Mathematical Specification: Complete Model

Layered mathematical structure of hierarchical modeling

beta ~ Normal(0, 2.5)
sigma_u, sigma_v ~ Half−Cauchy(0, 1)
u_i ~ Normal(0, sigma_u^2)
v_j ~ Normal(0, sigma_v^2)

Bayesian Priors

log(p1/p3) = alpha_1 + X_ij_k*beta_1 + u_i + v_j
log(p2/p3) = alpha_2 + X_ij_k*beta_2 + u_i + v_j

Linear Predictor

Y[ijk] ~ Multinomial(p1, p2, p3)

Observation Model

i = 1,...,6 (monkeys)
j = 1,...,88 (blocks)
k = 1,...,1,443 (trials)
p1 + p2 + p3 = 1

Hierarchical Multinomial Model

Fixed Effects: beta_1, beta_2, beta_3, beta_4
Random Effects: u_i, v_j

MCMC: 4 chains, 2000 iterations
Convergence: R_hat < 1.01