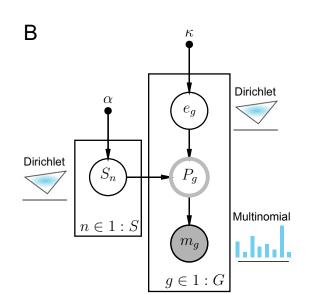


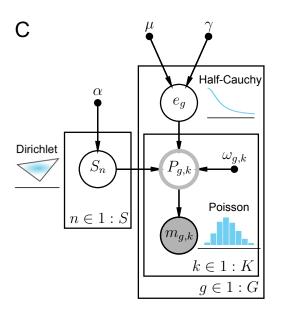
## NMF Generative model

$$e_g \sim \mathrm{Dir}(\kappa)$$
 $S_n \sim \mathrm{Dir}(\alpha)$ 
 $\theta_{g,i} \sim \mathrm{Cat}(e_g)$ 
 $m_{g,i} \sim \mathrm{Cat}(S_n | \theta_{g,i} = n)$ 



## NMF Inferential model

$$e_g \sim \mathrm{Dir}(\kappa)$$
 $S_n \sim \mathrm{Dir}(\alpha)$ 
 $P_{g,k} = \sum_n e_{g,n} S_{n,k}$ 
 $m_g \sim \mathrm{Mult}(P_g | E, S)$ 



## EMu model

 $e_g \sim \text{HalfCauchy}(\mu, \gamma)$ 

 $S_n \sim \text{Dir}(\alpha)$ 

 $P_{g,k} = \omega_{g,k} \times \sum_{n} e_{g,n} S_{n,k}$   $m_{g,k} \sim \text{Pois}(P_{g,k} | \omega, E, S)$ 

## Legend

Fixed value

Random variable

Observed data

Deterministic value



Dependency



**Probability distribution** 



Plate – indicates repeated elements within the model