Machine Learning Based Techniques for the Prediction of Axillary Lymph Node Metastases in Early Breast Cancer

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***Abstract*— One of the most significant considerations in determining the prognosis of breast cancer is the involvement of lymph nodes. Although non-invasive imaging techniques like ultrasound, computed tomography (CT), magnetic resonance imaging (MRI), and F-18 fluoro-2-deoxy-D-glucose (FDG) positron emission tomography (PET)/CT have been recommended for the assessment of the ALN status, their diagnostic performance lacks sufficient sensitivity in the detection of ALN metastasis. Accurate machine learning based techniques have been applied to the investigation of lymph node in the early stage of breast cancer. This occurrence is influenced by several tumor-specific elements. The primary objective of this research was to determine the clinical and pathological variables that validate the radiomics-based machine learning model can be used to predict whether individuals with early-stage breast cancer will have metastases in their axillary lymph nodes (ALNM). Various aspects were considered and analyzed while utilizing various machine learning algorithms to determine the involvement of the lymph node metastasis. For our experiments, we have examined three machine learning models such as Gradient Boosting Machine (GBM), KNNeighbor (KN) and Decision Tree (DT). Accuracy, specificity, sensitivity, and F1-score were used to evaluate the performance of all three models. The accuracy of GBM was 97%, followed by that of KNNeighbor (KNN) and Decision Tree (DT), which were 91% and 91%, respectively.**

***Keyword*— Breast cancer, Deep learning, Gradient Boosting Machine (GBM), Lymph node metastasis.**

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