

Homework Notes: I did not work with anyone else on this homework or refer to resources other than the course notes, textbook, and course Piazza page.

Problem 1

A The generative model for a continuous η , a base distribution G_0 , concentration parameter α , and the $\{B_1, \dots, B_K\}$ partitions ($K = \text{inf}$), is:

$$\begin{aligned} (G(\eta \in B_1), \dots, G(\eta \in B_K)) &\sim \text{Dirich}(\alpha G_0(B_1), \dots, \alpha G_0(B_K)) \\ p(\eta_i \in B_j) &= \int p(\eta_i \in B_j | G) p(G | G_0) dG \\ &= \frac{\alpha G_0(B_j)}{\sum_K \alpha G_0(B_k)} \\ &\propto \alpha G_0(B_j) \end{aligned}$$

The posterior is

$$G | \eta_{1:n}, \alpha, G_0 \sim DP(\alpha, G_0 + \sum_{i=1}^n \delta_{\eta_i}(\eta))$$

A simple choice for the base distribution is G_0 is the Gamma distribution, due to the conjugacy of the Gamma distribution with the Gaussian distribution.

B

C

Problem 2