Coursework / Project / Final Assignment

YOUR STUDENT ID AND/OR NAME HERE

DATE HERE

1 Introduction

Here's a checklist of things to do:

1. **Header**: Include your student ID in `author:`, and generate a pdf document. If you want to **reference** figures, you will also need to change the output from `pdf_document` to `bookdown::pdf_document2`.
2. **Captions**: Even if you don't reference figures in your report, you have to **caption** them. See the examples below for captioning and working with figures.
3. **References**: Remember to cite the references. For citing references in an Rmd file, see `https://rmarkdown.rstudio.com/authoring_bibliographies_and_citations.html`
4. **External figures**: You can include external figures or diagrams if they cannot be created directly using R code. For example, you may want to include diagrams explaining the method(s) that you find on the Internet. You can use `knitr::include_graphics()` to do so, and you need to include the graphic file in the zip to be submitted.
5. **R code**: Do not submit a separate R script for generating the numbers / figures / tables in the report. Insert R code chunks in the Rmd file to dynamically generate the results. There is no need to print the R code in the report, as long as it is in the Rmd file. This can be achieved by the chunk option `echo=FALSE`. The other useful options are `message=FALSE` (to suppress the messages from R e.g. those messages about conflicts when you load `tidyverse`), `include=FALSE` (to suppress printing the results). See `https://yihui.org/knitr/options/` for a full list of options.

2 Methods

In this project I explored the method by James et al. (2013). Here's an equation for the method:

$$\pi = 3.141592\ldots$$

And Figure 1 (from https://xkcd.com/518/) is the flow chart of the method:

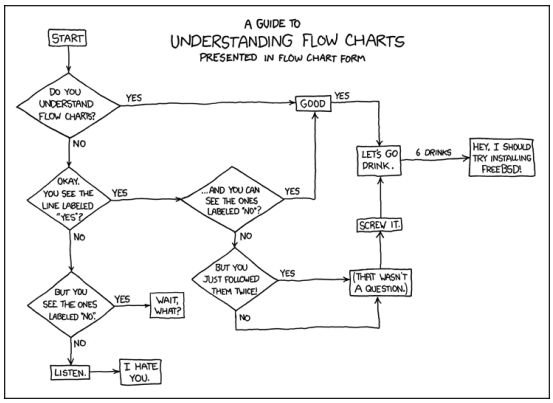


Figure 1: flowchart about flowcharts.

3 Theory

(a)

Use align* environment if you want to align the equations using the & symbol. Use align environment if you also want equation numbers on the right (try removing the * in the Rnw file and see what happens).

The likelihood is

$$\begin{aligned} L(\boldsymbol{y}|\theta) &= \prod_{i=1}^{n} p(y_i) \\ &= \prod_{i=1}^{n} i \\ &= n! \end{aligned}$$

(b)

You can also use the equation environment if there's no need for alignment. Make sure the line in the generated document is not too long.

The log-likelihood is

$$l(\boldsymbol{y}|\theta) = \log n! = \sum_{i=1}^{n} \log i, \tag{1}$$

and you can use equation 1 for subsequent calculations. Observe the use of `\log`, not `log`, in equations. The same goes for `\exp`.

Use `\label{}` & `\ref{}` in equation or align environment in the Rnw file when you want to label and reference equations later.

(c)

You can also type equations using `\[` and `\]`, or a pair of double dollar signs $$ in the source file. See the alternative in the line that is commented out in the source file.

The score is

$$S(\boldsymbol{y}|\theta) = \frac{d}{d\theta} l(\boldsymbol{y}|\theta) = \frac{d}{d\theta} \log n! = 0$$

Write some text explanation before or after equations if necessary.

4 Results

After coding the method in Python, the results are saved. Figure 2 shows the results:

You may need to use R code in the source file, but it's not required in the generated file. You can make the R code and messages invisible in the pdf using the options `echo=FALSE` and `message=FALSE`, respectively, in the code chunk.

