognitive bias, and the subtle, complex nature of disease patterns often buried in billions of pixels [1-22].

Enter Artificial Intelligence. The convergence of three factors has ignited the AI revolution in imaging: 1) the digitization of medical images (PACS, digital slide scanners); 2) the availability of massive, annotated datasets; and 3) breakthroughs in deep learning, specifically Convolutional Neural Networks (CNNs), which excel at pattern recognition in images. This paper posits that AI is poised to fundamentally augment diagnostic imaging, not by replacing

the expert eye, but by extending its capabilities, allowing clinicians to truly "read between the pixels" and uncover insights invisible to the naked eye [23-44].

Thesis: AI in radiology and pathology is transitioning from an assistive tool to an indispensable clinical partner, enhancing diagnostic accuracy, unlocking novel biomarkers, and redefining professional roles, though its successful integration hinges on overcoming significant technical, ethical, and workflow challenges.

4. Technological Foundations: How AI "Sees" an Image

Understanding the clinical impact requires a primer on the underlying technology.

- **From Rules to Learning:** Traditional computer-aided detection (CAD) systems used handcrafted rules (e.g., shape, density thresholds). Modern AI uses deep learning, where algorithms learn hierarchical feature representations directly from data.
- **Convolutional Neural Networks (CNNs):** The workhorse of medical image AI. CNNs use layers of filters to scan an image, detecting edges, textures, and eventually complex patterns like a lung nodule or a mitotic figure. They learn through exposure to thousands of labeled examples (e.g., "normal" vs. "pneumonia" chest X-rays) [45-65].

Key Architectures & Tasks:

- **Classification:** "Does this mammogram show cancer?" (e.g., DenseNet, ResNet).
- **Detection & Localization:** "Where are the tumors in this liver CT?" (e.g., Faster R-CNN, YOLO).
- **Segmentation:** "Precisely outline the boundaries of this prostate gland on MRI". (e.g., U-Net). This is crucial for measuring tumor volume.
- **Generation:** Synthesizing one imaging modality from another (e.g., CT from MRI) using Generative Adversarial Networks (GANs) [66-78].

5. AI in Radiology: From Triage to Prognosis

Radiology, being inherently digital and quantitative, has been at the forefront of AI adoption.

Chest Imaging:

- **Detection:** AI algorithms now match or exceed radiologists in detecting pulmonary nodules on CT, with FDA-cleared systems (e.g., Aidoc, Annalise) providing concurrent "second reader" support.
- **Triage & Worklist Prioritization:** AI can flag critical findings like pneumothorax, pleural effusion, or intracranial hemorrhage on non-contrast head CTs, pushing urgent cases to the top of the radiologist's worklist, potentially saving crucial time in stroke or trauma.
- **Quantification:** In COVID-19, AI tools rapidly quantified the percentage of lung involvement on CT, providing an objective measure of disease progression.

Mammography & Breast Imaging:

- AI is showing promise in reducing both false positives and false negatives. Studies have demonstrated that AI can act as an independent reader in screening, potentially increasing cancer detection rates while reducing radiologist workload [79-90].
- AI also assesses breast density, a known risk factor, with high consistency.

Neuroimaging:

- **Stroke:** AI rapidly analyzes CT angiography to identify large vessel occlusions, triggering immediate alerts to stroke teams.
- **Oncology:** AI segments brain tumors on MRI, measuring precise volumes for treatment response assessment (Response Evaluation Criteria in Solid Tumors - RECIST).
- **Dementia:** AI tools analyze structural MRI to detect patterns suggestive of Alzheimer's disease years before clinical symptoms.
- **Musculoskeletal & Beyond:** AI automates measurements of spinal curvature, detects subtle fractures, and characterizes liver lesions on multiphase CT/MRI [91-105].

6. AI in Pathology: The Digital Microscopy Revolution

The slower digitization of pathology is accelerating, fueled by AI's potential.

