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# Artificial Intelligence in Cancer Screening: A Bibliometric Analysis of Advances in Early Detection Accuracy

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ABSTRACT

Artificial intelligence (AI) has emerged as a transformative tool in cancer screening, offering significant improvements in early detection accuracy through advanced computational techniques such as machine learning and deep learning. This bibliometric analysis examines the global research landscape on AI in cancer screening, focusing on publication trends, influential contributors, thematic developments, and research gaps. Data was retrieved from Scopus, covering 8,793 records published between 2022 and 2024, with analysis spanning authorship, institutional contributions, source titles, and subject areas. The findings highlight a consistent growth in publications, peaking in 2024, with leading contributions from countries such as China, India, and the United States. Prominent institutions, including Princess Nourah Bint Abdulrahman University and the Ministry of Education of the People's Republic of China, have played pivotal roles in advancing the field. Keywords such as "machine learning," "deep learning," and "sensitivity and specificity" dominate the discourse, reflecting the focus on technological innovation and diagnostic accuracy. The subject areas of computer science, medicine, and engineering underscore the multidisciplinary nature of this research. Despite significant progress, critical gaps remain, particularly in addressing ethical challenges, ensuring dataset diversity, and expanding real-world implementation. This study emphasizes the importance of interdisciplinary collaboration and equitable integration of AI technologies into healthcare systems. The findings provide valuable insights for researchers, practitioners, and policymakers, highlighting future directions to maximize the impact of AI in revolutionizing cancer screening and improving patient outcomes globally.

## INTRODUCTION

Cancer remains one of the leading causes of mortality worldwide, posing significant challenges to healthcare systems despite advancements in treatment and diagnosis. Early detection is widely

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acknowledged as a critical factor in improving survival rates, reducing healthcare costs, and enhancing patient outcomes. However, traditional diagnostic approaches often suffer from delimitations such as variability in interpretation, high costs, and time inefficiencies. In this context, artificial intelligence (AI) has emerged as a transformative technology, offering unprecedented opportunities to revolutionize cancer screening by improving accuracy, efficiency, and accessibility.

AI technologies, particularly machine learning and deep learning, have demonstrated remarkable potential in automating and enhancing cancer detection processes. By analyzing vast datasets, identifying patterns, and providing diagnostic insights, AI systems can outperform traditional methods in sensitivity, specificity, and predictive accuracy. These advancements are not only driving innovation in clinical settings but also reshaping research priorities globally.

Bibliometric methods offer a systematic approach to identify influential authors, institutions, and publications while uncovering emerging areas of interest and critical research gaps. The findings from this study will contribute to a deeper understanding of the progression of AI-driven cancer screening research and its potential to transform healthcare practices.

The objective of this analysis is to map the development and collaboration patterns within the field, emphasizing the interdisciplinary and global nature of this research. By identifying these patterns, the study aims to provide actionable insights into future research directions, particularly in addressing critical areas such as ethical considerations, dataset diversity, and equitable application of AI technologies. These findings are intended to guide researchers in refining their focus, practitioners in adopting evidence-based AI solutions, and policymakers in developing frameworks to maximize the transformative potential of AI in cancer detection and patient care.

## LITERATURE REVIEW

In the context of bibliometric analysis, the exploration of AI's impact on cancer detection involves systematically mapping research trends, identifying influential contributors, and uncovering emerging themes in the field. This approach provides a structured understanding of the research landscape and highlights the progression of AI-driven innovations in enhancing early detection accuracy. For instance, DeGroat et al. (2024) explored the discovery of biomarkers linked to cancer prediction through AI-powered analysis, while Mahesh et al. (2024) showcased the transformative impact of convolutional neural networks in breast cancer diagnosis, emphasizing the potential of AI-driven imaging techniques.

Bibliometric analysis, as a methodology, leverages data from comprehensive databases such as Scopus to uncover key insights into the scientific domain. The analysis highlights the exponential growth of publications from 2022 to 2024, reflecting the increasing importance of AI in healthcare and its transformative potential in oncology. This growth aligns with studies like those by Chen et al. (2024), who utilized metabolomic machine learning to predict cancer diagnostic outcomes, showcasing AI's ability to integrate complex biological data for clinical insights. Furthermore, Yaqoob et al. (2024) demonstrated the optimization of gene selection processes, improving classification accuracy for cancer patients. Geographically, leading contributions stem from developed nations, including the United States, China, and European countries, where advancements in AI technology and access to high-quality healthcare datasets are more prevalent. However, as Hassan et al. (2024) note, regional disparities in AI adoption point to inequities in research funding and technological resource distribution, limiting global progress.

High-impact journals play a pivotal role in disseminating research on AI in cancer screening, with prominent outlets such as Nature Communications, Scientific Reports, and the Journal of Medical Systems driving the field forward. These journals not only provide a platform for innovative studies but also serve as benchmarks for emerging research trends. By publishing cutting-edge findings, they influence the direction of future studies and help establish standards for research quality and impact in the field. This

pivotal role underscores the interconnectedness between the dissemination of research findings and the identification of new thematic areas, as highlighted in subsequent sections.

The analysis of key contributors reveals a concentration of influence among a small number of prolific authors and institutions. Researchers such as Yaqoob et al. (2024), who focused on optimizing gene selection and cancer classification through AI techniques, and Mahesh et al. (2024), whose work emphasizes AI's role in enhancing breast cancer diagnostics, have established themselves as thought leaders in the application of AI for cancer detection. Their studies are frequently cited as foundational to the field, shaping current and future research directions.

Keywords and research themes extracted from the bibliometric data underscore the centrality of topics such as machine learning, deep learning, cancer detection, and diagnostic accuracy. Emerging clusters in the field focus on AI-driven imaging techniques, personalized screening methods, and advancements in predictive analytics. For instance, DeGroat et al. (2024) delved into biomarker discovery for precision diagnostics, while Mahesh et al. (2024) showcased the integration of convolutional neural networks for real-time imaging analysis in clinical practice. Visualization tools like VOSviewer facilitate the identification of thematic areas, highlighting the interconnectedness of various research topics and their evolution over time. Hassan et al. (2024) further emphasized the significance of ethical considerations, pointing to the need for transparency and equity in AI application development.

While significant advancements have been made in applying AI to cancer screening, several critical gaps and challenges persist, including ethical considerations, dataset diversity, and the integration of AI technologies into real-world healthcare systems. These delimitations highlight the need for further research to ensure equitable, practical, and ethically sound adoption of AI in clinical settings. This review will explore these challenges in greater detail after discussing the current research trends, influential contributors, and emerging themes in the field.

