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Improving biodiversity monitoring through soundscape information retrieval

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Passive acoustic monitoring has been suggested as an effective tool for investigating the dynamics of biodiversity. For instance, automatic detection and classification of sounds can acquire information of species occurrences and behavioral activities of vocalizing animals. However, current methods of automatic acoustic identification of species remain uncertain for most taxa, which constrains the application of remote acoustic sensing in biodiversity monitoring. One challenge is that most of the training samples more-or-less contains undesired sound signals from non-target sources. To overcome this issue, we developed a source separation algorithm based on a deep version of non-negative matrix factorization (NMF). Using multiple layers of convolutive NMF to learn spectral features and temporal modulation of sound signals from a spectrogram, vocalizations of different species can be effectively separated in an unsupervised manner. Based on the pre-trained features, acoustic activities of target species can be efficiently separated from long-duration field recordings. Besides, spectral features of each vocalizing species can also be archived for further utilizations. In this presentation, we will demonstrate the application of deep NMF on separating sounds from different species for both birds and bats. Our results show that the proposed deep NMF approach can be used to establish recognition database of vocalizing animals for soundscape-based biodiversity monitoring, confirming its promising applicability for the field of soundscape information retrieval.

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