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A Principle Component Analysis-based Random Forest with the Potential Nearest Neighbor Method for Automobile Insurance Fraud Identification

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Graphical abstract

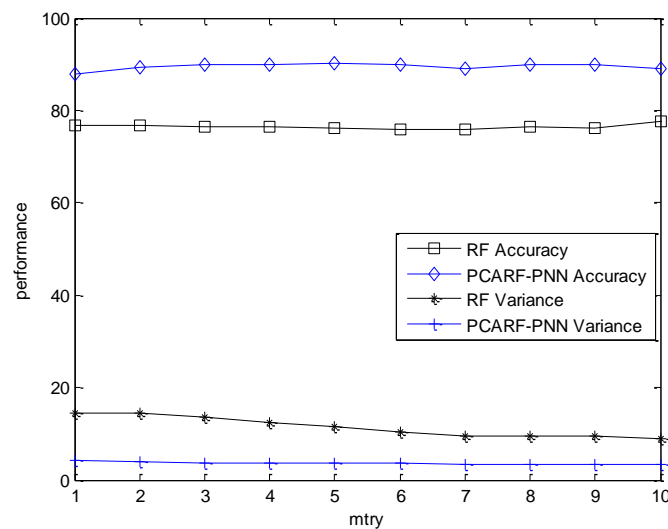


Fig. 1. Performance of the Two Models with Different “mtry” Parameters on Automobile Insurance Claims Data Set

Highlights

- A multiple classifier system based on Random Forest, Principle Component Analysis and Potential Nearest Neighbor is proposed. It improves the classification accuracy of the ensemble classifier by improving the difference of the base classifiers.
- The PCA transforms features in each node to increase diversity thereby resulting in decision trees with low correlation. It selects a tree with higher accuracy from larger number of decision trees in the ensemble feature spaces of PCARF - PNN.
- Random Forest is learned from the perspective of Adaptive Nearest Neighbor. It can be seen as an adaptive learning mechanism of k Potential Nearest Neighbors.
- A new voting mechanism, based on the Potential Nearest Neighbor, is presented to replace the traditional majority vote. It makes full use of the out-of-bag samples information on the decision tree.
- The proposed method is also applied to detect the automobile insurance fraud and the fraud rules are obtained.

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