Additionally, training datasets for AI models often lack diversity, raising concerns about the generalizability and equity of these technologies. Ethical and regulatory challenges, including data privacy and algorithmic transparency, are underexplored in the current literature. As noted by Hassan et al. (2024), the absence of standardized ethical frameworks poses a challenge to the broader adoption of AI-driven diagnostics. Similarly, Yaqoob et al. (2024) stressed the need for collaborative efforts to address these gaps and ensure equitable access to AI innovations globally.

In conclusion, bibliometric analysis provides a comprehensive overview of the research landscape, offering valuable insights into the progress and challenges of AI in cancer screening. While the findings highlight significant advancements and influential contributions, they also expose gaps in real-world applicability, diversity, and ethical considerations. Future studies should aim to address these gaps, expand collaboration across geographical and disciplinary boundaries, and focus on the longitudinal impact of AI in clinical practice. By doing so, the field can move closer to realizing the full potential of AI in revolutionizing cancer screening and improving patient outcomes.

## METHOD

A bibliometric analysis was conducted to examine scientific literature on the application of artificial intelligence (AI) in cancer screening with a focus on early detection accuracy. This study utilized quantitative techniques to evaluate research trends, influential publications, and author contributions. The Scopus database was selected as the primary data source for bibliometric analysis due to its comprehensive coverage of peer-reviewed literature and reliable citation indexing. Figure 1 below illustrate the flow diagram of the search strategy.

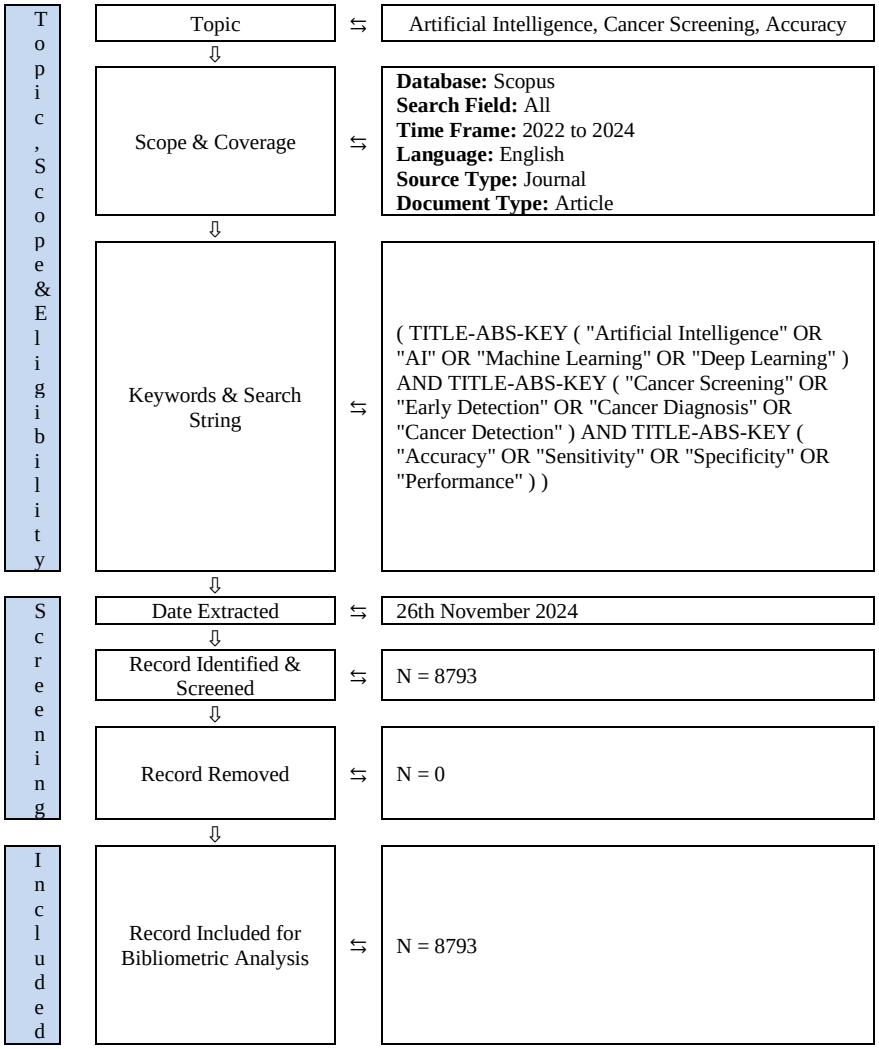


**Figure 1.** Flow diagram of the search strategy in AI-driven cancer screening research (2022–2024)

Articles published between 2022 and 2024 were selected for analysis. This period captures the most recent advancements in AI applications for cancer screening. Only publications written in English were included to ensure consistency and accessibility of the analysis. The focus was on journal articles, ensuring the inclusion of high-quality, peer-reviewed research. A total of 8,793 records were retrieved from the Scopus database on 26th November 2024.

### Inclusion and Exclusion Criteria

This bibliometric analysis focused on high-quality, peer-reviewed journal articles explicitly addressing AI applications in cancer screening and early detection. Publications in English from 2022 to 2024 were included to ensure relevance and accessibility. Non-journal publications, such as conference proceedings, reviews, and editorials, as well as non-English articles, were excluded to maintain consistency and prioritize original research findings. These criteria ensured a focused dataset aligned with the study's objectives.

## Data Extraction and Processing

The data retrieved from Scopus were exported in .CSV format and cleaned by removing duplicate records and entries that fell outside the defined scope of the study. Irrelevant entries included non-journal publications such as conference proceedings, reviews, and editorials, as well as articles not explicitly addressing AI applications in cancer screening and early detection. Key bibliometric parameters were then extracted, including publication trends (articles per year), authorship analysis (prolific authors, citations, and contributions), citation analysis (highly cited articles and journals), institutional and geographical contributions, and keyword co-occurrence analysis to identify research themes. Key bibliometric parameters were then extracted, including publication trends (articles per year), authorship analysis (prolific authors, citations, and contributions), citation analysis (highly cited articles and journals), institutional and geographical contributions, and keyword co-occurrence analysis to identify research themes.

Software tools supported the analysis, with VOSviewer used for network visualizations such as co-authorship and keyword mapping due to its robust ability to handle large datasets and create visually intuitive maps of complex relationships. Biblioshiny (R package) was employed for statistical analysis, offering advanced bibliometric functions such as trend analysis and impact metrics. Microsoft Excel was utilized for data sorting and percentage calculations, providing a straightforward and efficient platform for managing numerical data and generating summary statistics. This combination of tools was selected to ensure a comprehensive and methodologically sound bibliometric analysis of AI applications in cancer screening, leveraging the strengths of each tool for different analytical needs.

