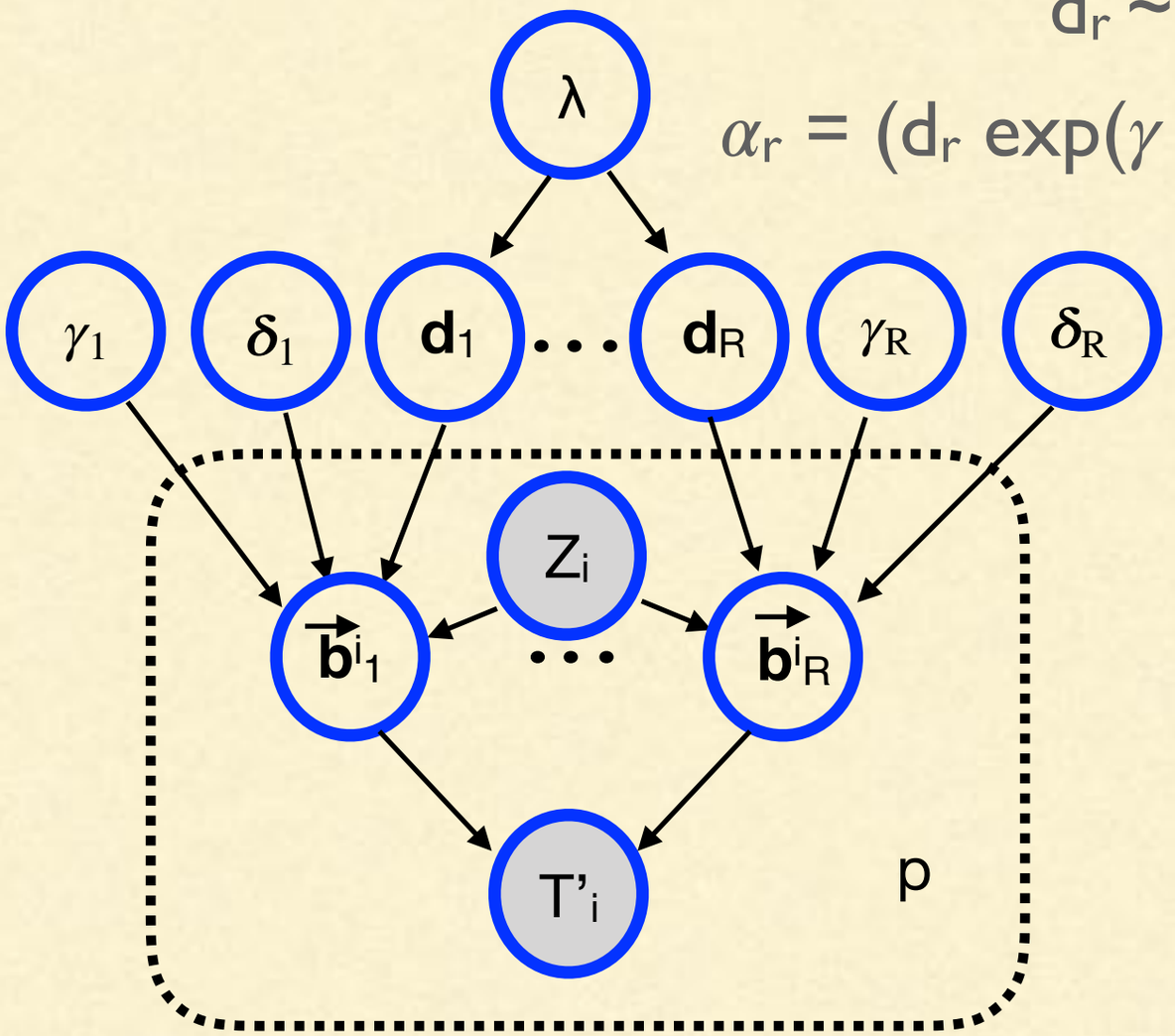
WITH MORE CATEGORIES AND COVARIATES



$d_r \sim$ Exponential (λ) i.i.d. $r = 1 \ldots R$

$\alpha_r = (d_r \exp(\gamma_{r1} + \delta_{r1} Z_i), \ldots, d_r \exp(\gamma_{rC-1} + \delta_{rC-1} Z_i), d_r)$

$r = 1, \ldots, R$

$b_r^i \mid \alpha_r \sim$ Dirichlet(α_r) i.i.d.

$r = 1, \ldots, R$

$\theta_{ic} = X^i_1 b^i_{1c} + X^i_R b^i_{Rc}$

$c = 1, \ldots, C$

$T'_{ic} \sim$ Multinomial(N_i, θ_i)

Note: $\log \mathbb{E}(b^i_{rc}) / (1 - (b^i_{rc})) = \gamma_{rc} + \delta_{rc} Z_i$

A HIERARCHICAL BAYESIAN APPROACH - SIMULATION STUDY

[demo modeling and fitting with pymc3]