- **Whole Slide Image (WSI) Analysis:** AI can analyze an entire gigapixel digital slide, a task impractical for humans at a cellular level.
- **Cancer Diagnosis & Grading:** AI algorithms can classify prostate, breast, and lung cancer subtypes and grade tumors (e.g., Gleason scoring for prostate) with high accuracy, improving reproducibility between pathologists.
- **Detection of Micrometastases:** AI can scour lymph node slides for tiny clusters of metastatic cells, a tedious and error-prone task for humans.
- **Tumor Microenvironment (TME):** This is AI's most revolutionary contribution. Algorithms can map the spatial architecture of tumors, quantifying tumor-infiltrating lymphocytes (TILs), stromal composition, and vascular patterns features with profound prognostic and predictive implications for immunotherapy.
- **Predictive Pathology:** AI goes beyond diagnosis to predict therapeutic response.
- By analyzing H&E-stained slides alone, AI can predict molecular alterations (e.g., microsatellite instability (MSI), EGFR mutations) previously requiring expensive genetic tests. This "chemo-omic" approach makes precision medicine more accessible.
- **Workflow Efficiency:** AI can pre-screen cases, flagging likely negatives or prioritizing complex cases, and automate tasks like counting mitotic figures or quantifying immunohistochemistry stains (e.g., Ki-67 index) [106-120].

7. Clinical Validation and Tangible Benefits

The promise of AI is increasingly supported by evidence.

- **Enhanced Diagnostic Accuracy:** Multiple studies in Nature Medicine, The Lancet Digital Health, etc., show AI systems performing at or above the level of expert radiologists/pathologists in specific, narrow tasks.

- **Improved Efficiency and Reduced Burnout:** By handling repetitive tasks (nodule detection, case triage), AI frees up specialists for complex decision-making, consultation, and patient-facing activities. It can cut interpretation times significantly.
- **Unlocking Novel Biomarkers:** AI can integrate imaging data with genomic, proteomic, and clinical data, creating powerful "radiomic" and "pathomic" signatures that predict survival, recurrence, and treatment response better than conventional metrics.
- **Democratizing Expertise:** AI decision-support tools can provide subspecialty-level insights in underserved areas with limited access to experts, improving equity in healthcare delivery [121-130].

8.Critical Challenges and Ethical Imperatives

Integration is not without substantial hurdles.

- **Data Quality and Bias:** AI is only as good as its training data. Biased datasets (e.g., underrepresentation of certain ethnicities, ages, or disease subtypes) lead to biased algorithms that may fail in real-world, diverse populations. Curating large, high-quality, annotated datasets is a major bottleneck.
- **The "Black Box" Problem:** The reasoning of complex deep learning models is often opaque. Explainable AI (XAI) is crucial for clinical trust. Methods like saliency maps, which highlight the pixels most influential to the AI's decision, are becoming essential.
- **Regulatory and Clinical Integration:** The FDA's evolving framework for Software as a Medical Device (SaMD) is complex. Proving clinical utility that AI improves patient outcomes, not just algorithmic performance is required. Seamless integration into clunky hospital IT systems (PACS, LIS, EHR) remains a technical and financial challenge.
- **Reimbursement and Liability:** Who pays for AI? How are its services coded? More critically, who is liable when an AI misses a diagnosis: the physician, the hospital, or the software developer? Legal frameworks are lagging.
- **The Human-AI Collaboration Model:** The goal is not autonomy but effective partnership. The optimal workflow whether AI as a first, concurrent, or second reader is still being researched. Clinician education and trust-building are paramount [131-140].

7. The Future: The Augmented Diagnostic Specialist

The future radiologist and pathologist will be "information specialists" or "augmented diagnosticians".

- **Seamless Workflow Integration:** AI will be invisible, running in the background, presenting concise, evidence-based annotations directly on images within the standard viewer.
- **Multimodal AI Fusion:** Algorithms will fuse data from multiple sources a chest CT, a pathology slide, genomic data, and the patient's HER to provide a comprehensive "diagnostic dashboard" with integrated risk scores and management recommendations.
- **Continuous Learning Systems:** Federated learning will allow AI models to improve across institutions without sharing sensitive patient data, addressing data scarcity and bias.
- **Shift in Professional Focus:** Freed from repetitive detection tasks, specialists will focus on complex integration of information, procedural guidance (e.g., targeting biopsies based on AI maps), patient communication, and multidisciplinary team leadership [141-144].

10. Conclusion

The journey of AI in radiology and pathology is no longer speculative; it is operational. "Reading between the pixels" is evolving from a human art to a collaborative science, powered by algorithms that can perceive patterns at scale and at a granularity beyond human limits. The transformative potential for patient care through earlier, more accurate, and more personalized diagnosis is immense. However, realizing this potential requires moving beyond technological prowess to address the harder problems of bias, explainability, integration, and equitable implementation. By navigating these challenges thoughtfully, the medical community can harness AI not as a disruptor, but as the most powerful tool yet developed to augment human expertise, ultimately fulfilling the promise of precision medicine for all patients.

