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Mutual Information and Entropy based Band Selection for Spectral-Spatial Classification of Hyperspectral Images

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Hyperspectral (HS) datasets are comprised of large numbers of spectral bands (∼100-300) with very narrow bandwidth (∼5-10 nm), which are proven to be very efficient for land-use land-cover classification and numerous other applications. However, the fine spectral and spatial resolution of the HS dataset as compared to multi-spectral data introduces the complexity of high dimensionality leading to high computational cost in data processing. In order to address this issue besides achieving a significantly improved classification performance, a simple information theory based band (or feature) selection approach is proposed in this study. Moreover a spectral-spatial classification technique is used to further enhance the classification accuracy. The proposed approach utilizes an unsupervised feature selection technique based on the information theory measures, mutual information and entropy. Spatial information is included in the model by creating the morphological profiles corresponding to the spectral features (bands) to improve the classification performance. The classification is carried out using the spectral-spatial features in the support vector machine (SVM) classifier. This classification approach has been evaluated for two HS datasets i.e. Indian Pines and Botswana and the achieved overall accuracies are 94.05±0.66% and 97.01±0.77% respectively. Further analysis also suggested that the proposed approach performs comparatively better than other feature selection based classification approaches available in literature.