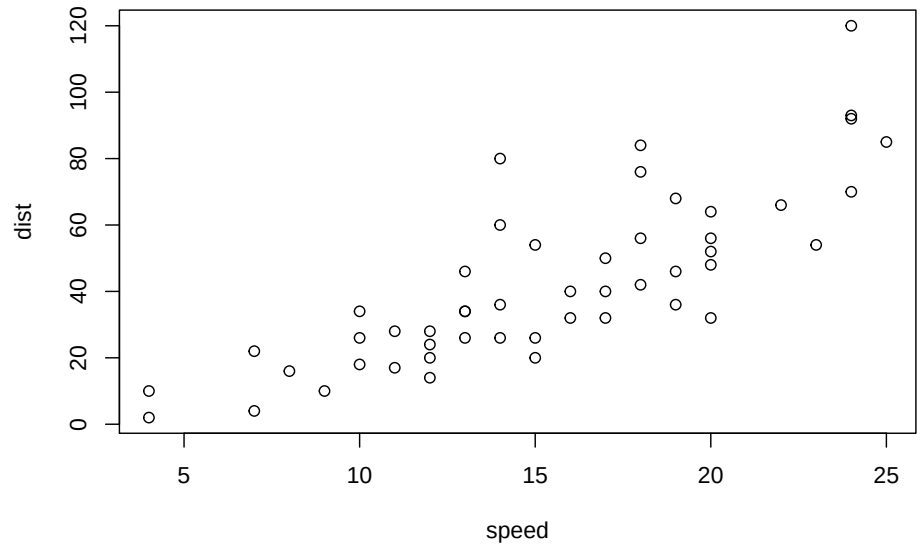
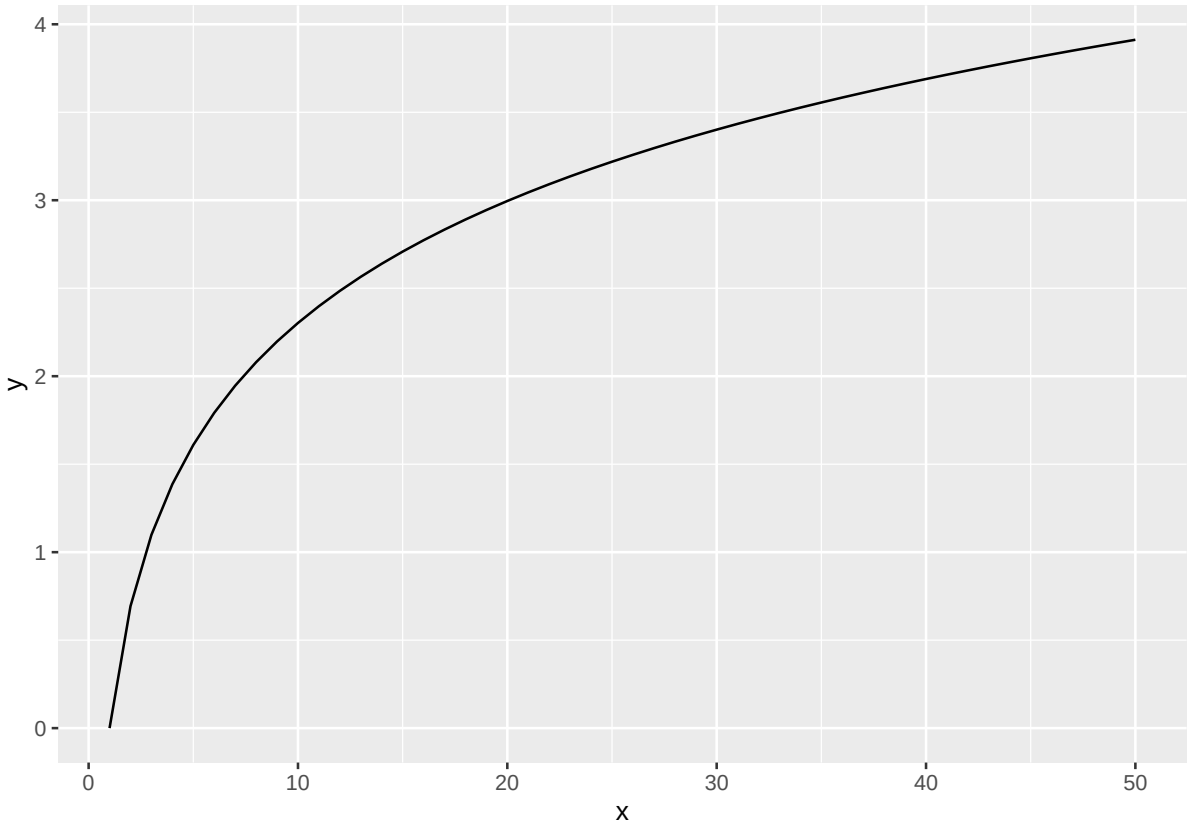


Figure 2: The results.



You can also obtain inline results using `\Sexpr{}` in the source file. For example, the number of points used for the plot is 50. You can use it in equations environment too:

$$n = 50$$

5 Conclusion

I successfully implemented the method.

References

James, G. M., Witten, D., Hastie, T. and Tibshirani, R. (2013), *An Introduction to Statistical Learning: With Applications in R*, Springer Texts in Statistics, Springer.