## Data Analysis

The data analysis phase involved summarizing key metrics and exploring relationships within the bibliometric dataset. Descriptive analysis highlighted total publications, citation counts, and annual trends, offering an overview of research activity. Network analysis identified collaborations through co-authorship, relationships among frequently cited articles via co-citation, and keyword co-occurrence, revealing dominant themes and emerging research areas.

Impact metrics, such as total and average citations per article, along with the h-index and g-index for authors and journals, were used to assess scholarly influence. The h-index measures both the productivity and citation impact of an author or journal by identifying the largest number of publications that have been cited. The g-index, on the other hand, provides an alternative by giving more weight to highly cited publications, making it useful for highlighting outstanding contributions within a dataset. The percentage contribution of authors was calculated using the formula:

$$Percentage\ Contribution = (Total\ Citations\ in\ Dataset\ Citations\ by\ Author) \times 100$$

These analyses provided a comprehensive understanding of the contributions and trends in artificial intelligence research for cancer screening.

## Results Presentation

The results of the bibliometric analysis are presented using a combination of tables and visualizations to offer a clear understanding of the research landscape in artificial intelligence for cancer screening and early detection. A key focus is the distribution of publications over time, displayed through a table and a bar chart, highlighting trends and peak periods in research activity.

Top contributors, including leading authors, institutions, and countries, are identified in a detailed table, showcasing their influence and impact on the field. Network diagrams further illustrate co-authorship relationships, providing insights into academic collaborations driving advancements in this domain.

Keyword analysis is presented through a word cloud and co-occurrence maps, revealing dominant themes and emerging research trends. A table of highly cited articles, including total citations and DOI links, highlights foundational studies and their significance.

Visual elements, such as bar charts, network diagrams, and word clouds, enhance the accessibility and engagement of the findings. Together, these tools provide a concise yet comprehensive overview of the progress and focus areas in AI-driven cancer screening research.

### Delimitation

The bibliometric analysis conducted in this study has certain delimitations that should be acknowledged. First, the analysis was confined to the Scopus database, which, while comprehensive, may have excluded relevant studies indexed in other prominent databases such as Web of Science or PubMed. Scopus was chosen for this study due to its extensive coverage of peer-reviewed journal articles across multidisciplinary fields, robust citation indexing capabilities, and advanced tools for bibliometric analysis. Although databases like PubMed are highly specialized in biomedical research, Scopus was deemed more suitable for this study's objectives because it encompasses a broader range of disciplines, including computer science and engineering, which are critical for analyzing AI applications in cancer screening. Future studies could consider integrating additional databases to provide an even more comprehensive view of the research landscape.

Furthermore, the study focused exclusively on journal articles, intentionally excluding other types of documents such as conference proceedings, book chapters, and review articles. These excluded document types might contain important insights, particularly in the rapidly evolving field of artificial intelligence and cancer research, where conferences often present cutting-edge developments. As a result, the scope of the analysis is somewhat narrow, potentially limiting the generalizability and comprehensiveness of the conclusions drawn.

This study adhered to ethical guidelines for bibliometric research, ensuring accurate reporting and acknowledgment of all data sources.

## RESULTS

### Years of Publications

Figure 2 highlights a steady growth in AI and cancer screening research from 2022 to 2024, with publications rising from 2,177 in 2022 to a peak of 3,706 in 2024.

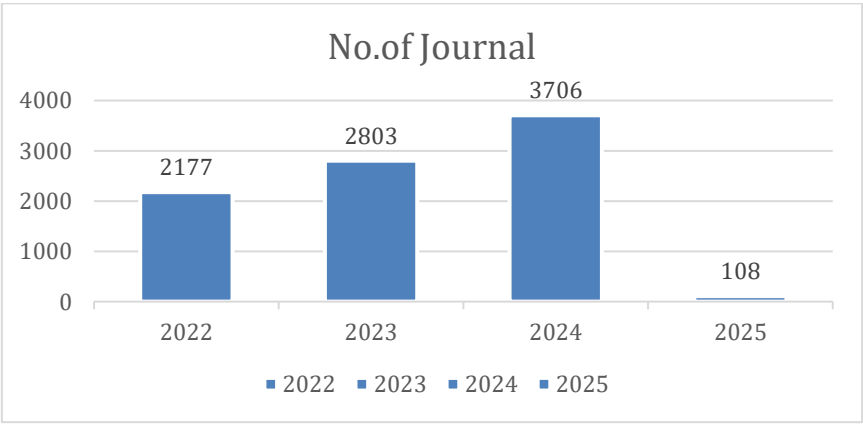


**Figure 2**. Number of Publications by year in AI-driven cancer screening research (2022–2024)

This surge reflects heightened interest and advancements in the field, likely driven by technological breakthroughs and increased funding. The sharp increase in 2024 underscores the growing global recognition of AI's potential in revolutionizing cancer detection.

The apparent decline to 108 publications in 2025 is likely due to incomplete data, as the year is still ongoing, and many articles are typically indexed later in the year. This preliminary nature of 2025 data suggests that additional publications will likely be recorded as indexing processes continue, and it should not be interpreted as an actual decrease in research activity. This trend reflects an expanding research landscape, with 2024 standing out as a pivotal year. Continued observation will be crucial to capture the full scope of 2025's contributions.

**Author with most citations**

Figure 3 provides an insightful overview of the leading contributors to the field of artificial intelligence in cancer screening, ranked by their total citations and corresponding percentage of influence. Esraa Hassan emerges as the most cited author with 41 citations, accounting for 11.88% of the total, highlighting their leadership and substantial impact on this research domain. Following closely, Tarek Abd El-hafeez holds the second position with 33 citations, contributing 9.57% of the total citations.". Following closely, Tarek Abd El-hafeez holds the second position with 33 citations, contributing 9.57% of the total citations.

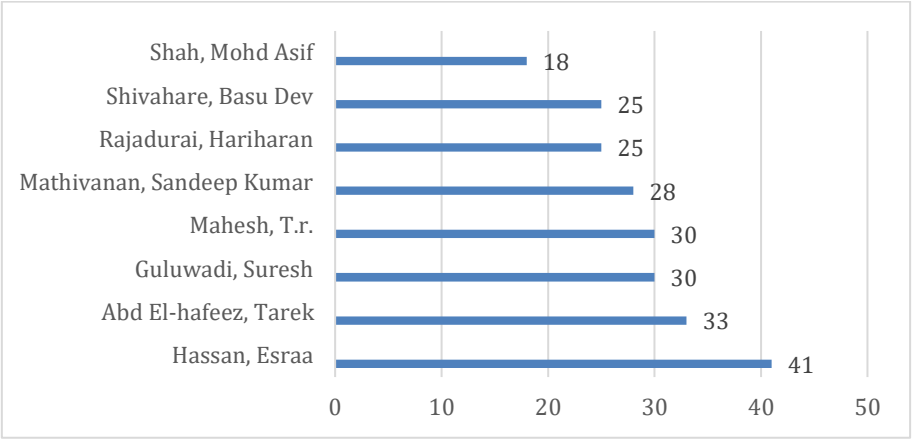


**Figure 3.** Most cited authors in AI-driven cancer screening research (2022–2024)

Other notable contributors include Suresh Guluwadi and T.R. Mahesh, each with 30 citations (8.70%), as well as Sandeep Kumar Mathivanan with 28 citations (8.12%). These authors represent the core of highly influential research within this domain, underlining their active role in advancing the integration of AI technologies in cancer detection and diagnosis. The mid-range contributors, such as Hariharan Rajadurai and Basu Dev Shivahare, both with 25 citations (7.25%), further emphasize the diversity of expertise and the collaborative nature of this field.

