International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 07 | July - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

A SURVEY ON INFLUENCE OF AI IN BREAST CANCER

Vishwanath V Murthy
Associate Professor
MCA Department
RNS Institute of Technology
Banglore,India
vm.rnsit@gmail.com

Dhanvika H A
MCA Department
RNS Institute of Technology
Banglore,India
Banglore,India
mca.dhanvikaha@gmail.com

***Abstract*—For both the general public and the medical community, breast cancer has been a major issue. Artificial intelligence will make early cancer diagnosis easier by being integrated into many screening devices. Artificial intelligence uses several technologies, including radiomics, deep learning, and machine learning, in the diagnosis of cancer [2]. These cutting-edge medical tools aid in early diagnosis and improved patient care. Artificial intelligence is not without its limitations, though. The use of intellectual property is subject to numerous laws. Artificial intelligence can identify breast quality, segmentation, and tissue density, as well as diagnose and manage patients, by spotting calcifications. It must be able to get beyond these obstacles and advance by additional study and technical advancement [10].**

***Index Terms*—Artificial intelligence, CAD (Computer-aided detection), breast cancer diagnosis, digital pathology Radiomics, Mammography screening.**

I. Introduction

Breast cancer is one of the difficult conditions we are confronting.ladies in the modern era. This is a significant health issue [1].Along with colorectal and breast cancer, it is one of the top three malignancies diagnosed worldwide [1] and the second most prevalent cancer overall.Cancer kills a great deal of people[3]. An earlier diagnosis could facilitate the treatment of breast cancer more easily. The outcome of the treatment It is not good, though, if it has not been francaised in the following stage [4]. Therefore, early diagnosis Prevention save more lives and Lessnumsof deaths. In early detection of cancer, it appears to be life-saving thus improving the outcome. Human wisdom always eclipsesall wisdom in this world. What is human intelligence?is the capacity to employ experience, adust on new situationsand find the patterns too [3]. The success of if a skill is done well, then intention counted as intelligence repetition airstrip [4].

II. Background

Traditionally, radiologists looked at images of breasts (from bare breasts) to detect and diagnose breast cancer. Show current budget here. eyes) and choose the end after the results of other doctors. This will include breast examination in search of breast cancer, which is a common practice; however, several unavoidable factors may cause the diagnosis to be missed and, therefore, the diagnostic process to take a long time.An example. 1.Absence of specialists in developing and rural nations. 2. varied classes of images (images with varied disease symptoms) cannot be identified by qualified experts.Every day, analyzing several medical photos can take a lot of time and effort. 4. Because of the sensitivity of the breast tumor and the nature of breast tissue, manual examination is more challenging. 5. Physicians: The diagnosis process is challenging and time-consuming due to high concentration levels and other forms of weariness.

III. Artificial Intelligence Technique in Breast Cancer

Artificial Intelligence (AI) is a phenomenon that has captured our attention since its inception in the 1950s. Its role in social life has increased during the last decade, so much so that many of its manifestations sound familiar. face or voice assistance was given and seems to exist. little to no surprises for the everyday user. Figure 1).

Artificial Intelligence (AI) has fascinated us and captured our imagination since the early 1950s. Over the last decade, its role in daily life has increased significantly, with technologies such as facial recognition and digital voice assistants becoming commonplace and rarely surprising casual users. The healthcare industry, particularly in the context of the breast cancer discovery and treatment, stands to benefit immensely from AI due to its reliance on processing large volumes of data (Fig. 1).

Medical image computing's "wind of change" for AI The term "artificial intelligence" (AI) refers to a number of methods for making robots replicate human decision-making (Fig. 2).

All methods that enable the computer to learn from the features obtained from training examples and without explicitly specifying these elements fall into the category of

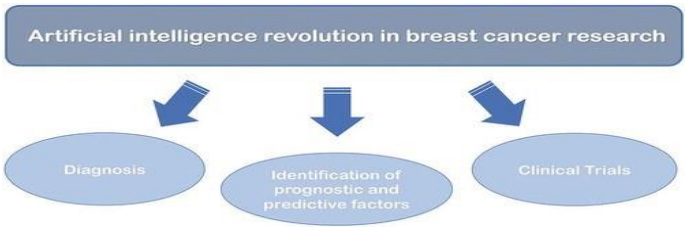

Fig. 1. Expected impact of AI in breast cancer research areas.

artificial intelligence and are called machine learning (ML) [5]. Regression, support vector machines, the random forest classifiers, nearest neighbor algorithms and artificial neural networks (ANN) are some examples of machine learning techniques [5]. Figure 1 shows the need for AI in different areas of cancer research.The two major concepts can be broadly categorized as unsupervised and supervised learning. [9].

