

Homework 3

Exercise 1: Let us consider data sampled from a univariate normal pdf with a mean μ and known σ , where the prior of μ is a normal pdf.

1. By using an existing source code, generate the data D from a normal pdf with $\mu=0$ and $\sigma=1$.
2. Plot the histogram from D.
3. Plot the likelihood, the prior, and the posterior as a function of μ .
4. Compare these three functions.
5. Show analytically that the posterior is a normal pdf.

Exercise 2: You need to read and understand the conditional expectation

1. Explain in your own words the conditional expectation.
2. Find $g(x)$, $g(x|y)$, $E(X)$ and $E(X|Y)$, where $g(x,y)$ is a bivariate normal pdf having a full covariance matrix.
3. Consider the roll of a fair die and let $X = 1$ if the number is even and $X = 0$ otherwise. Furthermore, let $Y = 1$ if the number is prime and $Y = 0$ otherwise.
 - a. Find $E(X)$, $E(Y)$, $E(X|Y)$, and $E(Y|X)$.
 - b. Consider that X and Y are independent variables, and $Z=X+Y$. Find $E(Z|X)$.

Exercise 3:

1. Explain in your own words the generative and supervised learning.
2. Give an example.

Deliverable: a report that also includes the code source.

Date: April 22th