My title*

My subtitle if needed

First author Another author

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First sentence. Second sentence. Third sentence. Fourth sentence.

1 Introduction

The English language has evolved a great deal over centuries and studying its evolution can give insight into the people who use it. Linguists are concerned with studying languages as a science; they observe and listen to speakers, conduct experiments, and perform analyses of languages to investigate the properties and characteristics of particular languages. Linguists may study the frequency of letter usage for a basic understanding of the particular writing system adopted by a language, whether it be syllabic, ideographic, or alphabetic. Additionally, the frequency of letters may vary from language to language and such information is of interest to cryptographers, keyboard designers, game creators.

2 Data

Some of our data is of penguins (**?@fig-bills**), from Horst, Hill, and Gorman (2020).

Talk more about it.

And also planes (**?@fig-planes**). (You can change the height and width, but don't worry about doing that until you have finished every other aspect of the paper - Quarto will try to make it look nice and the defaults usually work well once you have enough text.)

Talk way more about it.

*Code and data are available at: LINK.

3 Model

The goal of our modelling strategy is twofold. Firstly,...

Here we briefly describe the Bayesian analysis model used to investigate... Background details and diagnostics are included in Appendix B.

3.1 Model set-up

Define y_i as the number of seconds that the plane remained aloft. Then β_i is the wing width and γ_i is the wing length, both measured in millimeters.

$$
\begin{aligned}
y_i|\mu_i &\sim \text{Poisson}(\mu_i) && (1)\\
\log(\mu_i) &= \beta_0 + \beta_1 x Numberof Words_i && (2)\\
\beta_0 &\sim \text{Normal}(0, 2.5) && (3)\\
\beta_1 &\sim \text{Normal}(0, 2.5) && (4)\\
& && (5)
\end{aligned}
$$

We run the model in R (R Core Team 2023) using the `rstanarm` package of Goodrich et al. (2022). We use the default priors from `rstanarm`.

3.1.1 Model justification

We expect a positive relationship between the size of the wings and time spent aloft. In particular...

We can use maths by including latex between dollar signs, for instance θ.

4 Results

Our results are summarized in Table 1.

5 Discussion

5.1 First discussion point

If my paper were 10 pages, then should be be at least 2.5 pages. The discussion is a chance to show off what you know and what you learnt from all this.

Table 1: Explanatory models of flight time based on wing width and wing length

	First model
(Intercept)	0.98
	(0.14)
word_count	0.08
	(0.01)
Num.Obs.	230
Log.Lik.	−509.987
ELPD	−511.8
ELPD s.e.	7.1
LOOIC	1023.7
LOOIC s.e.	14.2
WAIC	1023.6
RMSE	2.17

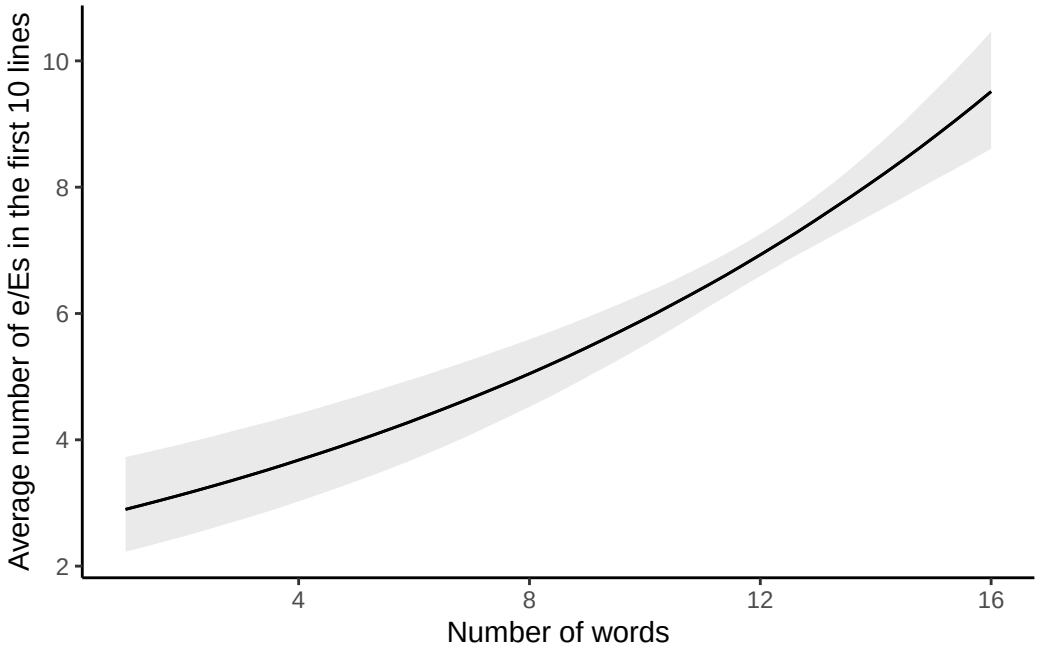


Figure 1: Explanatory models of flight time based on wing width and wing length

5.2 Second discussion point

5.3 Third discussion point

5.4 Weaknesses and next steps

Weaknesses and next steps should also be included.

Appendix

A Additional data details

B Model details

B.1 Posterior predictive check

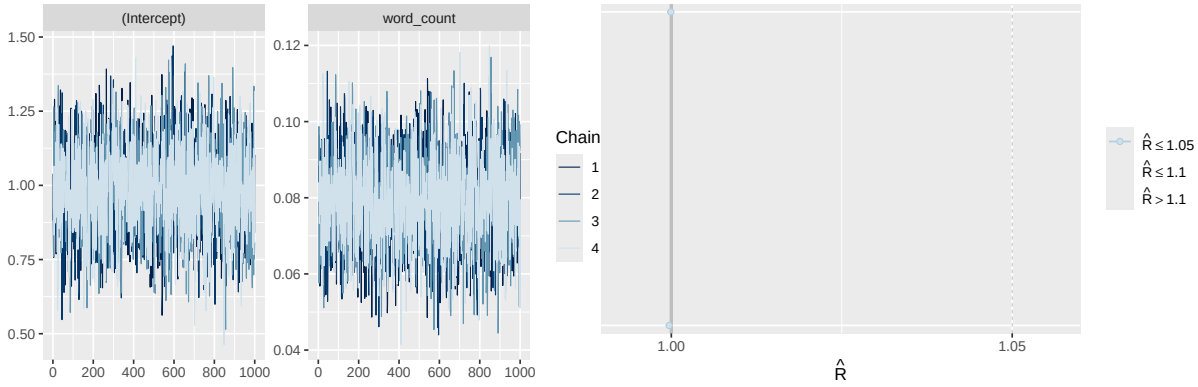
In **?@fig-ppcheckandposteriorvsprior-1** we implement a posterior predictive check. This shows...

In **?@fig-ppcheckandposteriorvsprior-2** we compare the posterior with the prior. This shows...

B.2 Diagnostics

Figure 2a is a trace plot. It shows... This suggests...

Figure 2b is a Rhat plot. It shows... This suggests...



(a) Trace plot

(b) Rhat plot

Figure 2: Checking the convergence of the MCMC algorithm

References

Goodrich, Ben, Jonah Gabry, Imad Ali, and Sam Brilleman. 2022. "Rstanarm: Bayesian Applied Regression Modeling via Stan." https://mc-stan.org/rstanarm/.

Horst, Allison Marie, Alison Presmanes Hill, and Kristen B Gorman. 2020. *Palmerpenguins: Palmer Archipelago (Antarctica) Penguin Data*. https://doi.org/10.5281/zenodo.3960218.

R Core Team. 2023. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.