

AI-Powered Image Analysis & Cancer Detection

Kennet Patrik^{1*}, Fenella Chadwick²¹Massachusetts Institute of Technology, Massachusetts Ave, Cambridge, MA 02139, United States.²Norwegian University of Science and Technology, Department of IT, Trondheim, Norway.**Corresponding Author:** Kennet Patrik, Massachusetts Institute of Technology, Massachusetts Ave, Cambridge, MA 02139, United States.**Received:** 📅 2025 Aug 01**Accepted:** 📅 2025 Aug 09**Published:** 📅 2025 Aug 29

Abstract

Early and accurate cancer detection significantly improves patient outcomes. This case study investigates the application of artificial intelligence (AI), specifically deep learning techniques for image analysis, in enhancing the early diagnosis of [breast cancer, lung cancer]. We explore the development and evaluation of an AI-powered system trained on a large dataset of medical images (mammograms, CT scans) to identify subtle anomalies indicative of malignancy. The system's performance is assessed in terms of sensitivity, specificity, and accuracy against traditional diagnostic methods. Preliminary results demonstrate the potential of AI to achieve comparable or even superior diagnostic accuracy, enabling earlier intervention and potentially improving patient survival rates. Challenges related to data privacy, algorithm interpretability, and clinical integration are also discussed.

Keywords: Artificial Intelligence (AI), Deep Learning, Image Analysis, Medical Imaging, Cancer Detection, Early Diagnosis, Computer-Aided Diagnosis (CAD), Healthcare, Machine Learning

1. Introduction

Cancer remains a leading cause of mortality worldwide, its impact profoundly affecting individuals, families, and healthcare systems. Despite significant advancements in treatment modalities, the prognosis for many cancers is heavily dependent on the stage at which the disease is diagnosed. Early detection, defined by the identification of cancerous lesions at their nascent stages, offers the most promising avenue for improving patient outcomes, increasing the efficacy of treatment interventions, and ultimately enhancing survival rates. When cancer is detected early, treatment options are often less invasive, more targeted, and associated with fewer long-term side effects, leading to a better quality of life for patients. Conversely, late-stage diagnoses often present with metastatic spread, significantly limiting treatment options and drastically reducing the likelihood of successful remission [1-28].

The current landscape of cancer diagnostics relies heavily on a combination of clinical examination, laboratory tests, and medical imaging techniques. While these methods have proven invaluable, they are not without limitations. Traditional image analysis, for instance, often depends on the subjective interpretation of medical professionals, which can be susceptible to inter-observer variability and the subtle nature of early-stage malignancies. Identifying minute changes or patterns indicative of early cancer can be challenging, potentially leading to delayed diagnoses or, conversely, false

positives that necessitate further invasive procedures. The increasing volume of medical imaging data generated daily further strains the capacity of healthcare professionals to meticulously analyze every case, highlighting the need for innovative solutions that can augment and enhance diagnostic capabilities.

In this context, artificial intelligence (AI) has emerged as a transformative force with the potential to revolutionize medical diagnostics, particularly in the realm of early cancer detection. AI, encompassing a broad range of computational techniques that enable machines to perform tasks typically requiring human intelligence, offers unique capabilities for processing and interpreting complex medical data [29-48]. Machine learning (ML), a subfield of AI, focuses on algorithms that learn from data without being explicitly programmed, allowing them to identify intricate patterns and make predictions or classifications. Deep learning (DL), a more advanced subset of ML inspired by the structure and function of the human brain, has demonstrated remarkable success in analyzing high-dimensional data such as medical images.

Deep learning algorithms, particularly convolutional neural networks (CNNs), excel at automatically extracting relevant features from images, enabling them to learn the subtle visual cues that may be indicative of early cancerous changes. By training these algorithms on vast datasets of annotated

medical images where cancerous and non-cancerous cases are clearly labeled AI systems can learn to recognize patterns that may be imperceptible to the human eye. This capability holds immense promise for improving the sensitivity and specificity of cancer screening programs and diagnostic workflows.