11. References

1. Sung, H., Ferlay, J., Siegel, R. L., et al. (2021). *Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries*. *CA: A Cancer Journal for Clinicians*, *71*(3), 209–249.
2. Siegel, R. L., Giaquinto, A. N., & Jemal, A. (2024). *Cancer statistics, 2024*. *CA: A Cancer Journal for Clinicians*, *74*(1), 12–49.
3. Chow, L. Q. M. (2020). *Head and Neck Cancer*. *New England Journal of Medicine*, *382*(1), 60–72.
4. Warnakulasuriya, S. (2020). *Oral potentially malignant disorders: A comprehensive review on clinical aspects and management*. *Oral Oncology*, *102*, 104550.
5. Gupta, N., Gupta, R., Acharya, A. K., et al. (2021). *Changing trends in oral cancer – a global scenario*. *Nepal Journal of Epidemiology*, *11*(4), 1035–1057.
6. Hashibe, M., Brennan, P., Chuang, S. C., et al. (2009). *Interaction between tobacco and alcohol use and the risk of head and neck cancer: pooled analysis in the International Head and Neck Cancer Epidemiology Consortium*. *Cancer Epidemiology, Biomarkers & Prevention*, *18*(2), 541–550.
7. Chaturvedi, A. K., Mbulaiteye, S. M., & Engels, E. A. (2021). *HPV-Associated Cancers in the United States Over the Last 15 Years: Has Screening or Vaccination Made Any Difference? The Oncologist*, *26*(7), e1130–e1135.
8. Lalla, R. V., Saunders, D. P., & Peterson, D. E. (2014). *Chemotherapy or radiation-induced oral mucositis*. *Dental Clinics*, *58*(2), 341–349.
9. Vissink, A., Jansma, J., Spijkervet, F. K., et al. (2003). *Oral sequelae of head and neck radiotherapy*. *Critical Reviews in Oral Biology & Medicine*, *14*(3), 199–212.
10. Peterson, D. E., Doerr, W., Hovan, A., et al. (2010). *Osteoradionecrosis in cancer patients: the evidence base for treatment-dependent frequency, current management strategies, and future studies*. *Supportive Care in Cancer*, *18*(8), 1089–1103.
11. Buglione, M., Cavagnini, R., Di Rosario, F., et al. (2016). *Oral toxicity management in head and neck cancer patients treated with chemotherapy and*

