Simulate data

library(tidyverse)

set.seed(123)

# Create a dataframe with 20 fields

agriculture\_field <- seq(1:20)

# Generate disturbance yes=1 or no=0

disturbance <- c(rep(1, 9), rep(0,11))

# Generate birds presence or absence yes=1 or no=0

birds <- c(rep(1, 12), rep(0, 8))

df <- data.frame(agriculture\_field, disturbance, birds )

library(brms)

model <- brm(birds ~ disturbance,

data= df,

family = bernoulli(),

iter = 4000

)

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| > model  Family: bernoulli  Links: mu = logit  Formula: birds ~ disturbance  Data: df (Number of observations: 20)  Draws: 4 chains, each with iter = 4000; warmup = 2000; thin = 1;  total post-warmup draws = 8000  Population-Level Effects:  Estimate Est.Error l-95% CI u-95% CI Rhat Bulk\_ESS Tail\_ESS  Intercept -1.18 0.75 -2.82 0.20 1.00 7589 5031  disturbance 9.45 6.56 2.73 26.74 1.01 780 686  Draws were sampled using sampling(NUTS). For each parameter, Bulk\_ESS  and Tail\_ESS are effective sample size measures, and Rhat is the potential  scale reduction factor on split chains (at convergence, Rhat = 1). |
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The family used in your model is Bernoulli, which is appropriate when your response variable "birds" is binary (i.e., only takes on values of 0 or 1). The model also uses a logit link function, which maps the linear predictor to the interval (0,1), ensuring that the predicted values of "birds" are always between 0 and 1.

The Intercept estimate in your model (-1.18) represents the expected log-odds of observing a bird in a field when the disturbance is 0. In other words, when there is no disturbance in a field, the model estimates that the log-odds of observing a bird is -1.18. To convert the log-odds to probabilities, you can take the inverse logit of the Intercept estimate using the following formula:

p = exp(-1.18) / (1 + exp(-1.18)) = 0.235

This means that the model estimates the probability of observing a bird in a field with no disturbance to be approximately 0.235.

The disturbance estimate in your model (9.45) represents the expected change in the log-odds of observing a bird for a one-unit increase in disturbance. Specifically, the model estimates that for every one-unit increase in disturbance, the log-odds of observing a bird increases by 9.45, on average. To convert the log-odds to probabilities, you can exponentiate the disturbance estimate and take the inverse logit using the following formula:

p = exp(-1.18 + 9.45) / (1 + exp(-1.18 + 9.45)) = 0.999

This means that the model estimates the probability of observing a bird in a field with maximum disturbance to be approximately 0.999.

Finally, the effective sample size measures (Bulk\_ESS and Tail\_ESS) and the potential scale reduction factor (Rhat) are used to assess the convergence of the MCMC algorithm used to estimate the model. In general, higher values of effective sample size and lower values of Rhat indicate better convergence. The values reported in your output suggest that the MCMC algorithm has converged well for both the Intercept and disturbance estimates.