Enhancing the Performance of Breast Cancer Diagnosis Using Deep Learning Techniques and Image Processing

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Abstract

Breast cancer is the most frequently diagnosed cancer and the second leading cause of cancer death among women in the world. Analyzing medical images plays an important role in many areas of medical applications, which is used in classification, diagnosis, and treatment recommendation of diseases. The mammogram classification types can be malignant masses, or benign. However, the medical images analysis and making a diagnosis of breast cancer require trained medical specialists, and is considered as tedious work, time-consumed, and costly. It would be desirable to have a computer-aided system to improve medical diagnosis in terms of diagnosis accuracy, effort, cost, and time. The early detection of breast cancer has proven to be critical to give patients the best chance of recovery and survival. In this thesis, we apply deep learning technique on the mammogram images to detect breast cancers. The methodolody uses Convolution Nueral Network (CNN) deep learning models and is done by the CBIS-DDSM dataset.Five models are implemented: DenseNet201 Model, InceptionResNetV2, MobileNetV2 Model, ResNet152V2 model, and Xception model. The thesis tries to resolve the challenges that happened from the wrong diagnosis using two phases. In phase one, we use the original gray-scale mammogram images, while in phase two, we add coloring to the mass by changing the white color mass of gray-scale into the red color of (RGB) channels. One of the major aspects of training the deep learning models is to avoid the risks of overfitting and increase the accuracy of diagnosis. We use two techniques; Least Absolute Shrinkage And Selection Operator (LASSO) regression as a regularization technique and *Adam optimizer* as th**e** adaptive learning optimization algorithm. The overall results of applying five different models of deep learning CNN techniques are relatively good results but they are under our

expectation, even after we color the white masses of the mammogram images, the slightly enhancement was 9%. In some models that the False positive is decreased, this means that the benign masses are diagnosed correctly. Hence, the patient will not need to take unneeded biopsies, and this will reduce the cost and time. While the reduction of False Negative values in some models, this means that the malignant masses are diagnosed correctly. Therefore, it gives the patient the best chance of recovery.