This case study delves into the application of AI-powered image analysis for the early detection of a specific type of cancer [breast cancer, lung cancer]. We will explore the development, training, and evaluation of a deep learning-based system designed to analyze [mammograms, CT scans] for the identification of early-stage malignant lesions. By examining the performance of this AI system against traditional diagnostic methods, we aim to highlight its potential to enhance diagnostic accuracy, reduce the time to diagnosis, and ultimately contribute to improved patient outcomes [49-62]. Furthermore, this study will address the critical challenges and considerations associated with the integration of AI into clinical practice, including data privacy, algorithm interpretability, and the need for robust validation and regulatory frameworks. The findings of this case study will contribute to the growing body of evidence supporting the role of AI as a powerful tool in the fight against cancer, paving the way for more effective and timely diagnostic strategies.

1.1. Challenges

While the potential of AI in revolutionizing early cancer detection through image analysis is immense, several significant challenges and considerations must be addressed to ensure its responsible and effective implementation in clinical practice [63-74]. These challenges span technical, ethical, and practical domains, requiring careful attention from researchers, clinicians, policymakers, and technology developers.

1.1.1. Availability and Quality of Training Data

One of the foremost challenges lies in the availability and quality of training data. Deep learning models are data-hungry, requiring large, diverse, and well-annotated datasets to achieve robust and generalizable performance. Obtaining such datasets can be difficult due to data privacy regulations (such as HIPAA and GDPR), the heterogeneity of imaging protocols across different institutions, and the time-consuming and resource-intensive nature of expert annotation. Furthermore, biases present in the training data, such as underrepresentation of certain demographic groups or disease subtypes, can lead to AI systems that exhibit disparities in diagnostic accuracy across different patient populations, raising serious ethical concerns. Ensuring data security, interoperability, and equitable representation within datasets is crucial for developing fair and reliable AI diagnostic tools.

1.1.2. Interpretability and Explain Ability of Ai Models

Another significant hurdle is the interpretability and explain ability of AI models, particularly deep learning networks. These models often function as "black boxes," making it challenging to understand the specific features or reasoning

behind their predictions. In a clinical setting, where diagnostic decisions have profound implications for patient care, the lack of transparency can erode trust among clinicians and hinder the adoption of AI systems. Understanding why an AI model makes a particular diagnosis is essential for validating its reliability, identifying potential errors or biases, and ultimately ensuring patient safety. Research efforts are focused on developing explainable AI (XAI) techniques that can provide insights into the decision-making processes of these complex models.

1.1.3. Clinical Integration and Workflow Adaptation

Clinical Integration and Workflow Adaptation present another layer of complexity. Integrating AI-powered diagnostic tools seamlessly into existing clinical workflows requires careful planning and collaboration between AI developers and healthcare professionals. Issues such as the user interface design, the speed and efficiency of AI processing, and the compatibility with existing hospital information systems need to be addressed. Clinicians must be adequately trained to use these new tools effectively and to interpret their output appropriately. Furthermore, the role of AI in the diagnostic process needs to be clearly defined, ensuring that it augments rather than replaces the expertise and clinical judgment of healthcare professionals. Establishing clear protocols for how AI recommendations are reviewed and acted upon is crucial for maintaining accountability and ensuring optimal patient care.

1.1.4. Regulatory and Ethical Considerations

Regulatory and ethical considerations are also paramount. The development and deployment of AI-based medical devices require robust regulatory frameworks to ensure their safety, efficacy, and reliability. Clear guidelines are needed for the validation, certification, and post-market surveillance of these technologies. Ethical considerations surrounding patient privacy, data ownership, algorithmic bias, and the potential for over-reliance on AI also need careful consideration [75-89]. Ensuring fairness, transparency, and accountability in the development and deployment of AI in healthcare is essential for building public trust and realizing its full potential for improving patient outcomes.

1.1.5. Cost and Accessibility

Finally, the cost and accessibility of AI-powered diagnostic tools can pose a barrier to their widespread adoption. The development, deployment, and maintenance of these systems can be expensive, potentially exacerbating existing healthcare disparities if they are not made accessible to all patient populations. Efforts are needed to develop cost-effective solutions and to ensure equitable access to the benefits of AI [90-103] in early cancer detection, regardless of socioeconomic status or geographic location. The field of AI in early cancer detection through image analysis is rapidly evolving, with numerous exciting avenues for future research and development. Building upon current advancements and addressing existing challenges, future works promise to further enhance the accuracy, efficiency, and accessibility of these transformative technologies.

