Lab 1 – MATH 240 – Computational Statistics

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Abstract

This document provides a basic template for the 2-page labs we will complete each week. Here, you should provide a succinct summary about what you did and why it might be helpful.

Keywords: What topics does the lab cover with respect to class?

1 Instructions

For this lab, you will

1. Install R and RStudio
2. Install tinytex (if necessary): **install.packages("tinytex")**
3. Create a Github account here,and email me your username.
4. Install Github Desktop
5. Accept the Lab 1 Document here
6. Recreate this document (except put your name/info at the top)to get used to writing in LaTeX and to see the types of things we can do when creating a document to convey statistical information.Make sure to commit and push your work using GitHub desktop as you finish each section.

Remark: You will find the class Sweave cheat sheet to be *incredibly*(`\emph{incredibly}`)helpful.

2 Word Processing Tasks

2.1 Centering Text

We can center text in Sweave.

2.2 Bolds, Italics, and Underlining

We can **bold**, *italicize*, underline, and *emphasize* text in Sweave.

Note, I did a column break here so that the list wasn't broken a cross columns.

2.3 Lists, and Numbered Lists

We can write an unordered list in Sweave.

- first item
- second item
- third item

We can write an numbered list in Sweave.

1. first item
2. second item
3. third item

We can write a lettered list in Sweave.

a. first item
b. second item
c. third item

2.4 Submissions

This part of the midterm is due Sunday November 14 by 5p. I will not accept late submissions. Note that you may use this template to help build your introduction and methods sections,and you can use the work you did as a group during the datathon. Still, I expect this submission to be your own summary and extension of that work without collaboration.

2.5 Typing Mathematical Equations

We can write a one line equation that is centered like this

$$\widehat{y_i} = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{1i} x_{2i} + \epsilon_i.$$

This can be written in the text, as $\widehat{y_i} = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{1i} x_{2i} + \epsilon_i$ using as well.

When we need to show multiple steps,we can create a multi-line equation that is centered like this:

$$\begin{aligned} 8(x-5) + x &= 9(x-5) + 5 \\ 8x - 40 + x &= 9x - 45 + 5 && \text{(Distributing)} \\ 9x - 40 &= 9x - 40 && \text{(Combining like terms)} \\ 9x &= 9x && \text{(Adding 40 to both sides)} \\ x &= x && \text{(Dividing both sides by 9)} \end{aligned}$$

The equality holds for any x.

Note, I did a page break here so that the next section started on a clean page.

2.6 Running R code

Code chunks can be entered into Sweave; e.g., here are some comments.

```
# R code goes here
# Output is automatically printed in the pdf
```

Below, you can see that we can do algebra with R.

```
8*(9-5)+9 # 8(x-5) + x for x=9

## [1] 41
```

Below,we show we can produced the code without evaluating it.

```
8*(9-5)+9 # 8(x-5) + x for x=9
```

Alternatively, we can produced the output without the code.

```
## [1] 41
```

We can also call object values from R directly.

```
result <- 8*(9-5)+ 9 #8(x-5)+x for x=9
result.with.error <- result + rnorm(1,mean=0,sd =0.1)
result.with.error

## [1] 40.94749
```

The result is 40.9474905. Note that I did not type the result, but I used the `\Sexpr{}` command.

2.7 Plotting

We can also plot with R.

```
#Plot a histogram of random normally distributed data
hist(rexp(100))
```

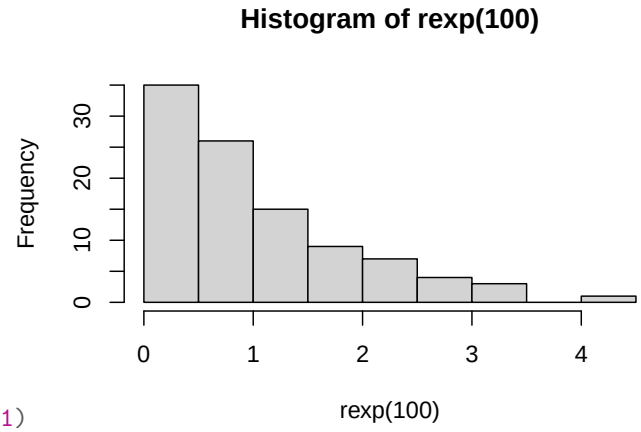

Figure 1: A histogram of random exponentially distributed data, $n = 100$.