radiation: Xerostomia and trismus (Part 2). Critical Reviews in Oncology/Hematology, 102, 47–54.
12. The American Academy of Oral Medicine. (2017). *Dental Management of the Oral Complications of Cancer Treatment.* AAOM Professional Resource.
13. Panahi, O. (2025). *The Algorithmic Healer: AI's Impact on Public Health Delivery.* Medi Clin Case Rep J, 3(1), 759–762. DOI: 10.51219/MCCRJ/Omid-Panahi/197.
14. Panahi, O. (2024). *AI: A New Frontier in Oral and Maxillofacial Surgery.* Acta Scientific Dental Sciences, 8(6), 40–42.
15. Panahi, O., & Falkner, S. (2025). *Telemedicine, AI, and the Future of Public Health.* Western J Med Sci & Res, 2(1), 102.
16. Panahi, D. O., Esmaili, D. F., & Kargarnezhad, D. S. (2024). *Искусственный интеллект в стоматологии.* SCIENCIA SCRIPTS Publishing.
17. Esmaielzadeh, D. S., Panahi, D. O., & Çay, D. F. K. (2020). *Application of Clay's in Drug Delivery in Dental Medicine.* Scholars' Press.
18. Panahi, D. O. (2019). *NanoTechnology, Regenerative Medicine and Tissue Bio-Engineering.* Scholars' Press.
19. Panahi, D. O., & Dadkhah, D. S. (2025). *La IA en la odontología moderna.* NUESTRO CONOC. ISBN.
20. Panahi, D. O., Esmaili, D. F., & Kargarnezhad, D. S. (2024). *Inteligencia artificial en odontología, NUESTRO CONOC.* Mento Publishing. ISBN.
21. Panahi O, Esmaili DF, Kargarnezhad DS. (2024) Intelligenza artificiale in odontoiatria. SAPIENZA Publishing. ISBN.
22. Panahi DO, Dadkhah DS. (2025) L'IA dans la dentisterie moderne. ISBN.
23. Panahi O, Eslamlou SF. (2025) Artificial Intelligence in Oral Surgery: Enhancing Diagnostics, Treatment, and Patient Care. J Clin Den & Oral Care. 3(1): 01–05.
24. Omid P, Soren F. (2025) The Digital Double: Data Privacy, Security, and Consent in AI Implants. Digit J Eng Sci Technol. 2(1): 105.
25. Panahi DO, Eslamlou DSF. (2025) Le péridontium: Structure, fonction et gestion clinique. ISBN.
26. Panahi DO, Dadkhah DS. (2025) Sztuczna inteligencja w nowoczesnej stomatologii. ISBN.
27. Panahi O. (2025) The Role of Artificial Intelligence in Shaping Future Health Planning. Int J Health Policy Plann. 4(1): 01–05.
28. Panahi O, Amirloo A. (2025) AI-enabled IT systems for improved dental practice management. On J Dent & Oral Health.
29. Panahi DO, Dadkhah DS. (2025) A IA na medicina dentária moderna. ISBN.
30. Panahi DO, Dadkhah DS. (2025) L'intelligenza artificiale nell'odontoiatria moderna. ISBN.
31. Panahi O, Eslamlou SF, Jabbarzadeh M. (2025) Medicina dentária digital e inteligência artificial. ISBN.
32. Panahi DO. (2021) Cellule staminali della polpa dentaria. ISBN.
33. Panahi O. (2021) Células madre de la pulpa dental. Ediciones Nuestro Conocimiento.
34. Panahi O. (2025) AI-Enhanced Case Reports: Integrating Medical Imaging for Diagnostic Insights. J Case Rep Clin Images. 8(1): 1161.
35. Panahi O. (2025) Navigating the AI Landscape in Healthcare and Public Health. Mathews J Nurs. 7(1): 56.
36. Panahi O. (2025) Innovative Biomaterials for Sustainable Medical Implants: A Circular Economy Approach. Eur J Innov Stud Sustain. 1(2): 1–5.
