

ZOO 800

Homework Week 14

Submission instructions

Submit a single URL to a public GitHub repository on Canvas. Please make sure it works – i.e., that you can clone the repo as a project yourself. **Submit a single URL for each person.**

Problem

In Week 11, we used a model selection process (backward selection) based on p-values described in Faraway pp 270 – 272. This week, we are going to expand on this to evaluate models using likelihood. This is a more wholistic approach to model selection that asks whether additional parameters are justified by improvements to their predictions. We'll try a simple approach – the likelihood ratio test – first. This method only works for nested models where a candidate model can be compared to a simpler model that is a special case of the candidate model – i.e., the models are “nested.” We'll then use AIC to compare multiple models at once.

In both cases, you should use the simulated data set that you analyzed in Week 11 (you would have received this from a partner).

Objective 1

- A. Exchange data (.csv file) with a partner. Share only the data and the ecological background and question. Don't share your simulation code or parameters. That is, don't give them the answer! [Note, this is from Week 11 – just repeating here so it's clear where your data come from]
- B. Fit two alternative models to the data given to you:
 - a. The full model (both X variables and their interaction) and
 - b. A reduced model with no interaction term.
- C. Calculate the negative log likelihood (NLL) of each model using the `logLik` function. Which has the lower NLL?
- D. Compare the two models using the likelihood ratio test (`lmtest::lrtest`) to see whether the NLL of the full model is sufficiently lower to justify the additional parameter. Which model is preferred and what does that mean ecologically? How does your answer compare to the result you obtained when doing backward model selection?

Objective 2

In Objective 1, you determined whether a model with an interaction is better than one without. However, both models could still be bad. A more comprehensive model selection process might involve fitting the full set of possible models and comparing their AIC values in a table.

- A. Develop an AIC table (in a data frame) to compare the following models:
 - a. The full model – intercept, both X variables and their interaction
 - b. Main effects – intercept and both X variables
 - c. Single variable 1 – intercept and X1
 - d. Single variable 2 – intercept and X2
 - e. Intercept only

- B. Which model or models are supported by AIC? What does this mean ecologically?