

Exercise Sheet 6

Density Transformations and ICA

Till Rohrmann - 343756

Jens Krenzin - 319308

Problem 6.2

Random Number Generation

Problem 6.2 Random Number Generation

Formulas:

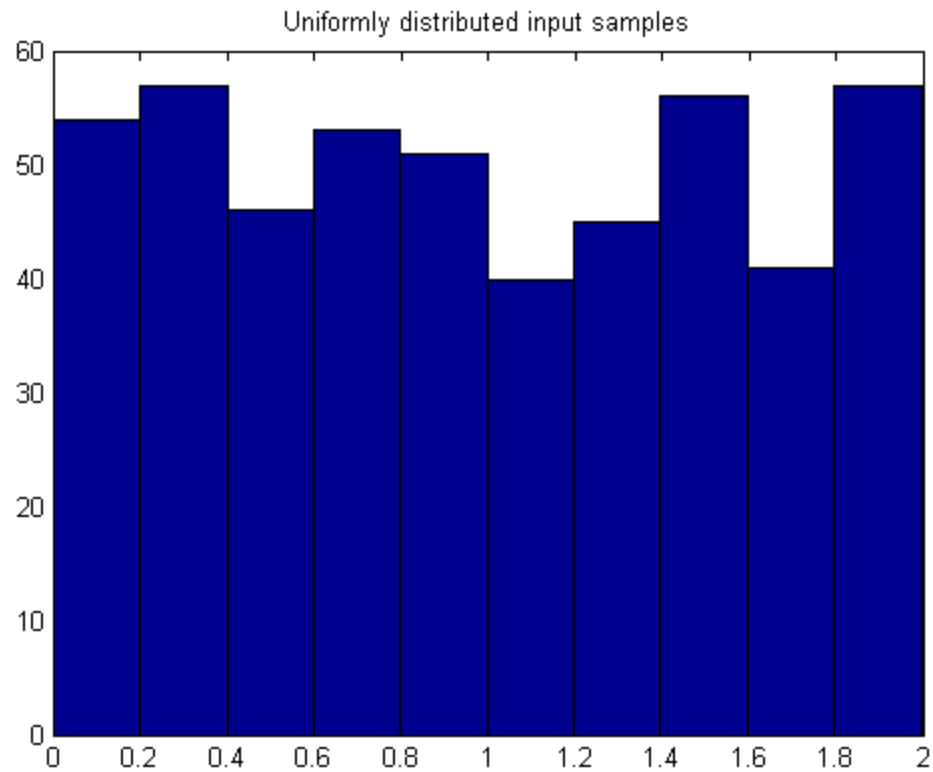
$$p(x) = \frac{1}{2b} \exp \left(-\frac{|x - \mu|}{b} \right)$$

$$F_x(x) = \begin{cases} \frac{1}{2} \exp \left(\frac{x - \mu}{b} \right), & x \leq \mu \\ 1 - \frac{1}{2} \exp \left(-\frac{x - \mu}{b} \right), & x > \mu \end{cases}$$

$$F_x^{-1}(x) = \begin{cases} \mu + b \cdot \ln(|2y|), & x \leq \mu \\ \mu - b \cdot \ln(|2(1 - y)|), & x > \mu \end{cases}$$