37. Panahi DO. (Year not provided) Стволовые клетки пульпы зуба.
38. Panahi O, Azarfardin A. (2025) Computer-Aided Implant Planning: Utilizing AI for Precise Placement and Predictable Outcomes. J Dent Oral Health. 2(1).
39. Panahi O. (2024) The Rising Tide: Artificial Intelligence Reshaping Healthcare Management. S J Publc Hlth. 1(1): 1–3.
40. Panahi O. (2025) AI in Health Policy: Navigating Implementation and Ethical Considerations. Int J Health Policy Plann. 4(1): 01–05.
41. Panahi O. (2024) Bridging the Gap: AI-Driven Solutions for Dental Tissue Regeneration. Austin J Dent. 11(2): 1185.
42. Panahi O, Zeinalddin M. (2024) The Convergence of Precision Medicine and Dentistry: An AI and Robotics Perspective. Austin J Dent. 11(2): 1186.
43. Panahi O. (2024) Modern Sinus Lift Techniques: Aided by AI. Glob J Oto. 26(4): 556198. DOI:10.19080/GJO.2024.26.556198.
44. Panahi O, Zeinalddin M. (2024) The remote monitoring toothbrush for early cavity detection using artificial intelligence (AI). IJDSIR.
45. Panahi O. (2021) Stammzellen aus dem Zahnmark. Verlag Unser Wissen.
46. Panahi O, Eslamlou SF, Jabbarzadeh M. (Year not provided) Stomatologia cyfrowa i sztuczna inteligencja. ISBN.
47. Panahi O, Eslamlou SF, Jabbarzadeh M. (2025) Odontoiatria digitale e intelligenza artificiale. ISBN.
48. Panahi O, Eslamlou SF, Jabbarzadeh M. (2025) Dentisterie numérique et intelligence artificielle. ISBN.
49. Panahi O, Eslamlou SF, Jabbarzadeh M. (2025) Odontología digital e inteligencia artificial. ISBN.
50. Panahi O, Eslamlou SF, Jabbarzadeh M. (2025) Digitale Zahnmedizin und künstliche Intelligenz. ISBN.
51. Panahi O. (2025) Predictive Health in Communities: Leveraging AI for Early Intervention and Prevention. Ann Community Med Prim Health Care. 3(1):1027.
52. Panahi O, Zeinalddin M. (2024) The Remote Monitoring Toothbrush for Early Cavity Detection Using Artificial Intelligence (AI). IJDSIR.
53. Panahi O. (2021) Stammzellen aus dem Zahnmark. Verlag Unser Wissen.
54. Panahi O, Eslamlou SF, Jabbarzadeh M. (Year unknown) Stomatologia cyfrowa i sztuczna inteligencja. ISBN.
55. Panahi O, Eslamlou SF, Jabbarzadeh M. (2025) Odontoiatria digitale e intelligenza artificiale. ISBN.
56. Panahi O, Eslamlou SF, Jabbarzadeh M. (2025) Dentisterie numérique et intelligence artificielle. ISBN.
57. Panahi O, Eslamlou SF, Jabbarzadeh M. (2025) Odontología digital e inteligencia artificial. ISBN.
58. Panahi O, Eslamlou SF, Jabbarzadeh M. (2025) Digitale Zahnmedizin und künstliche Intelligenz. ISBN.
59. Panahi O. (2025) Predictive Health in Communities: Leveraging AI for Early Intervention and Prevention. Ann Community Med Prim Health Care. 3(1):1027.
60. Panahi P, Bayılmış C, Çavuşoğlu U, et al. (2021) Performance Evaluation of Lightweight Encryption Algorithms for IoT-Based Applications. Arab J Sci Eng. 46(4):4015–4037.
61. Panahi U, Bayılmış C. (2023) Enabling Secure Data Transmission for Wireless Sensor Networks Based IoT Applications. Ain Shams Eng J. 14(2):101866.

