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LIVER FIBROSIS DETECTION USING ENSEMBLE MODEL OF SUPPORT VECTOR MACHINE AND DECISION TREE

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Abstract:
Liver fibrosis is a progressive condition identified by the excessive formation of extracellular proteins matrix, resulting in scarring and impaired the liver functions. A prompt and precise diagnosis is essential for efficient treatment and disease management because delays in treatment can develop into cirrhosis or liver failure. Traditional diagnostic methods often face problems when there is a variable progression of the complex nature of fibrosis development and variations in the clinical data. Futhermore, these diagnostic methods show data inconsistencies, and the complexity of underlying patterns usually limit their diagnostic dependability. To avoid these isues, aggregation of several learning models helps to lower variation and bias, thereby improving predicted accuracy by means of ensemble approaches. In this study, an approach of machine learning techniques called ensemble model of support vector machine (SVM) and decision tree (DT) were proposed to diagnose liver fibrosis. The methodology includes multiple phases: dataset acquisition, a pre-processing layer (comprising one-hot encoding, data visualization, and data cleaning), feature extraction and selection utilizing machine learning algorithms, and partitioning the data into training and testing sets. Furthermore, cross-validation and evaluation metrics were utilized to evaluate model performance, including accuracy, precision, recall, and F1-score to evaluate the proposed model. The results found that the proposed ensemble model shows quite outstanding performance with the accuracy of 99.46%, a precision of 100%, a recall of 95.96%, and an F1-score of 97.87%, compared to SVM and DT classifiers achieving accuracy rates of 96.79% and 98.03%, respectively.

Keywords:

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Liver Fibrosis Detection; Hepatitis C Virus (HCV); Machine Learning; Ensemble Learning (EL); Support Vector Machine (SVM), Decision Tree (DT)