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Pattern Recognition

Exercises

Practice Sheet 7

Exercise L-7.1 (Maximum-likelihood estimate)

Write an Octave procedure to practically validate your theoretical result of exercise T-5.1 (Maximum-likelihood estimation for exponential distribution).

To this end generate at least 50 different sets of 100 normally distributed training samples with different means and standard deviations. For this, you may use the function randn.
Note that the considered exponential function, given in Theory Sheet 5, is only defined for positive x_i. You must therefore eliminate negative samples before continuing. (Note also, that using a normal distribution for generating the required training data is a pragmatic approximation for producing training data of the exponential function.)

For each data set, determine the Maximum-likelihood estimate for parameter λ – using your theoretical result – and compute the log-likelihood function (for the whole training data set, cf. Chapter 3.2 in the lecture).

For each of the 50 different training data sets, test 100 different settings for λ, centered around the assumed optimal parameter (i.e. the Maximum-likelihood estimate), and illustrate the obtained 100 training data likelihoods in an appropriate figure. Do not forget to label the axes appropriately. Mark the value of the Maximum-likelihood estimate in this figure with a vertical line.

Print some of the obtained figures in your report and comment on your results!