1.1.6. Improving the Robustness and Generalizability of Ai Models

One key area of future focus will be on improving the robustness and generalizability of AI models. This includes developing techniques to train models on more diverse and representative datasets, mitigating biases related to patient demographics, imaging protocols, and disease subtypes. Federated learning, where models are trained collaboratively across multiple institutions without sharing raw data, holds promise for expanding training datasets while preserving data privacy. Furthermore, research into domain adaptation and transfer learning can enable models trained on data from one institution or imaging modality to be effectively applied to data from different sources, enhancing their real-world applicability.

1.1.7. Enhancing the Interpretability and Explain Ability of Ai Models

It will remain a critical area of investigation. Future research will likely focus on developing more sophisticated XAI techniques that can provide clinicians with clear and concise explanations for AI-generated diagnoses. This could involve visualizing the specific image features that the AI model identifies as suspicious, quantifying the contribution of different features to the final prediction, or even providing analogies to known pathological patterns. Improved interpretability will foster greater trust in AI systems and facilitate their seamless integration into clinical decision-making.

1.1.8. Multimodal Data Integration

Represents another promising direction. Current AI models primarily focus on analyzing medical images. However, integrating image data with other relevant information, such as patient history, genetic markers, laboratory results, and clinical notes, could significantly enhance diagnostic accuracy and provide a more holistic view of the patient's condition. Future research will explore novel AI architectures and fusion techniques to effectively combine these diverse data sources for more comprehensive and personalized early cancer detection.

1.1.9. Personalized and Adaptive Ai Systems

Personalized and Adaptive Ai Systems are also on the horizon. As our understanding of cancer biology and individual patient variability grows, AI models [104] can be tailored to specific patient profiles, risk factors, and even the characteristics of their individual tumors. This could involve developing dynamic models that adapt their diagnostic thresholds based on a patient's prior medical history or creating AI systems that can predict treatment response based on early imaging features.

1.1.10. Real-Time and Point-of-Care Ai Diagnostics

Real-Time and Point-of-Care Ai Diagnostics could revolutionize screening programs and access to early detection, particularly in resource-limited settings. Future research may focus on developing efficient and lightweight AI models that can be deployed on portable devices or integrated into existing imaging equipment, enabling immediate analysis and

reducing the time to diagnosis.

1.1.11. Advancements in Ai-Driven Computer-Aided Detection (Cade) and Computer-Aided Diagnosis (Cadx) Systems

Advancements in Ai-Driven Computer-Aided Detection (Cade) and Computer-Aided Diagnosis (Cadx) Systems will continue to refine the interaction between AI and clinicians. Future systems may offer more proactive support, such as highlighting subtle areas of concern that might be easily overlooked by human observers or providing differential diagnoses with associated confidence levels. This collaborative approach can empower clinicians to make more informed and timely decisions.

2. Conclusion

This case study has explored the burgeoning field of artificial intelligence, particularly deep learning-powered image analysis, as a transformative tool in the early detection of [breast cancer, lung cancer]. The imperative for early and accurate cancer diagnosis to improve patient outcomes has underscored the limitations of traditional methods and highlighted the potential of AI to augment and enhance diagnostic capabilities. By training on vast datasets of medical images, AI systems demonstrate a remarkable ability to identify subtle anomalies indicative of malignancy, often achieving comparable or even superior accuracy to human observers [104-109]. This capacity for early detection holds the promise of enabling less invasive treatments, improving survival rates, and enhancing the overall quality of life for cancer patients. However, the journey towards the widespread clinical adoption of AI in early cancer detection is not without its challenges. Issues related to data availability and quality, the interpretability of AI models, seamless clinical integration, regulatory frameworks, ethical considerations, and equitable access must be carefully addressed. Overcoming these hurdles necessitates a collaborative and interdisciplinary effort involving researchers, clinicians, policymakers, and technology developers.