However, depending on the deep learning model design, learning objectives, and training methods, as well as the quality and diversity of the data, different information may be needed to achieve sufficient accuracy. The largest dataset (called "training") is used to evaluate the model. The data collected from training is used in validation data to optimize the hyperparameters of the model. CNN and DL aren't the only new ideas. Previously, deep training of CNN was considered impossible due to the lack of underlying data and high processing cost. problems.The broad application of deep learning (DL) is a result of these technological advancements. in the medical field, including the application of cancer risk assessment to the analysis of mammography data for breast cancer. The deep learning and training were also developed owing to these advances. methods.

A. CAD:Computer-aided detection

Since its introduction in the late 1990s, computer-aided detection (CAD) has been plagued by unmet expectations. It was the first software released for clinical use in cancer diagnosis. More information. This technology relies on the algorithm that analyze mammograms to find common features of malignancies (e.g., shape, size, asymmetry, etc.) that researchers find with an electronic finder while reading the test. Despite initial results, years of CAD treatment applications have not shown significant improvement in performance analysis, and all enthusiasm for deep learning has faded (DL) constitutes the second point of interest) a revolution in the early 2012 period.

B. Computational radiology

Disease detection using computer vision, wound detection or pattern recognition, classification and functional presentation (diagnosis) of diseases according to BIRADS (Body Anatomy Guide and Data), electronic calculations previously

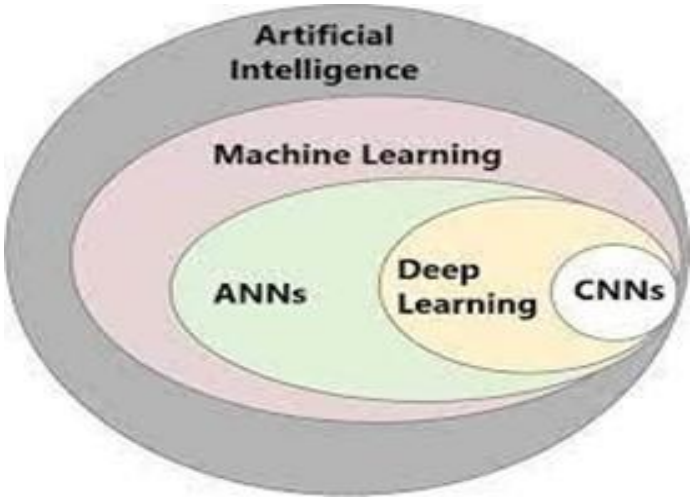

Fig. 2. The relationship between the diferent techniques in the field of artificial intelligence.

performed by professionals. Additionally, biomarkers were extracted to model treatment response based on predicted and extrapolated data. Some of the key areas of artificial intelligence required for cancer diagnosis are machine learning and deep learning. Use machine learning to collect large amounts of data that is used to train predictive models and understand trends. A system that can classify and analyze images. The main role of artificial intelligence (AI) in cancer diagnosis is the detection of objects (segmentation) and Classification of the tumors in question as benign or malignant [2].

TABLE I
VARIOUS WAYS IN WHICH ARTIFICIAL INTELLIGENCE WORKS IN BREAST CANCER SCREENING

Sr No.	Methods	Operation Mode
1.	Machine Learning	A computational algorithm that uses image features.
2.	Deep Learning	An image processing by multi-neural layer or network.
3.	Radiomics	It extracts quantitative . aspects from an image, called a feature.

