Collapsed Gibbs for LDA

Model

$$p(\theta_d) = \mathrm{Dir}(\beta) \qquad p(\phi_t) = \mathrm{Dir}(\alpha)$$

$$p(z_{dn}|\theta_d) = \Theta_{dz_{dn}} \qquad p(w_{dn}|z_{dn}, \Phi) = \Phi_{z_{dn}w_{dn}}$$

Can compute analytically

$$p(\Theta \mid Z) \quad p(\Phi \mid Z, W) \quad p(Z \mid W) = \frac{p(W \mid Z)p(Z)}{C}$$

$$p(Z) \qquad p(W \mid Z)$$

$$p(Z \mid W) \sim \{Gibbs\ Sampling\}$$