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Improving the classification of invasive plant species by using continuous wavelet analysis and feature reduction techniques

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Abstract

The impacts of invasive plant species on the environment and economy make effectively detecting and mapping them crucial. Using leaf spectral reflectance and the advantages of continuous wavelet analysis (CWA), we aimed to utilize the CWA and features reduction techniques (principal component analysis (PCA), regularized random forest (RRF), and guided regularized random forest (GRRF)) and two famous classifiers (random forest (RF) and support vector machine (SVM)) to discriminate between five invasive plant species. The sample used in the study consisted of 562 leaves representing five species (*Senna uniflora*, Hyptis suaveolens, Parthenium hysterophorus, Prosopis juliflora, and Xanthium strumarium), which were collected from two sites. Both spectra (smoothed and original) were analyzed using CWA with different scales. 120 models of feature reduction methods (PCA, RRF, and GRRF) were established, combined with two classifiers (RF and SVM) and then compared. 90% of the smoothed CWA models (54