C. Radiomics

Radiomics is a method used by many artificial intelligence systems. It retrieves so-called features (quantitative aspect) from an image. This is usually a function of pattern recognition algorithms recognizing the image and display a list of numbers corresponding to different parts of the displayed image. Radiomics is created where features obtained from the data represent different molecular and genetic activities. In order to better understand the consequences of the disease, machine learning is used in in silico methods where images obtained from radiographic images are used (Fig.3). Radiomics uses

two types of machine learning: supervised machine learning and unsupervised machine learning. Training skills using existing data is the first step in supervised machine learning. As part of deep learning, images are processed by various neural processes or networks, such as supervised machine learning, that transform images into lists of numbers that influence the features to be exported. This was done using information obtained from radiographs and biopsy. This is supported by the world's initiative to develop learning algorithms to interpret mammograms, reducing the likelihood of false positives. AI increases the likelihood of detecting metastatic breast cancer in whole-section imaging lymph node biopsies.

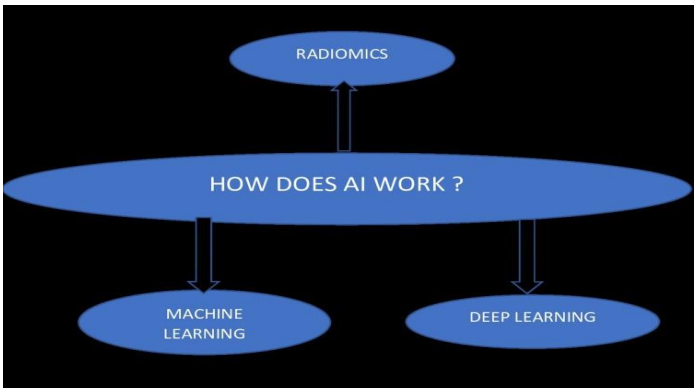

Fig. 3. Mode of functioning of artificial intelligence. .

D. Mammography

The most used technique in breast cancer detection is mammography (4). Acquire high-resolution images, then store and use them indefinitely, regardless of the user's age or size [10]. All digital mammography systems can produce raw images as well as processed images. AI evaluates images to identify breast tumors, hip segmentation, breast density and determine cancer risk.Probably the most important One of the steps in computer-aided diagnosis, or CAD, is breast diagnosis. This is because it is common in patients with cancer. Microcalcifications and macrocalcifications are two types of calcifications that appear as small particles on a mammogram. CAD systems now have the ability to detect microcalcifications. Breast size segmentation directly affects the diagnosis, and breast size segmentation is considered a true segmentation. Automatic segmentation of mammograms by breast size using blindsight. Breast segmentation can be difficult to determine due to individual differences. Thanks to appropriate cognitive segmentation, the patient's prognosis is better [1]. A two-dimensional mammogram is used to determine the breast. Risk factors for breast cancer include age, family history, reproductive factors, estrogen, and personal characteristics.

Twenty years ago CAD was introduced into mammography.Different studies have been conducted to compare the performance of a single reading performed by an electronic searcher with two readings performed by a CAD. One is not necessarily better than the other, but using both is said to increase success. Research has also demonstrated the ability of AI-based CAD to meet high demand [6]. It can be used as a preliminary screening tool in digital breast tomosynthesis (DBT) to exclude low-risk mammograms and reduce reading time. In many cases, Second opinion already CAD is used as. in patient care or decision support, but it should be carefully The plans were studied and its effectiveness was proven before being implemented.

Artificial Intelligence Developments in Mammogram Analysis in the Assessment of Breast Cancer Risk Kallenberg et al. is one of the first to examine the prospective of deep learning in predicting cancer risk. They used a convolutional sparse autoencoder that learns more about the features of the system controls of healthy subjects from two independent data repositories [3]. proposed a different method using the AlexNet preliminary model and feature set of FFDM images from two high-risk groups with health management (e.g., BRCA1/2 gene mutation mutation and non- combined cancer patients).The DL model made use of normal mammography images acquired at least a year prior to the diagnosis of breast cancer, as well as extensive screening of a representative sample of general observers. Since one of the therapeutic objectives of these research is to identify women at high risk prior to cancer diagnosis, the idea of breast cancer risk assessment has become more obvious.