62. Panahi O, Panahi U. (2025) AI-Powered IoT: Transforming Diagnostics and Treatment Planning in Oral Implantology. J Adv Artif Intell Mach Learn. 1(1):1–4.
63. Panahi U. (2025) AD HOC Networks: Applications, Challenges, Future Directions. Scholars' Press. ISBN:978-3-639-76170-2.
64. Panahi P, Dehghan M. (2008) Multipath Video Transmission Over Ad Hoc Networks Using Layer Coding and Video Caches. ICEE2008. pp.50–55.
65. Panahi O. (2021) Research System in Health Management Information Systems. Sciencia Scripts Publishing.
66. Panahi U, Panahi O. (2025) AI-Powered IoT: Transforming Diagnostics and Treatment Planning in Oral Implantology.
67. Zeynali M, Panahi O, Ezzati D. (2025) Will AI Replace Your Dentist? On J Dent & Oral Health. 8(3).
68. Panahi O, et al. (Year unknown) A New Frontier in Artificial Intelligence in Periodontology. Mod Res Dent.
69. Panahi O, Dadkhah S. (Year unknown) AI in der modernen Zahnmedizin.
70. Panahi U. (2025) Redes AD HOC: Aplicações, Desafios, Direcções Futuras. Edições Nosso Conhecimento.
71. Panahi U. (2025) AD HOC Networks: Applications, Challenges, Future Paths. Our Knowledge.
72. Panahı U. (2022) Design of Lightweight Cryptography-Based Secure Communication for IoT. Sakarya University.
73. Koyuncu B, Panahi P. (2014) Kalman Filtering of Link Quality Indicator Values for Position Detection. IJCCIE.
74. Koyuncu B, Gökçe A, Panahi P. (2015) Integrative Game Engine for Archaeological Reconstruction. SOMA 2015.
75. Panahi O, Eslamlou SF. (Year unknown) Peridonio: Struttura, Funzione e Gestione Clinica. ISBN:978-620-8-74559-2.
76. Panahi O, Dadkhah S. (Year unknown) AI in der modernen Zahnmedizin. ISBN:978-620-8-74877-7.
77. Panahi O. (Year unknown) Cellules souches de la pulpe dentaire. ISBN:978-620-4-05358-5.
78. Panahi O, Esmaili F, Kargarnezhad S. (2024) Искусственный интеллект в стоматологии. SCIENCIA SCRIPTS Publishing.
79. Panahi O, Melody FR. (2011) A Novel Scheme About Extraction Orthodontic and Orthotherapy. Int J Acad Res. 3(2).
80. Panahi O. (2025) The Evolving Partnership: Surgeons and Robots in Maxillofacial Surgery. J Dent Sci Oral Care. 1:1–7.
81. Panahi O, Dadkhah S. (Year unknown) Sztuczna inteligencja w nowoczesnej stomatologii. ISBN:978-620-8-74884-5.
82. Panahi O. (2025) The Future of Medicine: Converging Technologies and Human Health. J Bio-Med Clin Res. 2.
83. Panahi O, Raouf MF, Patrik K. (2011) Pregnancy and Periodontal Therapy. Int J Acad Res. 3:1057–1058.
84. Panahi O, Nunag GM, Siyahtan AN. (2011) Molecular Pathology: Helicobacter Pylori in Oral Cavity. Cell J. 12(Suppl 1):91–92.
85. Panahi O. (2025) The Age of Longevity. J Bio-Med Clin Res. 2.
86. Panahi O, Eslamlou SF. (Year unknown) Peridoncio: Estructura, Función y Manejo Clínico. ISBN:978-620-8-74557-8.
87. Panahi O, Farrokh S. (2025) Building Healthier Communities. Int J Nurs Health Care. 1(1):1–4.
88. Panahi O. (Year unknown) Стволовые клетки пульпы зуба. ISBN:978-620-4-05357-8.
89. Panahi O. (2025) Nanomedicine: Tiny Technologies, Big Impact. J Bio-Med Clin Res. 2.
90. Panahi O, Amirloo A. (2025) AI-Enabled IT Systems for Dental Practice. On J Dent & Oral Health. 8(4).
91. Panahi O. (2013) Effect of Unripe Makopa Fruit Extract on Bleeding Time. Int J Paediatr Dent. 23:205.
92. Panahi O, Eslamlou SF. (Year unknown) Peridontium: Struktura, funkcja i postępowanie kliniczne. ISBN:978-620-8-74560-8.
93. Panahi O, Eslamlou SF. (2025) Artificial Intelligence in Oral Surgery. J Clin Den & Oral Care. 3(1):01–05.
94. Panahi O, Eslamlou SF, Jabbarzadeh M. (Year unknown) Odontoiatria digitale e intelligenza artificiale. ISBN:978-620-8-73913-3.
95. Omid P, Soren F. (2025) The Digital Double. Digit J Eng Sci Technol. 2(1):105.
96. Panahi O, Eslamlou SF, Jabbarzadeh M. (Year unknown) Medicina dentária digital e inteligência artificial. ISBN:978-620-8-73915-7.
97. Panahi O. (Year unknown) Stammzellen aus dem Zahnmark. ISBN:978-620-4-05355-4.
98. Panahi O. (2025) AI-Enhanced Case Reports. J Case Rep Clin Images. 8(1):1161.
99. Panahi O. (2025) Navigating the AI Landscape. Mathews J Nurs. 7(1):5.
100. Panahi O. (2025) AI for Health Planning. Int J Health Policy Plann. 4(1):01–05.
101. Panahi O, Falkner S. (2025) Telemedicine and AI. West J Med Sci Res. 2(1):10.
102. Panahi O, Azarfardin A. (2025) Computer-Aided Implant Planning. J Dent Oral Health. 2(1).
103. Panahi O. (2025) AI & Ethics in Health Policy. Int J Health Policy Plann. 4(1):01–05.
104. Panahi O, Eslamlou SF, Jabbarzadeh M. (Year unknown) Stomatologia cyfrowa i sztuczna inteligencja. ISBN:978-620-8-73914-0.
105. Panahi O. (2025) Innovative Biomaterials for Implants. Eur J Innov Stud Sustain. 1(2):1–5.
106. Panahi O. (2024) AI for Dental Tissue Regeneration. Austin J Dent. 11(2):1185.
107. Panahi O, Eslamlou SF, Jabbarzadeh M. (Year unknown) Dentisterie numérique et intelligence artificielle. ISBN:978-620-8-73912-6.
108. Panahi O, Zeinalddin M. (2024) Precision Medicine & Dentistry. Austin J Dent. 11(2):1186.
109. Panahi O, Zeinalddin M. (2024) Remote Monitoring Toothbrush. IJDSIR. 7(4):173–178.
110. Panahi O. (2024) Modern Sinus Lift Techniques. Glob J Oto. 26(4):556198.
111. Panahi O. (2024) The Rising Tide: AI in Health Management. S J Publc Hlth. 1(1):1–3.
112. Panahi P. (2008) Multipath Local Error Management for Ad Hoc Networks. ICASMCMD. pp.187–194.
113. Panahi O, Eslamlou SF, Jabbarzadeh M. (Year unknown) Digitale Zahnmedizin und künstliche Intelligenz. ISBN:978-620-8-73910-2.
114. Panahi U. (2025) AD HOC Networks: Applications. Scholars' Press. ISBN:978-3-639-76170-2.
115. Panahi U. (Year unknown) AD HOC-Netze. Verlag Unser Wissen. ISBN:978-620-8-72963-9.

