Bayesian Hierarhical Model

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1 Generalized Linear Mixed Model

1.1 Fixed Effect Intercept and Random Slope (Version 1)

We fit a model to our data, where the occurence of the species $(y_{i,j})$ for site i in projected area j is modeled as,

$$
\begin{aligned}
y_{i,j} &\sim \text{Bernoulli}(p_{i,j}) \\
\text{logit}(p_{i,j}) &= \alpha_0 + \beta_j \times \text{dist.human}_{i,j} \\
\beta_j &\sim \text{Normal}(\mu^\beta, \sigma^\beta)
\end{aligned}
$$

1.1.1 Priors

$$
\begin{aligned}
\alpha_0 &\sim \text{Logistic}(0, 1) \\
\mu^\beta &\sim \text{Normal}(0, 3) \\
\sigma^\beta &\sim \text{Uniform}(0, 5)
\end{aligned}
$$

1.2 Fixed Effect Intercept and Random Slope (Version 2)

$$y_{i,j} \sim \text{Bernoulli}(p_{i,j})$$
$$\text{logit}(p_{i,j}) = \alpha_0 + (\beta_1 + \beta_{2,j}) \times \text{dist.human}_{i,j}$$
$$\beta_{2,j} \sim \text{Normal}(0, \sigma^\beta)$$

1.2.1 Priors

$$\alpha_0 \sim \text{Logistic}(0, 1)$$
$$\beta_1 \sim \text{Normal}(0, 3)$$
$$\sigma^\beta \sim \text{Uniform}(0, 5)$$