Overall, this citation analysis highlights a concentration of influence among a few leading researchers, with Esraa Hassan leading the way. However, it also showcases a broad and diverse network of contributors, reflecting the collaborative and multidisciplinary nature of research in artificial intelligence for cancer screening. This distribution of citations underscores the importance of both individual leadership and collective efforts in driving advancements in this critical area of healthcare.

**Collaboration Between Authors**

The concentration of citations among authors in 2024 reflects the recency and relevance of their contributions, as these papers often incorporate the latest advancements and address current challenges in AI-driven cancer screening. This recency likely increases their visibility and impact within the academic community, as more recent studies are often referenced in ongoing research and discussions. Highlighting these authors provides a snapshot of key contributors shaping the current direction of the field.

Figure 4 provides a detailed analysis of the collaborative relationships among researchers in the field of artificial intelligence and cancer screening. In this bibliometric context, 'coupling links' refer to the shared references between authors' works, indicating a relationship based on common scholarly foundations or research topics. Lee (2024b) stands out as the most interconnected author, with 26 total coupling links, accounting for 8.39% of the total network. This highlights their pivotal role in fostering collaboration and serving as a central figure in co-authorship and intellectual exchange within the research community.

Chang (2024) and Attallah (2024) follow with 22 (7.10%) and 21 (6.77%) coupling links, respectively, highlighting their significant influence in building and maintaining research networks. Chen (2024e) ranks fourth with 19 links (6.13%), further underscoring the importance of collaborative endeavors in advancing research within this domain. The contributions of Sannasi Chakravarthy (2024) and Kebede (2024), each with 17 links (5.48%), reflect their substantial involvement in facilitating connections among researchers.

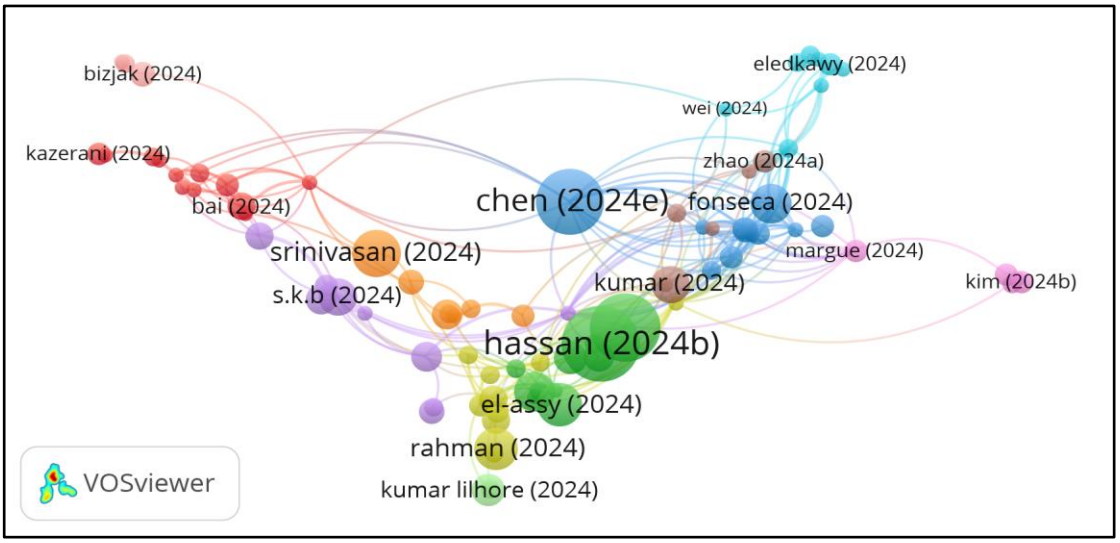


**Figure 4.** Most coupling links between authors in AI-driven cancer screening research (2022–2024)

Other notable contributors include Zhang (2024a), Fonseca (2024), Demir (2024), and Liu (2024b), each with 15 to 16 links and percentages ranging from 4.84% to 5.16%. These authors exemplify the interconnected and cooperative nature of the field, enabling the exchange of ideas and methodologies critical to progress. The presence of authors such as Hatamikia (2024), Margue (2024), and Chen (2024d), each with 14 links (4.52%), further highlights the distributed nature of research partnerships.

Overall, the data reveals a robust network of collaborations, with Lee (2024b) at its core. This interconnected structure emphasizes the collaborative ethos of the AI and cancer screening research community, where shared knowledge and co-authorship drive innovation. Such coupling links not only enhance the dissemination of ideas but also foster interdisciplinary approaches, ultimately accelerating advancements in the field. This analysis underscores the importance of strategic partnerships and

cooperative efforts in tackling complex challenges within cancer detection and diagnosis through artificial intelligence.

**Institutions with Most Contribution**.

The term ‘contribution’ in this context refers to the number of articles published by these institutions related to AI in cancer screening. Table 1 highlights the leading organizations contributing to the research landscape, measured by the total number of publications. For instance, Princess Nourah Binti Abdulrahman University emerged as the most influential institution, contributing 158 articles, accounting for 8.81% of the total publications in this field

**Table 1.** Most contributing institutions

| Affiliation | Total Journals | Percentage (%) |
|---|---|---|
| Princess Nourah Bint Abdulrahman University | 158 | 8.81 |
| Ministry of Education of the People's Republic of China | 130 | 7.25 |
| Vellore Institute of Technology | 126 | 7.02 |
| King Saud University | 122 | 6.80 |
| Chinese Academy of Sciences | 119 | 6.63 |
| K L Deemed to be University | 108 | 6.02 |
| Prince Sattam Bin Abdulaziz University | 102 | 5.69 |
| SRM Institute of Science and Technology | 99 | 5.52 |
| King Abdulaziz University | 85 | 4.74 |

Following closely is the Ministry of Education of the People’s Republic of China, with 130 journals (7.25%). This reflects China’s strong emphasis on leveraging national institutions for technological and healthcare advancements. The Vellore Institute of Technology (7.02%) and King Saud University (6.80%) are also among the top contributors, emphasizing the critical role of academic institutions in fostering cutting-edge research and innovation.