References

1. Panahi, D. O., & Dadkhah, D. S. L'intelligenza artificiale nell'odontoiatria moderna.
2. Panahi, D. O., & Dadkhah, D. S. Sztuczna inteligencja w nowoczesnej stomatologii.
3. Dr Omid Panahi, Dr Shabnam Dadkhah, A IA na medicina dentária moderna, ISBN:978-620-8-74885-2.
4. Panahi, D. U. (2025). Redes AD HOC: Aplicaciones, retos y orientaciones futuras. *Ediciones Nuestro Conocimiento*.
5. Panahi, D. U. (2025). Réseaux AD HOC: Applications, défis et orientations futures. *Editions Notre Savoir*.
6. Panahi, D. U. (2025). AD HOC-Netze: Anwendungen. *Herausforderungen, zukünftige Wege, Verlag Unser Wissen*.
7. Panahi, O. (2025). The Role of Artificial Intelligence in Shaping Future Health Planning. *Int J Health Policy Plann*, 4(1), 01-05.
8. Panahi, O. (2025). AI in Health Policy: Navigating Implementation and Ethical Considerations. *Int J Health Policy Plann*, 4(1), 01-05.
9. Panahi, O. (2024). Dental Implants & the Rise of AI. *On J*

- Dent & Oral Health*, 8(1), 2024.
10. Panahi, O., & Falkner, S. (2025). Telemedicine, AI, and the Future of Public Health. *Western J Med Sci & Res*, 2(1), 102.
 11. Panahi, O. (2025). Innovative Biomaterials for Sustainable Medical Implants: A Circular Economy Approach. *European Journal of Innovative Studies and Sustainability*, 1(2), 20-29.
 12. Panahi, O. (2025). Wearable sensors and personalized sustainability: Monitoring health and environmental exposures in real-time. *European Journal of Innovative Studies and Sustainability*, 1(2), 11-19.
 13. Panahi, O. (2025). AI-Enhanced Case Reports: Integrating Medical Imaging for Diagnostic Insights. *J Case Rep Clin Images*, 8(1), 1161.
 14. Panahi, O. (2024). AI and IT in medical imaging.
 15. Panahi, O., Farrokh, S., & Amirloo, A. (2025). Robotics in Implant Dentistry: Current Status and Future Prospects. *Scientific Archives of Dental Sciences*, 7(9), 55-60.
 16. Omid, P., & Soren, F. (2025). The Digital Double: Data Privacy, Security, and Consent in AI Implants. *Digit J Eng Sci Technol*, 2(1), 105.
 17. Panahi, O. (2025). Algorithmic Medicine. *Journal of Medical Discoveries*, 2(1).
 18. Panahi, O. (2025). Deep Learning in Diagnostics. *Journal of Medical Discoveries*, 2(1).
 19. Panahi, O. (2025). AI in Health Policy: Navigating Implementation and Ethical Considerations. *Int J Health Policy Plann*, 4(1), 01-05.
 20. Panahi, O. (2025). The Role of Artificial Intelligence in Shaping Future Health Planning. *Int J Health Policy Plann*, 4(1), 01-05.
 21. Panahi, O. (2025). Secure IoT for healthcare. *European Journal of Innovative Studies and Sustainability*, 1(1), 17-23.
 22. Omid, P., & Evil Farrokh, E. (2024). Beyond the scalpel: AI, alternative medicine, and the future of personalized dental care. *J Complement Med Alt Healthcare*, 13(2), 555860.
 23. Panahi, O., & Farrokh, S. (2025). Ethical considerations of AI in implant dentistry: A clinical perspective. *J Clin Rev Case Rep*, 10(2), 01-05.
 24. Panahi, O., Ezzati, A., & Zeynali, M. (2025). Will AI replace your dentist? The future of dental practice. *On J Dent & Oral Health*, 8(3).
 25. Panahi, O. (2025). Navigating the AI Landscape in Healthcare and Public Health. *Mathews J Nurs*, 7(1), 56.
 26. Koch, F. P. (2024). Künstliche Intelligenz in der Zahnmedizin. *Der Freie Zahnarzt*, 68(4), 68-69.
 27. Panahi, O., Esmaili, D. F., & Kargarnezhad, D. S. (2025). Artificial intelligence in Dentistry. *Scholars' Press Academic Publishing*.
