Definition of the problem

The general problem can be formalised this way. Suppose we have some random variables $x \in \mathbb{R}^p$ which correspond to a mix of some primitive sources $s \in \mathbb{R}^n$. The aim is to extract from x every source s_i. To do so, we suppose here that:
– the sources are independents
– the mix is linear and instantaneous
– at most one source has a gaussian distribution.
We write:

$$x = As \quad \text{and} \quad y = Wx, \tag{1}$$

where A is the mixing matrix, W the separation matrix and y the estimation of the sources. The goal is then to find the matrix W that maximises the independence of y.)

Measure of independance

As a measure of independence, we consider, for theoretical purpose, the mutual information:

$$\mathrm{I}(Y) = \int_{\mathbb{R}^p} P(Y) \log \frac{P(Y)}{\Pi_i P_i(Y_i)} \mathrm{d}Y. \tag{2}$$

However, as it is too hard to compute, we consider other contrast functions, invariant by permutation, scaling on coordinates and maximal for independant ones. For practical purpose, we consider other contrast function than the mutual information (too hard to compute), which are invariant by permutation and scaling on coordinates and "minimal" for independent coordinates.

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