This analysis reveals the importance of institutional leadership in driving advancements in AI and cancer research. The dominance of universities and national agencies highlights the role of research funding, infrastructure, and strategic prioritization in enabling impactful contributions. These institutions form the backbone of knowledge generation and dissemination, facilitating international collaboration and interdisciplinary approaches to address complex challenges in cancer screening through AI technologies.

**Global Distribution of Research**

Figure 5 provides a comprehensive overview of the global distribution of research influence in the field of artificial intelligence and cancer screening. The data presented focus on the total citations, with China leading the list by contributing 210 articles that account for 21.32% of the total citations in the dataset. This distinction between article count and citation percentage is essential, as the latter reflects the impact and influence of the research. To maintain consistency, all numbers and percentages in the text correspond to the citation data presented in Figure 3.

India ranks second with 156 journals (15.84%), highlighting the country’s growing prominence in AI and healthcare research. India’s robust academic ecosystem and increasing emphasis on technological applications in healthcare have positioned it as a key player globally. The United States follows closely with 137 journals (13.91%), underscoring its historical leadership in innovation and its focus on integrating AI into medical research and applications.

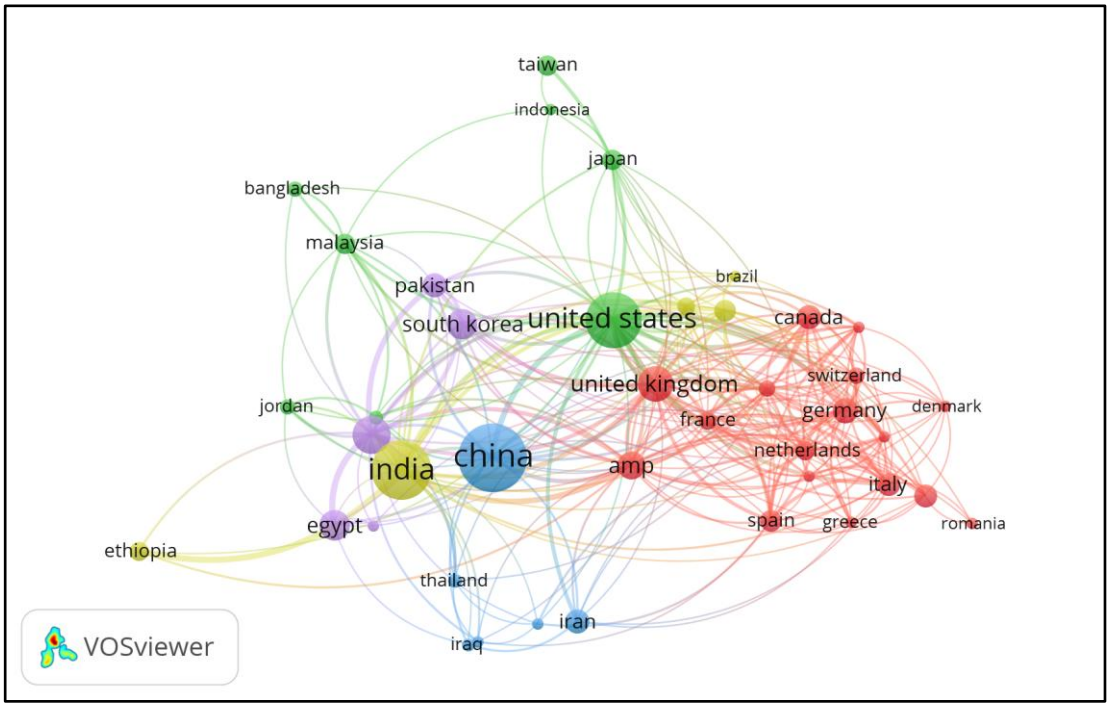


**Figure 5.** Network visualization most citations by country in AI-driven cancer screening research (2022–2024)

Saudi Arabia emerges as a notable contributor with 62 journals (6.29%), reflecting its investments in AI-driven healthcare initiatives as part of broader national development strategies. Similarly, the United Kingdom, with 54 journals (5.48%), continues to leverage its strong academic institutions and interdisciplinary research culture to advance this critical area. South Korea and Egypt also make significant contributions, with 40 (4.06%) and 39 (3.96%) journals, respectively, showcasing the increasing global interest in AI applications for cancer detection.

Overall, the distribution of citations by country reflects a mix of established leaders like China, the United States, and India, alongside emerging contributors such as Saudi Arabia and Egypt. This global collaboration underscores the universal significance of AI in addressing healthcare challenges and the collective effort to enhance cancer detection and diagnosis. The diversity of contributions highlights the interdisciplinary and multinational nature of research in this field, fostering innovation and cross-border knowledge sharing.

## Leading Journals and Sources Contributions

Figure 6 provides a detailed account of the leading journals and sources contributing to the field of artificial intelligence in cancer screening. IEEE Access emerges as the most prolific source, with 281 publications accounting for 10.93% of the total. This reflects its reputation as a multidisciplinary journal that prioritizes high-impact research in technology, including AI applications in healthcare.

Diagnostics follows closely with 258 publications (10.03%), emphasizing its focus on advancing diagnostic methodologies and technologies. Biomedical Signal Processing and Control ranks third with 257 publications (9.99%), highlighting its importance in publishing work that integrates AI with signal

processing for medical applications. These sources serve as pivotal platforms for disseminating research on technological advancements in cancer screening.

