

Assignment 2. Conjugate Distributions

Bayesian Methods – Advanced Machine Learning, Spring 2016, Term 3

1. Let $x_1, x_2, \dots, x_N \stackrel{i.i.d.}{\sim} p(x|\lambda) = \lambda \exp(-\lambda x)$, $x \geq 0, \lambda > 0$ (exponential distribution). Find maximum likelihood estimate λ_{ML} , conjugate distribution $p(\lambda)$, posterior $p(\lambda|x_1, \dots, x_N)$ and Bayesian estimate of λ as $\mathbb{E}p(\lambda|x_1, \dots, x_N)$.
2. Write down the density of Gamma distribution $\mathcal{G}(x|a, b) = \frac{b^a}{\Gamma(a)} x^{a-1} \exp(-bx)$ as exponential class distribution. Find $\mathbb{E}x$ $\mathbb{E} \log x$ by differentiation of the partition function.