Problem 6.2 Random Number Generation

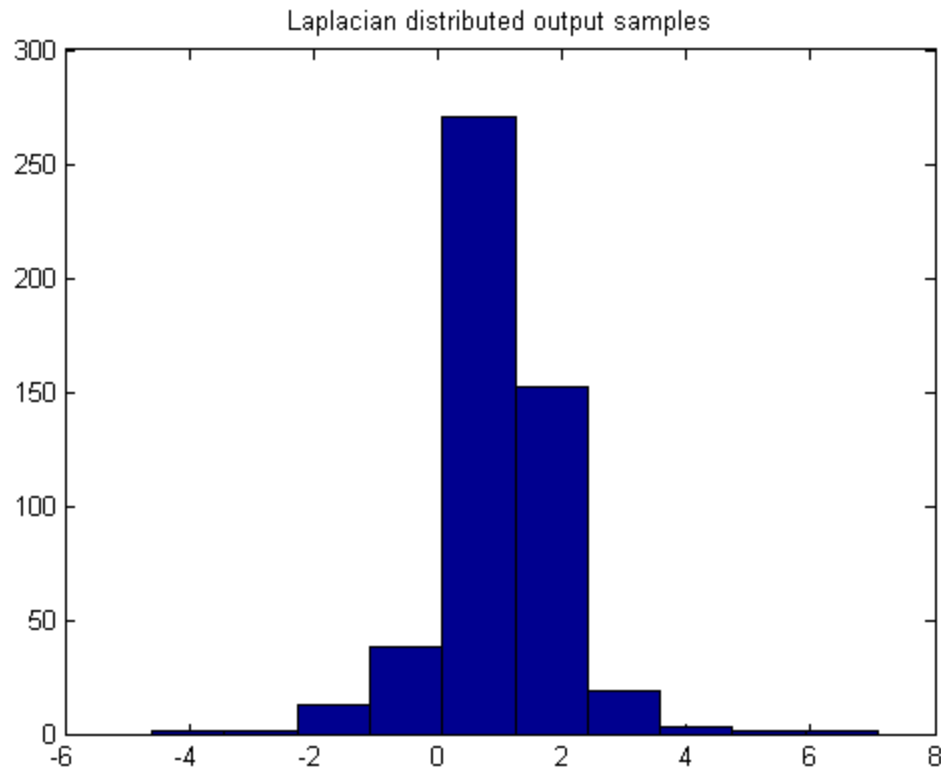
500 Uniformly distributed input samples:



Problem 6.2 Random Number Generation

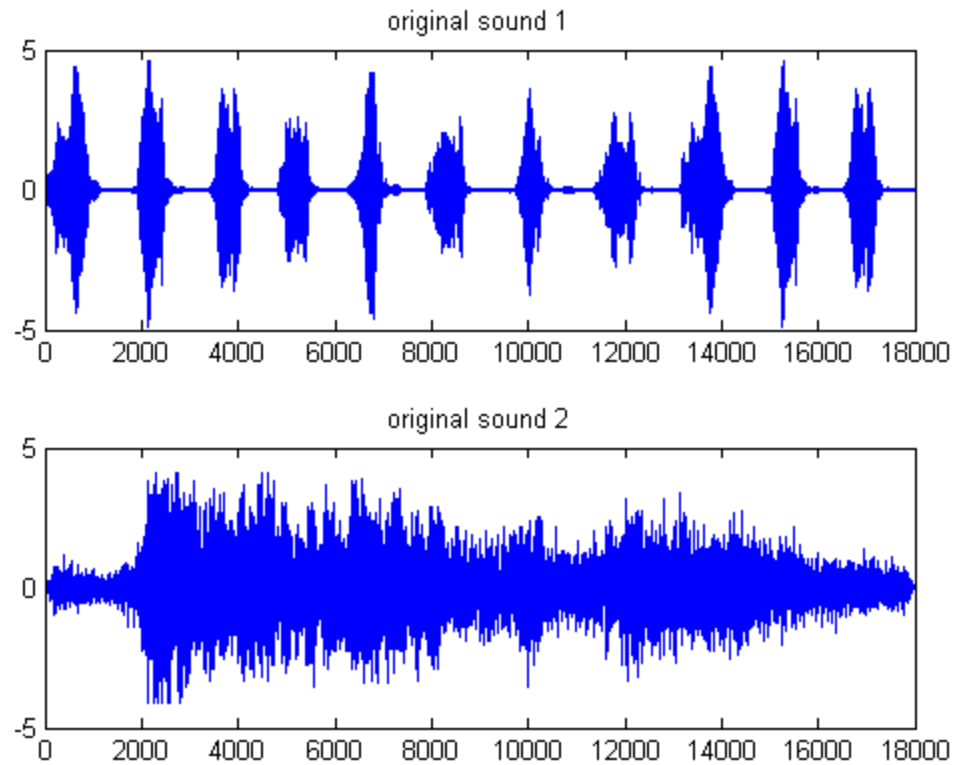
500 Laplacian distributed output samples:

mean = 1
variance = 2



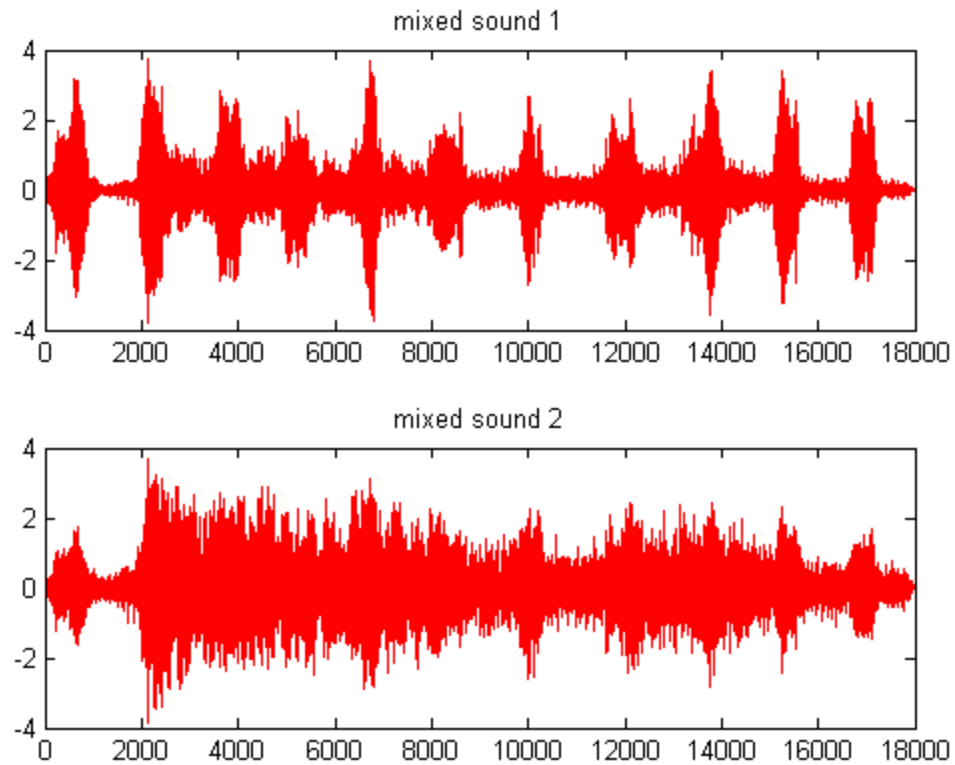
Problem 6.3 ICA

Original sounds:



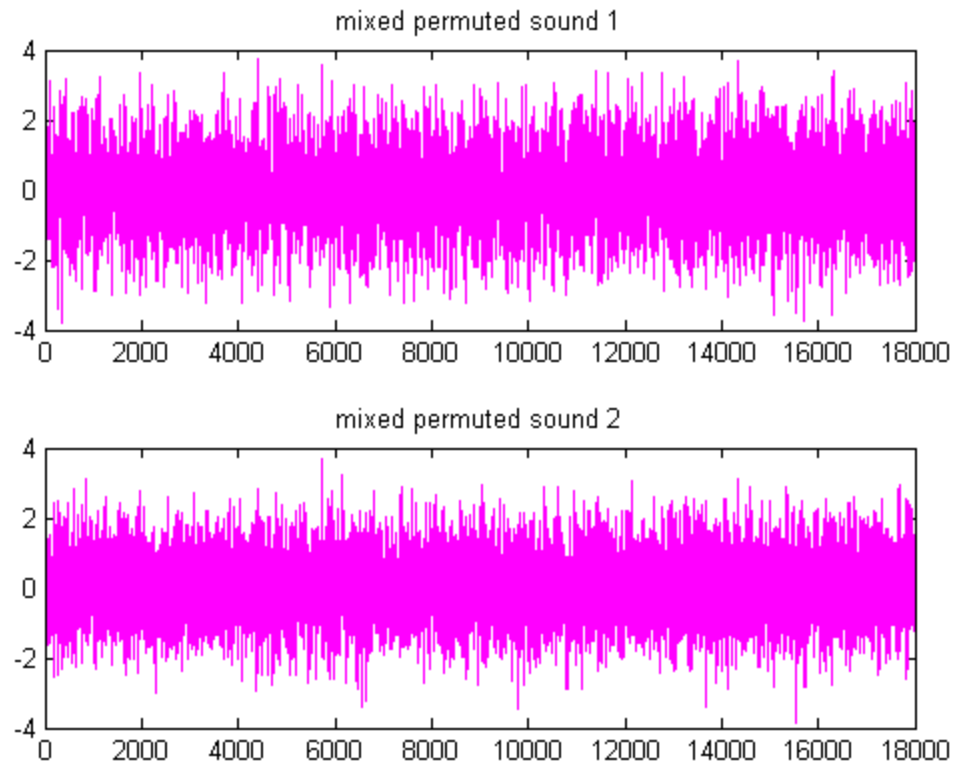
Problem 6.3 ICA

Mixed sounds:



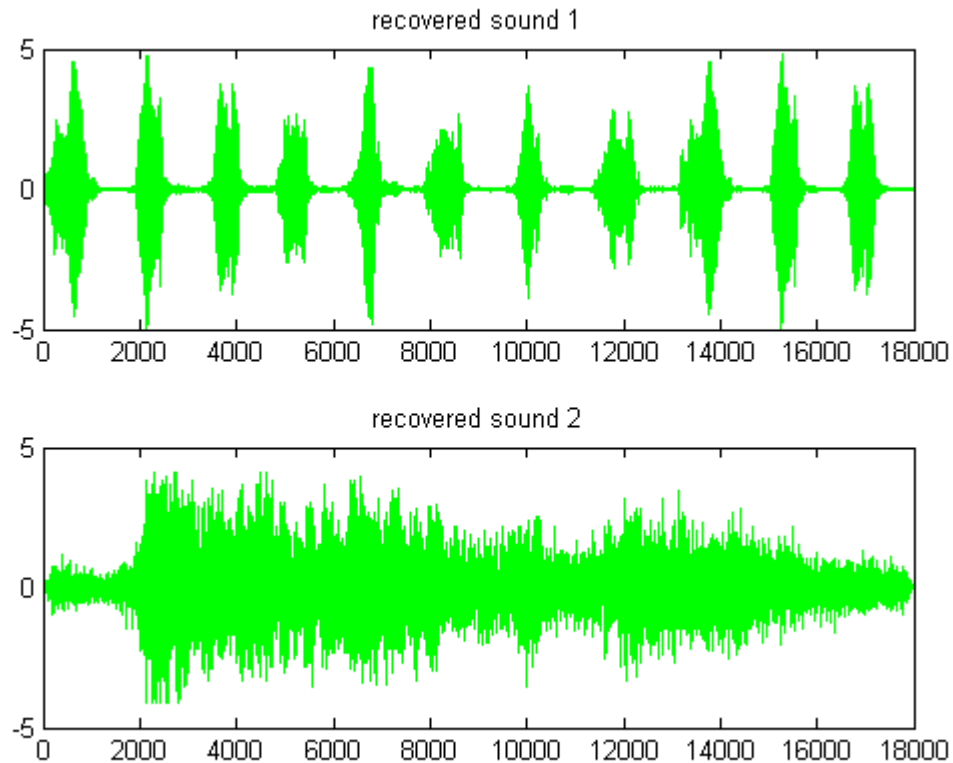
Problem 6.3 ICA

Mixed permuted sounds:



Problem 6.3 ICA

Recovered sounds:



Correlations:

$$\rho_{s,x} = \begin{pmatrix} 1 & 0.0018 \\ 0.0018 & 1 \end{pmatrix}$$

$$\rho_{s,\hat{s}} = \begin{pmatrix} 1 & 0.9997 \\ 0.9997 & 1 \end{pmatrix}$$

Learning rate:

$$\eta = 0.02$$

Problem 6.3 ICA

Comparison

