Linear models

Introductions

- Who you are
- What you would like to learn about

Course background

- Motivation
- Philosophy

What might you learn?

- R
- stats
- math

What is a linear model?

$$y \sim N(X\beta, \sigma)$$

or

$$y = X\beta + \epsilon$$

$$\epsilon \sim N(0, \sigma)$$

Matrix multiplication review

$$X = \begin{bmatrix} 1 & 0 \\ 1 & 1.1 \\ 1 & 2.5 \end{bmatrix}, \beta = \begin{bmatrix} -3 \\ 1 \end{bmatrix}, \text{ what is } X\beta?$$

Linear models

$$y = X\beta + \epsilon$$

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} -3 \\ -1.9 \\ -0.5 \end{bmatrix} + \begin{bmatrix} \epsilon_1 \\ \epsilon_2 \\ \epsilon_3 \end{bmatrix}$$

$X\beta$ is the **linear predictor**, ϵ is normal error

Examples of linear models

- model of the mean
- linear regression
- multiple regression
- ANOVA
- ANCOVA
- factorial ANOVA
- general linear models

Case study: amniote life history trait prediction

- R markdown overview
- how to turn in assignments (vote)