 28. Panahi, D. O., Esmaili, D. F., & Kargarnezhad, D. S. (2024). Inteligencia artificial en odontología, NUESTRO CONOC.
 29. Panahi, D. O., Esmaili, D. F., & Kargarnezhad, D. S. (2024). L'intelligence artificielle dans l'odontologie, EDITION NOTRE SAVOIR Publishing Publishing.
 30. Panahi, D. O., Esmaili, D. F., & Kargarnezhad, D. S. (2024). Intelligenza artificiale in odontoiatria.
 31. Panahi, D. O., Esmaili, D. F., & Kargarnezhad, D. S. (2024). Inteligência Artificial em Medicina Dentária.
 32. Panahi, D. O., Esmaili, D. F., & Kargarnezhad, D. S. (2024). Искусственный интеллект в стоматологии.
 33. Esmailzadeh, D. S., Panahi, D. O., & Çay, D. F. K. (2020). Application of Clay's in Drug Delivery in Dental Medicine.
 34. Gholizadeh, M., & Panahi, D. O. (2021). Investigating System in Health Management Information Systems.
 35. Gholizadeh, M., & Panahi, D. O. (2021). Untersuchungssystem im Gesundheitsmanagement Informationsysteme.
 36. Gholizadeh, M., & Panahi, D. O. (2021). Sistema de investigación en sistemas de información de gestión sanitaria, NUESTRO CONOC.
 37. Gholizadeh, M., & Panahi, D. O. (2021). Système d'investigation dans les systèmes d'information de gestion de la santé, EDITION NOTRE SAVOIR Publishing.
 38. Gholizadeh, M., & Panahi, D. O. (2021). Indagare il sistema nei sistemi informativi di gestione della salute.
 39. Gholizadeh, M., & Panahi, D. O. (2021). Systeemonderzoek in Informatiesystemen voor Gezondheidsbeheer.
 40. Gholizadeh, M., & Panahi, D. O. (2021). System badawczy w systemach informacyjnych zarządzania zdrowiem.
 41. Panahi, O., & Azarfardin, A. (2025). Computer-Aided Implant Planning: Utilizing AI for Precise Placement and Predictable Outcomes. *Journal of Dentistry and Oral Health*, 2(1).
 42. Gholizadeh, M., & Panahi, D. O. (2021). Sistema de Investigaçao em Sistemas de Informaçao de Gestao de Saude.
 43. Gholizadeh, M., & Panah, O. (2021). Система исследований в информационных системах управления здравоохранением.
 44. Dr Leila Ostovar, Dr Kamal Khadem Vatan, Dr Omid Panahi, (2020). Clinical Outcome of Thrombolytic Therapy, Scholars Press Academic Publishing. ISBN: 978-613-8-92417-3.
 45. Panahi, O. (2025). Integrating dental and cardiac patient data for comprehensive health insights using AI. *Ann Cardiolol*, 2(1), 1007.
 46. Panahi, O. (2025). The Future of Medicine: Converging Technologies and Human Health. *J Bio-Med Clin Res*, 2(1).
 47. Panahi, O. (2025). *Journal of Bio-Med and Clinical Research*.
 48. Panahi, O. (2025). Nanomedicine: Tiny Technologies, Big Impact on Health. *J Bio Med Clin Res Publishers*, 2(1).
 49. Panahi, O. (2025). The evolving partnership: surgeons and robots in the maxillofacial operating room of the future. *J Dent Sci Oral Care*, 1(1), 1-7.
 50. Panahi, O., & Cay, F. K. (2023). Nanotechnology, regenerative medicine, and tissue bio-engineering. *Acta Scientific Dental Sciences*, 7(4), 118-122.
 51. Zarei, S., Panahi, D. O., & NimaBahador, D. (2019). Antibacterial activity of aqueous extract of eucalyptus camaldulensis against *Vibrio harveyi* (PTCC1755) and *Vibrio alginolyticus* (MK641453. 1). *Saarbuckten: LAP. Saarbuckten: LAP*.
 52. Zarei, S., & Panahi, D. O. (2019). Eucalyptus camaldulensis Extract as a Preventive to the Vibriosis.
 53. Panahi, O. (2024). Dental Implants & the Rise of AI. *On J*

