Pattern Recognition
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Exercise Sheet 8
Theory and Practice

Exercise T-8.1: MAP parameter estimation

In this exercise, we consider an image region with constant but unknown gray value c. This constant c is assumed to be a normally distributed random variable with zero mean and variance σ_c^2.

The region is observed by a sensor in the presence of Gaussian noise e, which has zero mean and variance σ_e^2. These n *measured* pixel intensities, which constitute the training corpus, are given by

$$\{x_k \mid x_k = c + e_k, \;\; k = 1, ..., n\}$$

Use MAP parameter estimation to determine the constant gray value $\hat{c}$ of the noisy image region. Compare your result **theoretically and practically** (Octave experiments) with the Maximum-likelihood solution and discuss the differences. Which influence does the number of training samples have?

Hint: The mean of the likelihood $p(x_k|c)$ is c since the random variable e has the mean 0.