EECS E6892 Bayesian Models for Machine Learning
Homework 4

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1 Normal-Wishart prior

The multivariate analog ofthe normal-gamma prior is the normal-Wishart prior.

We are given observations $x_1, \ldots, x_n$ from a d-dimensional multivariate Gaussian with a Normal-Wishart prior on the mean and precision matrix: $x_i \sim N(\mu, \Lambda^{-1}), \mu|\Lambda \sim N(m, (\frac{1}{a}\Lambda)^{-1}), \Lambda \sim Wishart(\nu, B)$.

1.1 Posterior $p(\mu, \Lambda|x_1, \ldots, x_N)$

1.2 Marginal likelihood of a singular data point

For a single vector, $p(x) = \int_\Lambda \int_\mu p(x|\mu, \Lambda)p(\mu|\Lambda)p(\Lambda)\partial\mu\partial\Lambda$.

$$p(x) = \pi^{-d/2}\frac{\Gamma}{-}\left(\right)^{d/2}$$

2 EM for Gaussian mixture

3 Dirichlet Process Gaussian Mixture Model (D.P.G.M.M.)

3.1 Normal-Wishart prior