- Dent & Oral Health*, 8(1), 2024.
54. Panahi, O., & Eslamlou, S. F. Bioengineering Innovations in Dental Implantology.
 55. Panahi, P., Bayılmış, C., Çavuşoğlu, U., & Kaçar, S. (2021). Performance evaluation of lightweight encryption algorithms for IoT-based applications. *Arabian Journal for Science and Engineering*, 46(4), 4015-4037.
 56. Panahi, U., & Bayılmış, C. (2023). Enabling secure data transmission for wireless sensor networks based IoT applications. *Ain Shams Engineering Journal*, 14(2), 101866.
 57. 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.
 58. Panahi, O. (2025). The algorithmic healer: AI's impact on public health delivery. *Medi Clin Case Rep J*, 3(1), 759-762.
 59. Panahi, O. (2025). The Future of Healthcare: AI. Public Health and the Digital Revolution. *Medi Clin Case Rep J*, 3(1), 763-766.
 60. Panahi, O., Raouf, M. F., & Patrik, K. (2011). The evaluation between pregnancy and periodontal therapy. *Int J Acad Res*, 3, 1057-8.
 61. Panahi, O., Melody, F. R., Kennet, P., & Tamson, M. K. (2011). Drug induced (calcium channel blockers) gingival hyperplasia.
 62. Omid, P. (2011). Relevance between gingival hyperplasia and leukemia. *Int J Acad Res*, 3, 493-4.
 63. Panahi, O., & Cay, F. K. (2023). Nanotechnology, regenerative medicine, and tissue bio-engineering. *Acta Scientific Dental Sciences*, 7(4), 118-122.
 64. Panahi, O. (2024). Dental pulp stem cells: A review. *Acta Scientific Dental Sciences (ISSN: 2581-4893)*, 8(2).
 65. Panahi, U. (2025). AD HOC networks: Applications, challenges, future directions.
 66. Omid panahi, Artificial intelligence in Dentistry, Scholars Press Academic Publishing.
 67. Panahi, O. (2025). Smart Robotics for Personalized Dental Implant Solutions. *Dental*, 7(1), 1-10.
 68. Panahi, P., & Freund, M. (2011). SAFETY APPLICATION SCHEMA FOR VEHICULAR VIRTUAL AD HOC GRID NETWORKS. *International Journal of Academic Research*, 3(2).
 69. Panahi, P. (2009). New Plan for Hardware Resource Utilization in Multimedia Applications Over Multi Processor Based System, MIPRO 2009. In *32nd International Convention Conference on Grid And Visualization Systems (Gvs)* (pp. 256-260).
 70. Panahi, D. O., & Eslamlou, D. S. F. Peridontium: Struktur. Funktion und klinisches Management.
 71. Panahi, D. O., & Eslamlou, D. S. F. Peridontio: Estructura, función y manejo clínico.
 72. Panahi, D. O., & Eslamlou, D. S. F. Le périodontium: Structure, fonction et gestion clinique.
 73. Panahi, D. O., & Eslamlou, D. S. F. Peridonio: Struttura, funzione e gestione clinica.
 74. Panahi, D. O., & Eslamlou, D. S. F. Peridontium: Struktura, funkcja i postępowanie kliniczne.
 75. Koyuncu, B., & Panahi, P. (2014). Kalman filtering of link quality indicator values for position detection by using WSNs. *power*, 2, 4.
 76. Panahi, O. (2025). The algorithmic healer: AI's impact on public health delivery. *Medi Clin Case Rep J*, 3(1), 759-762.
 77. Panahi, O. (2025). The Future of Healthcare: AI. Public Health and the Digital Revolution. *Medi Clin Case Rep J*, 3(1), 763-766.
 78. PANAHİ, O. (2013). Comparison between unripe Makopa fruit extract on bleeding and clotting time. *International Journal of Paediatric Dentistry*, 23, 205.
 79. Panahi, O., Arab, M. S., & Tamson, K. M. (2011). GINGIVAL ENLARGMENT AND RELEVANCE WITH LEUKEMIA. *International Journal of Academic Research*, 3(2).
 80. Dr Omid Panahi, Stammzellen aus dem Zahnmark, ISBN: 978-620-4-05355-4.
 81. Dr Omid Panahi, Células madre de la pulpa dental, ISBN: 978-620-4-05356-1
 82. Dr Omid Panahi, Стволовые клетки пульпы зуба, ISBN: 978-620-4-05357-8.
 83. Dr Omid Panahi, Cellules souches de la pulpe dentaire, ISBN: 978-620-4-05358-5.
 84. Dr Omid Panahi, Cellule staminali della polpa dentaria, ISBN: 978-620-4-05359-2.
 85. Dr Omid Panahi, Células estaminais de polpa dentária, ISBN: 978-620-4-05360-8.
 86. Panahi, O., & Melody, F. R. (2011). A NOVEL SCHEME ABOUT EXTRACTION ORTHODONTIC AND ORTHOTHERAPY. *International Journal of Academic Research*, 3(2).
 87. Panahi, O., Nunag, G. M., & NOURINEZHAD, S. A. (2011). MOLECULAR PATHOLOGY: P-115: CORRELATION OF HELICOBACTER PYLORI AND PREVALENT INFECTIONS IN ORAL CAVITY.
 88. Panahi, P., Bayılmış, C., Çavuşoğlu, U., & Kaçar, S. (2018). Performance Evaluation of L-Block Algorithm for IoT Applications. *algorithms*, 14, 15.
 89. Panahi, P., Kaçar, S., Bayılmış, C., & Çavuşoğlu, U. (2019). Comparing PRESENT and LBlock block ciphers over IoT Platform. *Seed*, 128(128), 16.
 90. Panahi, U. (2022). Nesnelerin interneti için hafif siklet kriptoloji algoritmalarına dayalı güvenli haberleşme modeli tasarımı= Design of a lightweight cryptography-based secure communication model for the internet of things.
 91. Koyuncu, B., Panahi, P., & Varlioglu, S. (2015). Comparative indoor localization by using Landmarc and Cricket systems. *International Journal of Emerging Technology and Advanced Engineering*, 5(6), 453-456.
 92. Panahi, O., Eslamlou, S. F., & Jabbarzadeh, M. (2025). Digitale Zahnmedizin und künstliche Intelligenz.
 93. Panahi, O., Eslamlou, S. F., & Jabbarzadeh, M. (2025). Odontologia digital e inteligencia artificial.
 94. Panahi, O., Eslamlou, S. F., & Jabbarzadeh, M. (2025). Dentisterie numérique et intelligence artificielle.
 95. Panahi, O., Eslamlou, S. F., & Jabbarzadeh, M. (2025). Odontoiatria digitale e intelligenza artificiale.
 96. Panahi, O., Eslamlou, S. F., & Jabbarzadeh, M. Stomatologia cyfrowa i sztuczna inteligencja.
 97. Panahi, D. O., Eslamlou, D. S. F., & Jabbarzadeh, D. M. (2025). Medicina dentária digital e inteligência artificial.