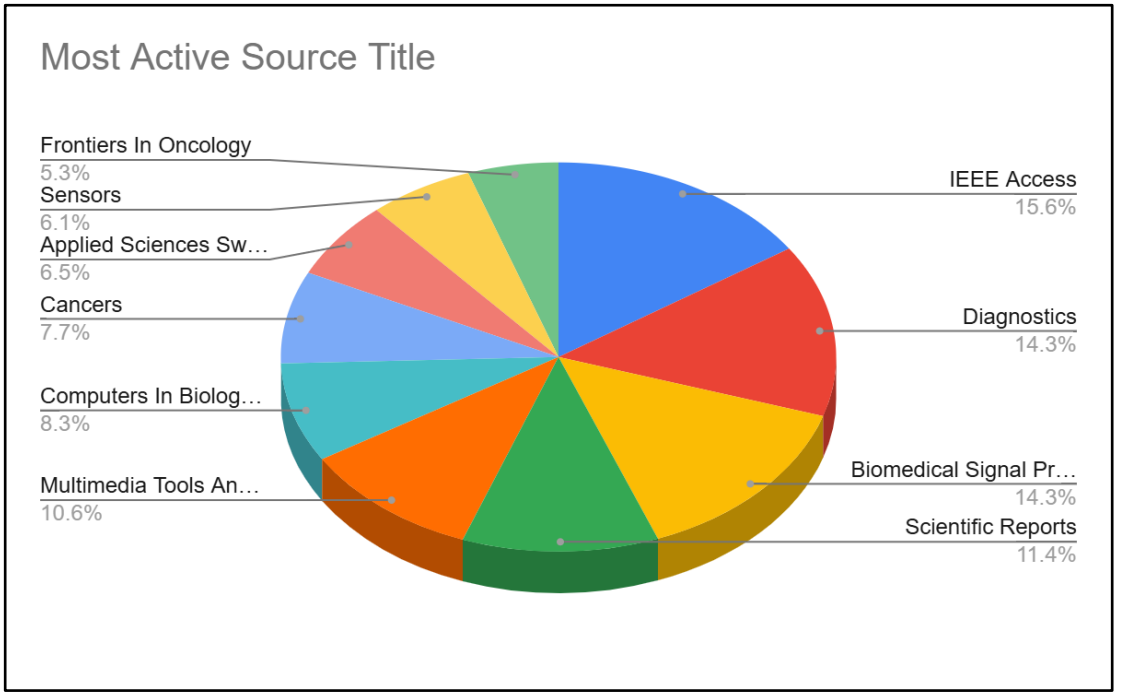


**Figure 6.** Most active source titles in AI-driven cancer screening research (2022–2024)

Scientific Reports, with 206 publications (8.01%), is a key contributor, offering a broad scope for publishing interdisciplinary studies. Similarly, Multimedia Tools and Applications, contributing 191 publications (7.43%), reflects the integration of multimedia techniques with AI-driven cancer screening technologies. Computers in Biology and Medicine (5.79%) and Cancers (5.37%) highlight the medical and computational focus within this field, demonstrating the synergy between biology, medicine, and AI.

Overall, the table reveals a diverse range of journals actively contributing to this field, reflecting its multidisciplinary nature. The prominence of technology-oriented and medical journals highlights the collaborative efforts of computer science, engineering, and healthcare domains in advancing AI-driven cancer screening. This diversity ensures that innovations are both technologically robust and clinically relevant, driving forward the potential for impactful breakthroughs.

**Interdisciplinary Nature of Research**

Figure 7 highlights the interdisciplinary nature of research in artificial intelligence and cancer screening. Computer Science leads as the most represented field, with 3,887 journals accounting for 22.50% of the total. This dominance reflects the critical role of computational methodologies, such as machine learning and data processing, in advancing AI applications for cancer detection.

Medicine follows closely with 3,545 journals (20.53%), underscoring the importance of clinical relevance and the integration of AI into healthcare practices. Engineering, contributing 2,935 journals (17.00%), demonstrates the field's role in developing hardware, algorithms, and systems for AI-enabled medical tools. The contribution of Biochemistry, Genetics, and Molecular Biology, with 1,767 journals

(10.23%), highlights the focus on integrating AI with genomic and molecular data to improve precision in cancer screening.

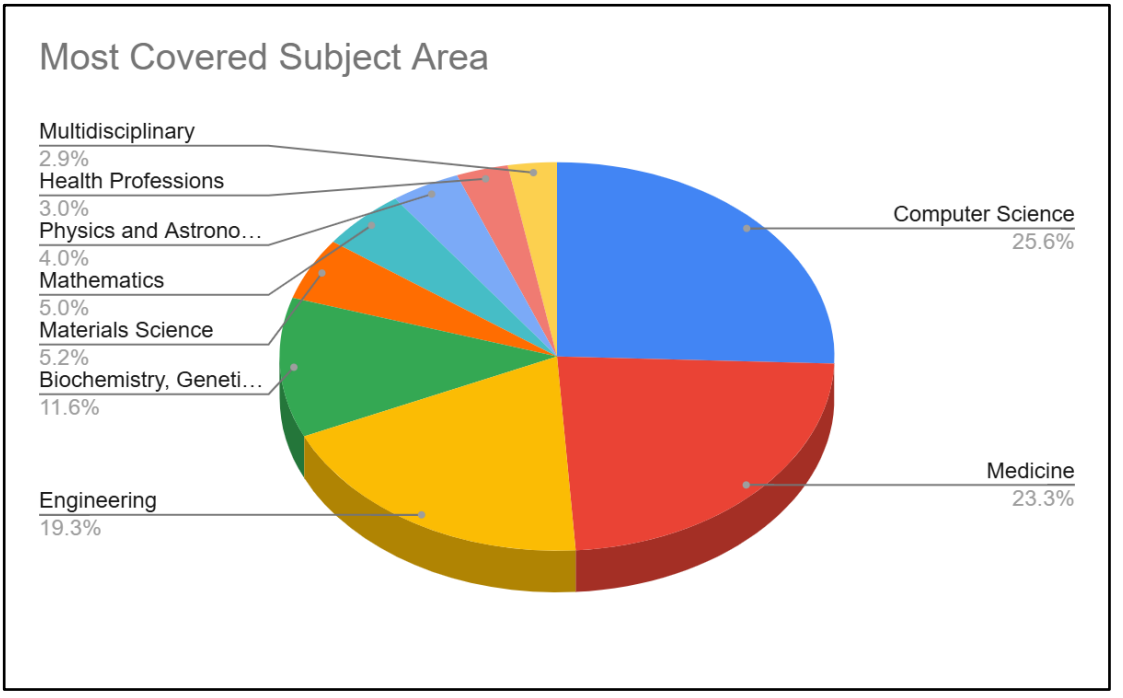


**Figure 7.** Most covered subject area in AI-driven cancer screening research (2022–2024)

The inclusion of Materials Science (4.54%) and Mathematics (4.44%) reflects the underlying technological and theoretical foundations required for developing robust AI systems. Fields such as Physics and Astronomy (3.54%) and Health Professions (2.66%) indicate a broader application of interdisciplinary methods and the training of professionals to implement these advancements in clinical settings.

This distribution of subject areas demonstrates the diverse research ecosystem supporting AI-driven cancer screening. The leading roles of computer science, medicine, and engineering highlight the interplay of technological innovation and clinical application, while contributions from other fields underscore the holistic approach needed to address the complexity of cancer detection and diagnosis. This multidisciplinary engagement ensures that advancements are comprehensive, practical, and impactful, reflecting the global commitment to leveraging AI for healthcare innovation.

