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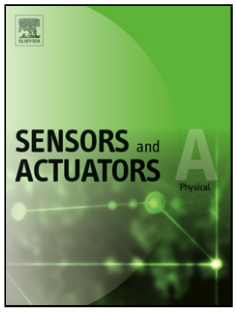

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An optimized multi-classifiers ensemble learning for identification of ginsengs based on electronic nose

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Highlight

- Optimized two-layer Adaboost.M2 ensemble model is constructed for the identification of Chinese herbal medicine based on electronic nose;
- The framework integrates with several classical classifiers in probabilistic forms and utilizes the diversity among them;
- Efficient algebraic fusion rules are employed for combining decisions from classifiers;
- The method contributes to a flexible tool to make valid probabilistic and precise prediction for electronic nose applications, and a feasible solution for online classification.

ABSTRACT

This paper proposes an optimized two-layer Adaboost.M2 model, which resolves a multi-class identification issue for Chinese herbal medicine and aims to enhance the accuracy and reliability of classification. Various base classifiers with probabilistic outputs are integrated in first layer and then transferred to Adaboost.M2 iteration process. Classical fusion rules are verified for optimal combination of classifiers. Identification capacities of base classifiers are investigated using diversity measurement and supply some instructions for optimization of classifier sets. Experimental results show that optimal Adaboost.M2 model integrated with SVM, PNN and LDA achieves the best accuracy of 91.75%, compared to 87.62% from the best single classifier SVM. Corresponding fusion rules are validated with error sensitivity and mean rule is selected while the least error of 8.25% is arrived. The contribution of the paper is that the optimized two-layer Adaboost.M2 with multiple classifiers is a flexible tool to make valid probabilistic and precise prediction for E-nose application in Chinese herbal medicine. This approach also proposes an idea for various ensemble system application, supplies a feasible solution for online classification.

Keywords:

Ensemble learning; Electronic nose; Multiple classifiers; Diversity measurement; Chinese herbal medicine

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