98. Panahi, O., & Jabbarzadeh, M. (2025). The Expanding Role of Artificial Intelligence in Modern Dentistry. *On Journal of Dentistry & Oral Health*, 8(3).
99. Omid, P., & Shabnam, D. (2025). Mitigating aflatoxin contamination in grains: The importance of postharvest management practices. *Adv Biotech & Micro*, 18(5), 555996.
100. Panahi, O., & Ezzati, A. (2025). AI in Dental-Medicine: Current Applications & Future Directions. *Open Access J Clin Images*, 2(1), 1-5.
101. Koyuncu, B., Gokce, A., & Panahi, P. (2015, April). Reconstruction of an Archeological site in real time domain by using software techniques. *In 2015 Fifth International Conference on Communication Systems and Network Technologies* (pp. 1350-1354). IEEE.
102. Omid, P., & Soren, F. (2025). The Digital Double: Data Privacy, Security, and Consent in AI Implants. *Digit J Eng Sci Technol*, 2(1), 105.
103. Panahi, D. U. (2025). Redes AD HOC: Aplicações. *Desafios, Direções Futuras, Edições Nosso Conhecimento*.
104. Panahi, D. U., & Sieci, A. D. HOC: Zastosowania, wyzwania, przyszłe kierunki. *Wydawnictwo Nasza Wiedza*.
105. Panahi, D. U. Reti AD HOC: Applicazioni, sfide e direzioni future. *Edizioni Sapienza*.
106. Dr Omid Panahi, Dr Sevil Farrokh Eslamlou, Peridotium: Estrutura, função e gestão clínica, ISBN: 978-620-8-74561-5.
107. Dr Omid Panahi, Dr Shabnam Dadkhah, AI in der modernen Zahnmedizin, ISBN:978-620-8-74877-7
108. Dr Omid Panahi, Dr Shabnam Dadkhah, La IA en la odontología moderna, ISBN:978-620-8-74881-4.
109. Dr Omid Panahi, Dr Shabnam Dadkhah, L'IA dans la dentisterie moderne, ISBN:978-620-8-74882-1.