

Fake project investigating the effects of environmental drivers on iris functional traits

true

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Project description

I made up a fake project for the LDP course using the iris dataset. This is where I would give a broad overview of what my project is. For example, in my fake project, I am studying the effects of environmental drivers on plant functional traits across different habitats. Using data from various plant species, we aim to understand how factors such as temperature, soil composition, and moisture levels influence traits like length and width of sepals and petals.

Data collection

No, no data have been collected for this study yet.

Hypothesis

I am reiterating that this is a fake example for the LDP class using the iris dataset. In my fake example I hypothesize that environmental drivers, specifically temperature and nitrogen levels, will significantly influence sepal and petal length and width. Specifically, I hypothesize that 1) Higher temperatures will correlate with increased sepal and petal sizes, reflecting adaptations to maximize reproductive success in warmer climates, and 2) plants in nitrogen-rich soils exhibiting larger sepal and petal dimensions compared to those in nitrogen-poor soils.

Dependent variable

My dependent variables are sepal length and width, and petal length and width. I will measure these traits in cm using a ruler. I will measure these traits every day.

Conditions

I will establish plots that represent a range of temperatures (e.g., low = 8C, moderate = 15C, and high = 22C) and nitrogen rich (10g NO₃) and poor (0g NO₃) plots to simulate different climatic conditions. Each plot will be replicated 3 times per condition and species.

Analyses

Generalized linear mixed models will be used to estimate parameters associated with the hypotheses listed above. I will perform this analysis in a bayesian framework using uninformative priors for all models. I will plot the parameter estimates and 95% credible intervals for each fixed effect. I want to model sepal length, sepal width, petal length and petal width as a function of temperature and nitrogen levels, while accounting for variations between different species and plots. This would look like: $\text{sepal_length} \sim \text{temperature} + \text{nitrogen} + (1 \mid \text{species}) + (1 \mid \text{plot})$. I simply love doing glms because they are powerful (Bolker et al. 2009).

I will conduct an ANOVA to examine the effects of temperature and nitrogen levels on sepal and petal dimensions between species (i.e. compares means of species 1 to species 2 in same condition).

Outliers and exclusions

I will only exclude plants from my analysis if they do not survive the entire experimental duration. Once data is collected, I will not remove any outliers as variation among species and conditions is the topic of interest.

Sample size

I will measure 50 iris plants per species per experimental condition

Other

I might perform follow-up analyses based on unexpected patterns that I find. Such exploratory analyses, however, will be reported as such.

Study type

My fake study is an experimental, observational comparative study. My study was inspired by the ideas of the students who I TA and is aiming to understand the relationship between environmental factors and plant traits across different species and conditions.

References

Bolker, Benjamin M., Mollie E. Brooks, Connie J. Clark, Shane W. Geange, John R. Poulsen, M. Henry H. Stevens, and Jada-Simone S. White. 2009. "Generalized Linear Mixed Models: A Practical Guide for Ecology and Evolution." *Trends in Ecology & Evolution* 24 (3): 127–35. <https://doi.org/10.1016/j.tree.2008.10.008>.