



Chapter 65

Deep Convolutional Neural Network–Based Analysis for Breast Cancer Histology Images

E. Sudheer Kumar

 <https://orcid.org/0000-0003-2752-0711>
JNTUA College of Engineering, India

C. Shoba Bindu

 <https://orcid.org/0000-0002-3637-507X>
JNTUA College of Engineering, India

Sirivella Madhu

JNTUA College of Engineering, India

ABSTRACT

Breast cancer is one of the main causes of cancer death worldwide, and early diagnostics significantly increases the chances of correct treatment and survival, but this process is tedious. The relevance and potential of automatic classification algorithms using Hematoxylin-Eosin stained histopathological images have already been demonstrated, but the reported results are still sub-optimal for clinical use. Deep learning-based computer-aided diagnosis (CAD) has been gaining popularity for analyzing histopathological images. Based on the predominant cancer type, the goal is to classify images into four categories of normal, benign, in situ carcinoma, and invasive carcinoma. The convolutional neural networks (CNN) is proposed to retrieve information at different scales, including both nuclei and overall tissue organization. This chapter utilizes several deep neural network architectures and gradient boosted trees classifier to classify the histology images among four classes. Hence, this approach has outperformed existing approaches in terms of accuracy and implementation complexity.

DOI: 10.4018/978-1-6684-7544-7.ch065

INTRODUCTION

Breast Cancer (BC) is the most routine cancer found in women. The growth of cancer ratio has been increasing over the last 10 to 15 years. The average age for these cancers is 50 to 69 years and it is the highest over 85 years of age. The rate of cancer is also higher in socioeconomic groups. The UK has a maximum rate of cancer incidence. BC is the most commonly occurring cancer in women, affecting 2.1 million women every year and that origin a massive number of cancer deaths among women. In 2018, expected that 6,27,000 women would die from BC about 15% of all cancer deaths among women (World Health Organization, 2018). Early diagnosis can significantly improve treatment very successfully. BC symptoms and signs may vary, and the diagnosis includes a physical examination, mammography, ultrasound examination, and biopsy.

Introduction to Breast Cancer

Early detection is an essential aspect of increasing the survival rate of BC. Two types of initial detection strategies are following they are early diagnosis and screening. Restricted resource settings with weaker health systems, more women being diagnosing in the final stages, so prioritizing the advanced diagnosis based on early signs and symptoms are important (Sree, Ng, Acharya, & Faust, 2011). The determination of BC by conventional methods is not a challenging task but these can be visualized on a traditional mammogram or ultrasound. A mammogram is the best method for detecting BC at the present stage. But the difficulty of using a mammogram is that the images of the mammogram itself are more complicated. So, by using image processing and feature extraction procedures can help the radiologist to detect a tumor much easier and faster. Symptoms extracted from areas not known in mammography images can help clinicians to detect tumor presence in real-time to speed up the process of treatment. Consequently, each cancer is different from other cancer that exists. In cancer treatment, a single drug may have a different reaction when administered to rare cancer and also can vary from person to person. Depending on one approach or an algorithm may not produce accurate results. The mammography image can also be compromised if the patient undergoes breast surgery. Various categories of imaging techniques are available in the current era to evaluate the human body without harming the body (Sudheer Kumar & Shoba Bindu, 2019). The different types of imaging modalities are shown in the below Figure 1.

Tumor cells differ in location (milk ducts or lobules) and how they look under the microscope, but they may be invasive or non-invasive. A breast biopsy is a procedure of taking a sample of breast tissue for laboratory testing and the results determine if there are cancer cells in the suspicious area of your breast or not. It provides a tissue sample used by doctors to detect abnormalities in cells. A lab report from a breast biopsy can help you decide whether if you need any additional surgery or other treatment. The natural history of BC begins with invasive carcinoma by hyperplasia and carcinoma in-situ with normal epithelial enlargement through clinical and pathological stages and is the pinnacle in metastatic disease. The mixture of Hematoxylin-Eosin (H&E) is the primary stain of tissue samples for the diagnosis of histopathological.

17 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/deep-convolutional-neural-network-based-analysis-for-breast-cancer-histology-images/315103

Related Content

Detection and Segmentation of Medical Images Using Generic Algorithms

Hardev Mukeshbhai Khandhar, Chintan M. Bhattand Simon Fong (2023). *Research Anthology on Improving Medical Imaging Techniques for Analysis and Intervention* (pp. 1563-1570).

www.irma-international.org/chapter/detection-and-segmentation-of-medical-images-using-generic-algorithms/315118

Image Fusion Techniques for Different Multimodality Medical Images Based on Various Conventional and Hybrid Algorithms for Disease Analysis

Rajalingam B., Priya R., Bhavani R.and Santhoshkumar R. (2023). *Research Anthology on Improving Medical Imaging Techniques for Analysis and Intervention* (pp. 268-299).

www.irma-international.org/chapter/image-fusion-techniques-for-different-multimodality-medical-images-based-on-various-conventional-and-hybrid-algorithms-for-disease-analysis/315050

Study of the Current Trends of CAD (Computer-Aided Detection) in Modern Medical Imaging

Ranjit Baruaand Jaydeep Mondal (2023). *Machine Learning and AI Techniques in Interactive Medical Image Analysis* (pp. 35-50).

www.irma-international.org/chapter/study-of-the-current-trends-of-cad-computer-aided-detection-in-modern-medical-imaging/313470

An Investigation of AI Techniques for Detecting Kidney Stones in CT Scan Images Through Advanced Image Processing

Ranjit Barua (2024). *Enhancing Medical Imaging with Emerging Technologies* (pp. 133-150).

www.irma-international.org/chapter/an-investigation-of-ai-techniques-for-detecting-kidney-stones-in-ct-scan-images-through-advanced-image-processing/344666

Implementation and Performance Assessment of Biomedical Image Compression and Reconstruction Algorithms for Telemedicine Applications: Compressive Sensing for Biomedical Images

Charu Bhardwaj, Urvashi Sharma, Shruti Jainand Meenakshi Sood (2023). *Research Anthology on Improving Medical Imaging Techniques for Analysis and Intervention* (pp. 1571-1598).

www.irma-international.org/chapter/implementation-and-performance-assessment-of-biomedical-image-compression-and-reconstruction-algorithms-for-telemedicine-applications/315119