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Classification of Non-Small Cell Lung Carcinoma using Computer Aided Semi-automatic Segmentation and Radiomics

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Among lung cancers, adenocarcinoma (AD) and squamous cell carcinoma (SCC) are common types and significantly contribute to global cancer-related mortality. This study aimed to classify these types by analysing radiomic features extracted through computer-aided semi-automatic segmentation. The 3D Slicer software was used to pre-process, segment, and extract 107 quantitative radiomic features from each segmented tumour region in 80 subjects. In the first stage of feature selection, features with a correlation coefficient less than 0.9 were selected. In the second stage, the LASSO binary logistic regression algorithm was applied, resulting in 15 features with non-zero coefficients which were then used to develop the radiomic score. A statistically significant difference in radiomic scores was observed between two groups. The discriminatory performance of the radiomic score was evaluated using receiver operating characteristic (ROC) curves, resulting in an area under the curve (AUC) of 0.679 (95% CI, 0.541-0.871) for the training set and 0.560 (95% CI, 0.342-0.778) for the validation set. Machine learning algorithms of Random Forest (RF) and Support Vector Machine (SVM) were compared for their ability to differentiate between AD and SCC. RF achieved an accuracy of 0.73 (95% CI, 0.54-0.88) with an AUC of 0.54, while SVM demonstrated an accuracy of 0.87 (95% CI, 0.69-0.96) and an AUC of 0.87. The findings emphasize the potential of radiomic analysis for differentiating between AD and SCC. SVM algorithm shows particularly strong discriminatory performance. The study suggests that further validation of these results could be achieved by exploring larger datasets and incorporating additional features.

Keywords: *lung cancer, computed tomography, radiomics, machine learning, tumour segmentation*