

Application of Deep Convolution Neural Network in Breast Cancer Prediction using Digital Mammograms

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Abstract—Cancer, a diagnosis so dreaded and scary, that its fear alone can strike even the strongest of souls. The disease is often thought of as untreatable and unbearably painful, with usually, no cure available. Among all the cancers, breast cancer is the second most deadliest, especially among women. What decides the patients' fate is the early diagnosis of the cancer, facilitating subsequent clinical management. Mammography plays a vital role in the screening of breast cancers as it can detect any breast masses or calcifications early. However, the extremely dense breast tissues pose difficulty in the detection of cancer mass, thus, encouraging the use of machine learning (ML) techniques and artificial neural networks (ANN) to assist radiologists in faster cancer diagnosis. This paper explores the MIAS database, containing 332 digital mammograms from women, which were augmented and preprocessed, and fed into a custom and different pre-trained convolutional neural network (CNN) models, with the aim of differentiating healthy tissues from cancerous ones with high accuracy. Although the pre-trained CNN models produced splendid results, the custom CNN model came out on top, achieving test accuracy, AUC, precision, recall and F1 scores of 0.9362, 0.9407, 0.9200, 0.8025 and 0.8572 respectively while having minimal to no overfitting. The paper, along with proposing a new custom CNN model for better breast cancer classification using raw mammograms, focuses on the significance of computer-aided detection (CAD) models overall in the early diagnosis of breast cancer. While a diagnosis of breast cancer may still leave patients dreaded, we believe our research can be a symbol of hope for all.

Index Terms—breast cancer, CAD model, convolutional neural network, mammogram, MIAS database