Model likelihood for the pronoun model (Orita et al. 2013)

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Multiply 1, 2, and 3 to compute the likelihood of the model.

1. Word level likelihood

$$p(\mathbf{w}|\mathbf{z}) = \left(\frac{\Gamma(V\beta)}{\Gamma(\beta)^V}\right)^K \prod_{k=1}^K \frac{\prod_{v=1}^V \Gamma(N_{k,v}+\beta)}{\Gamma(N_{k,\cdot}+V\beta)}$$

2. Table level likelihood

$$\prod_{j=1}^J p(\mathbf{t}_j) = \prod_{j=1}^J \frac{\alpha^{T_j} \prod_{t=1}^{T_j} (N_{j,t}-1)!}{\prod_{n=1}^{N_j} (n-1+\alpha)}$$

3. Dish level likelihood

$$p(\mathbf{k}) = \frac{\gamma^K \prod_{k=1}^K (M_k-1)!}{\prod_{s=1}^{M_{\cdot,\cdot}} (n-1+\gamma)}$$

Reference

Gershman,S. G. and Blei, D. M. (2012) A Tutorial on Bayesian Nonparametric Models. *Journal of Mathmatical Psychology* 56, 1-12.