It is also important to use breast cancer cases and age-matched controls in these research models or to provide age-adjusted measures to prevent risk estimation from escalating. The models presented supported results, generally outperforming cancer risk, with AUCs ranging from 0.60 to 0.84. It may be a more accurate prediction of breast cancer risk than prior exposure based on pattern and intensity. Researchers have explored the ability of artificial intelligence to combine with long-term risk studies to identify women most likely to be diagnosed with visible, latent or rapid cancer without a test. It's a risk. Factors include age, breast density, mammographic appearance (including microcalcifications and masses), and differences in bilateral parenchymal patterns seen by commercial DL-based software. Images were created using 2D maximum reflection (MSP) images in collaboration with Lotter et al. [8] adopted deep learning technique for good annotation. To determine cancer risk, McKinney et al. A set of three DL models was created, each run at one level of analysis (single case, single breast, and patient level). After training on large datasets of mammography images collected before and after breast cancer diagnosis or during follow-up examinations, all three AI systems were found to have prospective effectiveness in breast cancer risk assessment. Additionally, because a woman's tissue changes over time and

responds to different influences, such as pregnancy, hormone therapy, with risk-reducing surgery, creating a system that takes this data into account could help women comprehend the Personal Risk Assessment procedure better. Additionally, an extension of the DL model to include risk assessment of DBT is not available, which would also be useful (Fig.4).

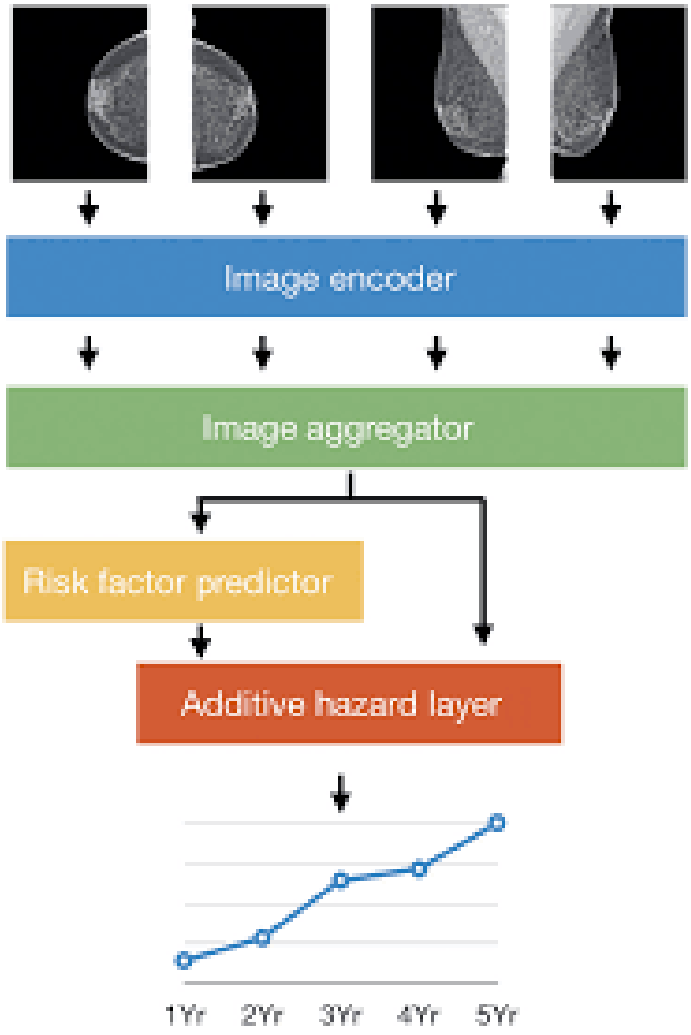

Fig. 4. Use of the four standard mammographic views in long-term risk assessment via artificial intelligence.

E. Challenges

- Wisdom is of great help in cancer treatment. It produces great results and able to replace existing treatments. Where the line should be drawn between artificial the intelligence of machine and human intelligence is the only question. Gathered information from the population is the source, of intelligence. Therefore, there should be no further differences in information collection between individuals from different economic backgrounds [7].
- Cancer is another illness whose frequency differs among racial groups. The outcomes of research on
- Just like other discoveries, humans need must be able for reproducing and create AI to be truly known. This means that public rights must be accessible to everyone, and this is only be possible if knowledge is shared equally among all users.
- Photographic information focuses on cognitive models used to treat cancer.The issue with this feature is that hospitals typically keep unusable electronic medical records as a result of patient histories they store. The engineering and medical communities must work together on this complicated endeavor.
- Building clinician confidence in using AI to guide decision-making is critical to its implementation. Medical professionals need to have adequate training in the use of artificial intelligence technology.