**Most Frequently Used Terms**

Figure 8 offers a comprehensive overview of the most frequently used terms in research related to artificial intelligence in cancer screening. The keyword "human" appears most frequently, with 503 occurrences, accounting for 11.09% of the total. This indicates the central role of human-focused studies, particularly in the context of clinical applications and patient-centered research.

Following this, "article" is the second most frequent keyword, with 353 occurrences (7.78%), reflecting the consistent emphasis on primary research and peer-reviewed publications in this domain. Keywords such as "machine learning" (7.43%) and "deep learning" (7.36%) highlight the dominance of these AI methodologies in cancer detection research. Their close occurrence frequencies signify their intertwined use in developing and optimizing diagnostic tools.

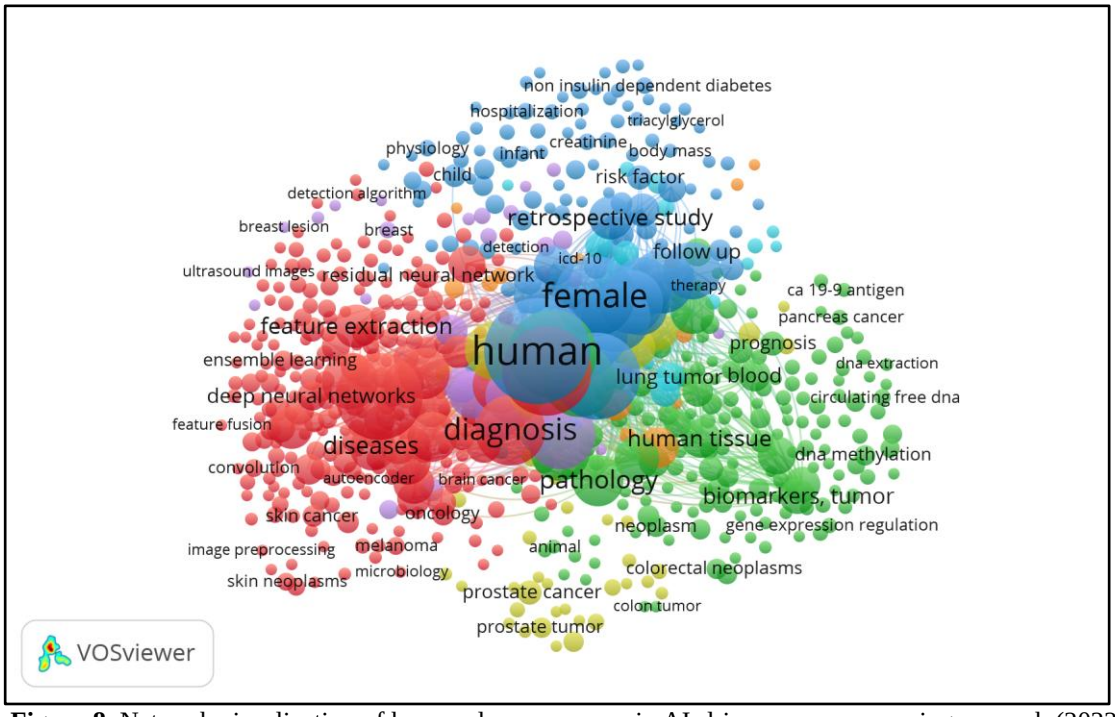


**Figure 8.** Network visualization of keywords occurrences in AI-driven cancer screening research (2022–2024)

Other significant terms include "humans" (7.19%), which, along with "human," emphasizes the focus on studies involving human participants. Gender-specific keywords like "female" (6.22%) and "male" (4.61%) indicate the attention paid to gender-based analyses, particularly in cancers with gender-specific prevalence, such as breast and prostate cancer.

The appearance of "controlled study" (5.07%) and "diagnosis" (4.78%) underscores the prevalence of experimental and clinical trial-based research aimed at improving diagnostic accuracy. Similarly, "procedures" (4.54%) and "major clinical study" (3.81%) reflect the methodological focus on validating AI-driven systems in clinical workflows.

Overall, the frequent occurrence of these keywords highlights the dominant themes in AI and cancer research, such as the development and clinical application of machine learning and deep learning technologies, gender-specific studies, and a focus on diagnostic accuracy and performance. The prominence of terms related to human studies and clinical trials underscores the translational focus of this research, bridging technological innovation with practical healthcare solutions.

## DISCUSSION

The findings from this bibliometric analysis provide valuable insights into the research landscape of artificial intelligence in cancer screening, particularly in terms of publication trends, influential contributors, and thematic focuses. The steady growth in publications from 2022 to 2024 underscores the increasing global interest in leveraging AI technologies to enhance early cancer detection. The surge in contributions during 2024 suggests a pivotal year marked by technological advancements, expanded collaborations, and heightened recognition of AI's potential in healthcare. However, the apparent decline in 2025 publications highlights the need for cautious interpretation, as data collection for this year may still be incomplete. This preliminary nature of the data could be due to delays in indexing newly published

articles or ongoing research that has yet to be finalized and published. Additionally, fluctuations in publication trends may reflect shifts in funding priorities, changes in research focus, or delays in journal processing times. A more comprehensive analysis in the future, once 2025 data is fully available, will help confirm whether this decline is temporary or indicative of a broader trend.

The analysis of influential contributors reveals a concentration of research activity among key authors and institutions, with prominent contributors such as Esraa Hassan and Princess Nourah Binti Abdulrahman University emerging as leaders in the field. This concentration reflects the significant role of institutional resources, funding, and expertise in advancing AI applications for cancer screening. Furthermore, the analysis of coupling links between authors highlights the collaborative nature of this research, emphasizing the importance of interdisciplinary and international partnerships in driving innovation.

The keyword analysis illustrates the dominant themes within the field, with a clear focus on machine learning, deep learning, and clinical evaluation metrics such as sensitivity and specificity. The prevalence of terms like "human" and "controlled study" underscores the translational nature of this research, aiming to bridge the gap between AI innovation and practical clinical application. However, the relatively low representation of keywords related to ethical considerations and diversity highlights critical research gaps that need to be addressed to ensure equitable and responsible adoption of AI in cancer care.

The subject area analysis reveals the multidisciplinary nature of this research, with computer science, medicine, and engineering taking the lead. This interdisciplinary collaboration ensures that technological advancements are both scientifically robust and clinically relevant. Nonetheless, the relatively lower contributions from fields such as health professions and neuroscience indicate potential areas for further exploration, particularly in integrating AI into broader healthcare systems and understanding its impact on neurological cancers.