116. Panahi O, Eslamlou SF, Jabbarzadeh M. (Year unknown) Odontología digital e inteligencia artificial. ISBN:978-620-8-73911-9.
117. Koyuncu B, Gokce A, Panahi P. (2015) Unity Engine for Archaeology. SOMA 2015. pp.95–103.
118. Koyuncu B, Meral E, Panahi P. (2015) Real-Time Geolocation Using SIM908. IIJECS. 4(2):148–150.
119. Koyuncu B, Uğur B, Panahi P. (2013) Indoor Location with RFID. IJMAN. 3(1):7–11.
120. Panahi U. (2025) Redes AD HOC. Edições Nosso Conhecimento.
121. Panahi P, Dehghan M. (2008) Multipath Video Transmission. ICEE2008. pp.50–55.
122. Panahi DU. (2025) HOC-A Networks. Scholars' Press.
123. Panahi O, Esmaili F, Kargarnezhad S. (2024) Artificial Intelligence in Dentistry. Scholars Press Publishing. ISBN:978-620-6772118.
124. Omid P. (2011) Gingival Hyperplasia and Leukemia. Int J Acad Res. 3:493–49.
125. Panahi O. (2025) Secure IoT for Healthcare. Eur J Innov Stud Sustain. 1(1):1–5.
126. Panahi O. (2025) Deep Learning in Diagnostics. J Med Discoveries. 2(1).
127. Omid P. (2024) AI in Oral Implantology. Adv Dent Oral Health. 17(4):555966.
128. Panahi O. (2024) Teledentistry: Expanding Access. J Dent Sci Res Rev Rep. SRC/JDSR-203.
129. Omid P. (2024) Empowering Dental Public Health. JOJ Pub Health. 9(1):555754.
130. Thamson K, Panahi O. (2025) AI as Collaborative Tool. J Bio Adv Sci Res. 1(2):1–08.
131. Panahi O. (2025) Algorithmic Medicine. J Med Discoveries. 2(1).
132. Panahi O. (2025) AI, Public Health & Digital Revolution. MediClin Case Rep J. 3(1):763–766.
133. Thamson K, Panahi O. (2025) AI in Clinical Trials. J Bio Adv Sci Res. 1(2):1–08.
134. Thamson K, Panahi O. (2025) Ethics of AI in Dentistry. J Bio Adv Sci Res. 1(2):1–07.
135. Thamson K, Panahi O. (2025) AI & Evidence-Based Dentistry. J Bio Adv Sci Res. 1(2):1–13.
136. Gholizadeh M, Panahi O. (2021) Research System in Health Information Management. Sciencia Scripts Publishing.
137. Panahi O, Esmaili F, Kargarnezhad S. (2024) L'intelligence artificielle dans l'odontologie. Edition Notre Savoir.
138. Panahi O, Esmaili DF, Kargarnezhad DS. (2024) Искусственный интеллект в стоматологии. SCIENCIA SCRIPTS Publishing.
139. Panahi U, Panahi O. (2025) AI-Powered IoT in Oral Implantology. J Adv Artif Intell Mach Learn.
140. Panahi O, Eslamlou SF. (Year unknown) Periodontium: Structure, Function and Clinical Management.
141. Panahi O, Ezzati A. (2025) AI in Dental Medicine. Open Access J Clin Images. 2(1):1–5.
142. Panahi O, Dadkhah S. (2025) Mitigating Aflatoxin Contamination. Adv Biotechnol Microbiol. 18(5).
143. Panahi O. (2024) Empowering Dental Public Health. JOJ Pub Health.
144. Panahi O, Fatmanur KC. (2023) Nanotechnology, Regenerative Medicine and Tissue Bio-Engineering.