F. Future of Artificial Intelligence in the Treatment of Breast Cancer

Now in today's age of mobile phones, it is easier to collect information from people [9]. Many parameters, from blood pressure to heart rate, can be easily monitored and recalled via these smartphones. As a result, treatment standards and patient satisfaction increased. However, when using artificial intelligence technology, data privacy, personal access, patient identity, consent, etc. are taken into consideration. Other risks such as should also be taken into account. Immorality [8]. The fact that radiomics is not widely used in current treatment is another disadvantage of using artificial intelligence in cancer diagnosis. Most studies are small and less reliable than larger studies. But ultimately, AI can replace much of the work of electrical engineers, and if it doesn't replace them, it won't help them make decisions. This is a valid option because it is not invasive and with further research, smarter capabilities will be possible.

the efficacy of artificial intelligence may be utilized to assess the caliberand validity of these investigations.

CONCLUSION

Breast cancer has been a big problem for people and the medical profession. By incorporating artificial intelligence into various screening technologies, early diagnosis of cancer will become easier. Radiomics, deep learning and machine learning are some of the methods used by artificial intelligence in cancer diagnosis [2]. These advanced technologies help doctors make early diagnoses and provide better patient care. However, the use of artificial intelligence has some limitations. There are many laws that regulate the use of intellectual property. By detecting calcifications, artificial intelligence can detect breast quality, segmentation and tissue density, as well as diagnosis and patient management. It must be able to overcome these problems and make progress through further research and technological development [10].

REFERENCES

[1] Artificial Intelligence in Breast Cancer Screening and Diagno- sis Monitoring Editor: Alexander Muacevic and John R Adler: https://www.tandfonline.com/doi/full/10.1080/147371 40.2021.1951240

[2] Artificial intelligence in mammographic phenotyping of breast cancer risk: a narrative Review Aimilia Gastounioti1,2, Shyam Desai1, Vinayak S. Ahluwalia1,3, Emily F. Conant4 and Despina Kontos1

[3] How will artificial intelligence impact breast cancer research effi- ciency? Gianluca FranceschiniORCID Icon, Elena Jane MasonOR- CID Icon,Armando OrlandiORCID Icon,Sabatino D'ArchiORCID Icon- SanchezORCID Icon Riccardo MasettiORCI,Alejandro Martin D Icon https://www.tandfonline.com/doi/full/10.1080/147371 40.2021.1951240

[4] Lamb LR, Lehman CD, Gastounioti A, Conant EF, Bahl M. Artifcial Intelligence (AI) for screening mammography, from the AI special series on AI applications. Am J Roentgenol. 2022. https://doi.org/10.2214/AJR.21. 27071.

[5] Mohamed AA, Luo Y, Peng H, Jankowitz RC, Wu S. Understanding clinical mammographic breast density assessment: a deep learning perspective. J Digit Imaging. 2018;31(4):387–92.

[6] Breast-cancer tumor size, overdiagnosis, and mammography screening effectiveness. Welch HG, Prorok PC, O'Malley AJ, Kramer BS. N Engl J Med. 2016;375:1438–1447. [PubMed] [Google Scholar]

[7] Early breast cancer identification and screening. Semin Oncol Nurs. 2017;33:141–155; Coleman C. [PubMed] [Scholar Google]

[8] Breast-cancer tumor size, overdiagnosis, and mammography screening effectiveness. Welch HG, Prorok PC, O'Malley AJ, Kramer BS. N Engl J Med. 2016;375:1438–1447. [PubMed] [Google Scholar]

[9] Awareness of breast cancer among surgical patients in a tertiary hos- pital in Malaysia. Kirubakaran R, Chee Jia T, Mahamad Aris N. https://pubmed.ncbi.nlm.nih.gov/28240018/. Asian Pac J Cancer Prev. 2017;18:115–120. [PMC free article] [PubMed] [Google Scholar]

[10] Breast cancer screening, mammography, and other modalities. Fiorica JV. Clin Obstet Gynecol. 2016;59:688–709. [PubMed] [Google Scholar]