Overcomplete ICA-Based Manmade Scene Classification

Author(s): Matthew Boutell (University of Rochester, United States of America) Jiebo Luo (Eastman Kodak Company, United States of America)

Abstract: Principal Component Analysis (PCA) has been widely used to extract features for pattern recognition problems such as object recognition. Oliva and Torralba used "spatial envelope" properties derived from PCA to classify images as manmade or natural. While our implementation closely matched theirs in accuracy on a similar (Corel) dataset, we found that consumer photos, which are far less constrained in content and imaging conditions, present a greater challenge for the algorithm (as is typical in image understanding). We present an alternative approach to more robust naturalness classification, using overcomplete Independent Components Analysis (ICA) directly on the Fourier-transformed image to derive sparse representations as more effective features for classification. We demonstrated that our ICA-based features are superior to the PCA-based features on a large set of consumer photographs.