Decision tree

A decision tree is a graphical representation of a decision-making process. It is a tree-like structure where an internal node represents a feature or attribute, a branch represents a decision rule, and a leaf node represents an outcome or a decision. Decision trees are widely used in various fields, including machine learning, data analysis, and decision analysis, to model and solve decision-making problems.

The general regression tree building methodology allows input variables to be a mixture of continuous and categorical variables. A decision tree is generated when each decision node in the tree contains a test on some input variable's value. The terminal nodes of the tree contain the predicted output variable values.

The purpose of this study was to build a model of machine learning (ML) for the prediction of mortality in patients with isolated moderate and severe traumatic brain injury (TBI).

Hospitalized adult patients registered in the Trauma Registry System between January 2009 and December 2015 were enrolled in this study. Only patients with an Abbreviated Injury Scale (AIS) score ≥ 3 points related to head injuries were included in this study. A total of 1734 (1564 survival and 170 non-survival) and 325 (293 survival and 32 non-survival) patients were included in the training and test sets, respectively.

Using demographics and injury characteristics, as well as patient laboratory data, predictive tools (e.g., logistic regression [LR], support vector machine [SVM], decision tree [DT], naive Bayes [NB], and artificial neural networks [ANN]) were used to determine the mortality of individual patients. The predictive performance was evaluated by accuracy, sensitivity, and specificity, as well as by area under the curve (AUC) measures of receiver operator characteristic curves. In the training set, all five ML models had a specificity of more than 90% and all ML models (except the NB) achieved an accuracy of more than 90%. Among them, the ANN had the highest sensitivity (80.59%) in mortality prediction. Regarding performance, the ANN had the highest AUC (0.968), followed by the LR (0.942), SVM (0.935), NB (0.908), and DT (0.872). In the test set, the ANN had the highest sensitivity (84.38%) in mortality prediction, followed by the SVM (65.63%), LR (59.38%), NB (59.38%), and DT (43.75%).

The ANN model provided the best prediction of mortality for patients with isolated moderate and severe TBI [1].

1)
Rau CS, Kuo PJ, Chien PC, Huang CY, Hsieh HY, Hsieh CH. Mortality prediction in patients with isolated moderate and severe traumatic brain injury using machine learning models. PLoS One. 2018 Nov 9;13(11):e0207192. doi: 10.1371/journal.pone.0207192. eCollection 2018. PubMed PMID: 30412613.