

An Introduction to Generalized Linear Models

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Contents

1	Description of our book	5
2	Introduction	7
2.1	Linear models	7
2.2	Some definitions	7
2.3	Assumptions of linear models	7
2.4	What happens when we break the assumptions of linear models .	9
2.5	Examples	9
3	GLMs - Kat	11
4	Linear Models - Emma	13
5	Logistic Regression - Andrew	15
6	Poisson GLMs - Leah	17
7	LearnR test	19

Chapter 1

Description of our book

Someone please update this.

We used (Dunn and Smyth, 2018)

Chapter 2

Introduction

2.1 Linear models

2.2 Some definitions

Predictor - the thing on the y-axis Explanatory variable - the stuff on the x-axis. Note that we can have more than one (but won't plot it then), and then this becomes multivariate regression.

Something that is an estimated quantity will have a hat over it. For example, we might assume that there is some 'true' (but unknown) linear relationship between our explanatory variables and our predictor.

$$y = \beta_0 + \beta_1 x$$

From our sample data, we use a linear model to make an estimate of β_0 and β_1 , so our estimate/best guess of this true model relationship is

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x$$

We of course want our $\hat{\beta}_0$ and $\hat{\beta}_1$ to be a 'good' and 'close' estimate of the unknown quantities β_0 and β_1 . Ideas of what 'good' and 'close' mean will be covered in the next section.

2.3 Assumptions of linear models

Linear models assume:



Figure 2.1: put a bird on it

2.4. WHAT HAPPENS WHEN WE BREAK THE ASSUMPTIONS OF LINEAR MODELS⁹

- The relationship between the explanatory variables and the
- The samples are independent.
- The variance is constant
- The errors are normally distributed with mean 0.

We can write these assumptions down in notation as such.

$$y_i = \beta_0 + \beta_1 x + \epsilon_i$$

where

$$\epsilon_i \sim \text{iid } N(0, \sigma^2)$$

In words, this means that each this means that the errors are independent and identically distributed by the normal distribution, with mean 0 and constant variance σ^2 (notice how there is no subscript i for the variance)

How can we tell when these assumptions are violated?

- Knowledge of the data.
-

2.4 What happens when we break the assumptions of linear models

2.5 Examples

Chapter 3

GLMs - Kat

Chapter 4

Linear Models - Emma

Chapter 5

Logistic Regression - Andrew

Chapter 6

Poisson GLMs - Leah

Chapter 7

LearnR test

Here is an embedded learnR tutorial from a published shiny app.

```
knitr::include_url("https://emilypalmer.shinyapps.io/GRM_LearnR/",  
  height = "600px")
```


Bibliography

Dunn, P. K. and Smyth, G. K. (2018). *Generalized linear models with examples in R*. Springer.