

$\pi \sim \text{Dirichlet}(\alpha)$

for $j = 1$ to K do

$\mu_j \sim \text{Dirichlet}(\beta)$

end for

for $i = 1$ to n do

$C_i \sim \text{Categorical}(\pi)$

$X_i \sim \text{Multinomial}(\theta_{C_i}, l_i)$

end for

The PDF is simply:

$\text{Dirichlet}(\pi | \alpha) \times$

$\prod_j \text{Dirichlet}(\mu_j | \beta) \times$

$\prod_i \text{Categorical}(C_i | \pi) \text{Multinomial}(X_i | (\theta_{C_i}, l_i))$

Updating π , based on the PDF above we have:

$\text{Dirichlet}(\pi | \alpha) \times$

$\prod_{i, \text{ where } X_i = w} \text{Categorical}(C_i | \pi)$

$\pi \propto \text{Dirichlet}(\alpha + \text{cnt})$ where cnt is a vector with cnt_c the total number of word in doc i produced by category c .

Updating μ For a Given j .

Based on the PDF above, we have:

$$\prod_j \text{Dirichlet}(\mu_j | \beta) \times \prod_{i, \text{ where } C_i = C} \text{Multinomial}(X_i | (\mu_C, l_i))$$

$\mu \propto \text{Dirichlet}(\beta + \text{cnt})$ where cnt is a vector with cnt_x the total number of times category c produced by word x .

Updating Category Assignment for i th in n vector

we will have then

$$\text{Categorical}(C_i | \pi) \text{Multinomial}(X_i | (\mu_C, l_i))$$

$$\prod \text{Categorical}(C_i | \pi) \text{Multinomial}(X_i | (\mu_{C_i}, l_i))$$

So we have

$$\Pr[C_i = C | \pi, \text{ all } (u, l), x_i]$$

$$\propto \text{Categorical}(C | \pi) \text{Multinomial}(X_i | (\mu_C, l_i))$$

This is just to compute the following for each C

$$\text{Categorical}(C | \pi) \text{Multinomial}(X_i | (\mu_C, l_i))$$

Then normalize

And update C_i by sampling C from resulting Categorical distribution

