28 Extraction of Features Using Sparse Coding

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In various pattern recognition tasks the main problem is the extraction of features from raw data. Classification methods are well developed and they work generally very well if the features are suitable for the task. In some cases, physical or some other type of knowledge of the underlying structure of the patterns to be recognized guides the selection of the features. Usually, however, no such knowledge is available or it is incomplete. In these cases, the features have to be chosen heuristically, or by applying adaptive methods, which learn the features directly from the raw data. Sparse Coding combines many properties of two classical adaptive feature extraction methods: Principal Component Analysis and Vector Quantization.
The ability of sparse coding to extract features has been tested using natural images as raw data. A total of 15 images where used in the simulation. A part of one of the images is shown in figure 45. Figure 46 shows 16 out of 400 extracted filters. They are qualitatively similar to Gabor filters, which are widely recognized as a good set of features for image processing. This shows that sparse coding can be used to extract features from raw data.

Figure 45: A part of one of the natural images used in the simulation.

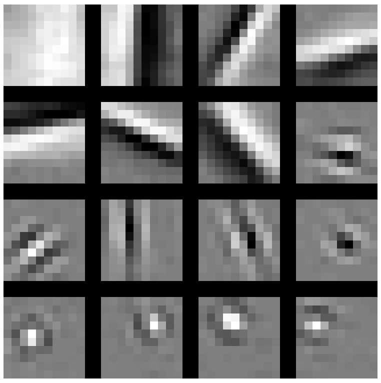

Figure 46: Some examples of features extracted from the images.