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Predicting Indocyanine Green Retention at 15 Minutes (ICG15) in Hepatocellular Carcinoma Patients Using Radiomics and Hematology

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Hepatocellular carcinoma (HCC) poses significant challenges and risks globally. Liver metabolism assessment, reflected in Indocyanine Green Retention at 15 minutes (ICG15), is crucial for HCC patients. This study aimed to predict ICG15 levels using radiomics-based features and selected hematology test results. A hybrid predictive model combining clustering and stacking models is developed to enhance ICG15 prediction precision.

A total of 120 HCC patients were enrolled, with 107 patients included after outlier handling. Dimension reduction using the Least Absolute Shrinkage and Selection Operator (LASSO) identified the 30 most influential predictors for subsequent investigation. Gaussian Mixture Model (GMM) clustering was then employed to categorize patients into two groups based on radiomics and hematology features. Subsequently, a stacking framework is built, with XGBoost serving as the base model and XGBoost, AdaBoost, RandomForest, and SVM regressor as the four meta-learners. Our research underscores the significance of integrating radiomics and machine learning models in treating liver cancer. By improving the predictive accuracy of ICG15, our model holds the potential to serve as a valuable tool for physicians in the preoperative evaluation of liver function, thus benefiting HCC patients.

Keywords

Hepatocellular Carcinoma (HCC), Indocyanine Green Retention at 15 minutes (ICG15), radiomics, hematology, machine learning model, Gaussian Mixture Model (GMM), stacking scheme, liver function prediction

Classification

Both methodology and application

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