## CONCLUSION

This bibliometric analysis highlights the dynamic and rapidly evolving research landscape of artificial intelligence in cancer screening. The results underscore the growing recognition of AI's transformative potential in improving early detection accuracy, driven by advancements in machine learning, deep learning, and clinical methodologies. Key contributors and institutions play a central role in advancing this field, fostering collaborations and producing high-impact research.

Future research should address ethical challenges by developing frameworks to detect and mitigate biases in AI models, ensuring fairness and patient privacy. Expanding and diversifying datasets through global collaborations can improve AI accuracy across diverse populations.

Despite significant progress, critical gaps remain, particularly in addressing ethical challenges, promoting diversity in datasets, and expanding interdisciplinary engagement. Future research should focus on integrating AI more effectively into real-world healthcare settings, ensuring that innovations are accessible and equitable across diverse populations. Additionally, greater emphasis on collaboration among emerging contributors and underrepresented regions could further accelerate progress.

In conclusion, the intersection of AI and cancer screening represents a transformative frontier in healthcare innovation, with the potential to significantly improve early detection, diagnostic accuracy, and patient outcomes. By prioritizing continued investment in cutting-edge research, fostering interdisciplinary collaboration, and ensuring ethical and equitable implementation, the field can overcome existing challenges and unlock the full potential of AI. With these concerted efforts, AI-driven advancements can pave the way for a future where cancer care is more accessible, precise, and impactful for patients worldwide.

## REFERENCES

Ahmi, A., & Mohamad, R. (2019). Bibliometric Analysis of Global Scientific Literature on Web Accessibility. *International Journal of Recent Technology and Engineering*, *7*(6), 250–258.

Ahmi, A., & Mohd Nasir, M. H. (2019). Examining the Trend of the Research on eXtensible Business Reporting Language (XBRL): A Bibliometric Review. *International Journal of Innovation, Creativity and Change*, *5*(2), 1145–1167.

Chen, J., Huang, S., Zhang, Y. & Chang, Q. (2024). Congenital heart disease detection by pediatric AI. *Nature Communications*, 15(1). DOI: 10.1038/s41467-024-44930-y

Chen, Y., Wang, B., Zhao, Y., Shao, X., Wang, M. & Ma, Y. (2024). Metabolomic machine learning predictor for diagnostic outcomes in cancer. *Nature Communications*, 15(1). DOI: 10.1038/s41467-024-46043-y

de Rooij, M., Allen, C., Twilt, J.J. & Thijssen, L. (2024). PI-QUAL version 2: an update of a standardised prostate MRI quality assessment tool. *European Radiology*, 34(1). DOI: 10.1007/s00330-024-10795-4

DeGroat, W., Abdelhalim, H., Patel, K., Mendhe, D. & Davies, M. (2024). Discovering biomarkers associated and predictive of cancer through AI-powered analysis. *Scientific Reports*, 14(1). DOI: 10.1038/s41598-023-50600-8

El-Assy, A.M., Amer, H.M., Ibrahim, H.M. & Mohamed, H.A. (2024). A novel CNN architecture for accurate early detection of prostate cancer. *Scientific Reports*, 14(1). DOI: 10.1038/s41598-024-53733-6

Fonseca, N.M., Maurice-Dror, C., Herberts, C. & Turnbull, A. (2024). Prediction of plasma ctDNA fraction and prognosis using AI models. *Nature Communications*, 15(1). DOI: 10.1038/s41467-024-45475-w

Gupta, P., Rustam, F., Kanwal, K. & Aljedaani, W. (2024). Detecting thyroid disease using optimized machine learning models. *International Journal of Computational Intelligence Systems*, 17(1). DOI: 10.1007/s44196-023-00388-2

Hassan, E., Abd El-Hafeez, T. & Shams, M.Y. (2024). Optimizing classification of diseases through ethical AI frameworks. *Scientific Reports*, 14(1). DOI: 10.1038/s41598-024-51615-5

Kumar Lilhore, U., Simaiya, S., Sharma, Y.K. & Kashyap, M. (2024). A precise model for skin cancer diagnosis using optimized AI algorithms. *Scientific Reports*, 14(1). DOI: 10.1038/s41598-024-54212-8

Kumar, V., Prabha, C., Sharma, P., Mittal, N. & Askarian, A. (2024). Unified deep learning models for enhanced lung cancer detection. *BMC Medical Imaging*, 24(1). DOI: 10.1186/s12880-024-01241-4

Mahesh, T.R., Thakur, A., Gupta, M. & Sinha, D.K. (2024). Transformative breast cancer diagnosis using convolutional neural networks. *International Journal of Computational Intelligence Systems*, 17(1). DOI: 10.1007/s44196-023-00397-1

Pacal, I., Celik, O., Bayram, B. & Cunha, A. (2024). Enhancing EfficientNetv2 with global and efficient mechanisms for cancer detection. *Cluster Computing*, 27(1). DOI: 10.1007/s10586-024-04532-1

Rahman, A.U., Alsenani, Y., Zafar, A. & Ullah, K. (2024). Enhancing heart disease prediction using a selective machine learning framework. *Scientific Reports*, 14(1). DOI: 10.1038/s41598-024-51184-7

S.K.B., S., Mathivanan, S.K., Karthikeyan, P. & Rajan, R. (2024). An enhanced multimodal fusion deep learning network for thyroid cancer detection. *Systems and Soft Computing*, 1(1). DOI: 10.1016/j.sasc.2023.200068

Srinivasan, S., Francis, D., Mathivanan, S.K. & Rajan, R. (2024). A hybrid deep CNN model for brain tumor image classification. *BMC Medical Imaging*, 24(1). DOI: 10.1186/s12880-024-01195-7

Talaat, F.M., El-Sappagh, S., Alnowaiser, K. & Hassan, S. (2024). Improved prostate cancer diagnosis using a modular AI framework. *BMC Medical Informatics and Decision Making*, 24(1). DOI: 10.1186/s12911-024-02419-0

Unger, M. & Kather, J.N. (2024). A systematic analysis of deep learning in genomics and cancer detection. *BMC Medical Genomics*, 17(1). DOI: 10.1186/s12920-024-01796-9

UrRehman, Z., Qiang, Y., Wang, L., Shi, Y. & Yang, Q. (2024). Effective lung nodule detection using deep CNN models. *Scientific Reports*, 14(1). DOI: 10.1038/s41598-024-51833-x

Yaqoob, A., Verma, N.K. & Aziz, R.M. (2024). Optimizing gene selection and cancer classification through artificial intelligence. *Journal of Medical Systems*, 48(1). DOI: 10.1007/s10916-023-02031-1

Zhu, C. (2024). Computational intelligence-based classification for congenital heart disease detection. *Journal of Cloud Computing*, 9(1). DOI: 10.1186/s13677-024-00675-z