Assignment 3

Stat 140SL

1/17/2018

Introduction

RStudio supports the authoring of LaTeX documents using R Markdown or R Sweave (knitr). LaTeX basics were introduced in Week 2. This assignment lets you demonstrate what you can do using LaTeX and RStudio. All of my examples from Week 2 have been posted. **PLEASE DO NOT** copy and paste *any* of my examples and claim they are yours to get credit for this assignment. Once upon a time, a couple of students copied and pasted my in class examples and submitted them for credit. (grr...) I know I can typeset using LaTeX and incorporate R, I am trying to determine if you can too.

Assignment

In one .Rmd file (you may use a .sty in addition to the .Rmd), please demonstrate the following:

- Your name – either in the author line or in a footer/header
- Use of any two packages and at least one package option, you can use any packages you want, its OK to copy and paste my package choices as you really can't modify a package choice.
- The use of
  1. color,
  2. **bold**,
  3. font size change,
  4. and *italics* for emphasis
- Sectioning - for example in this document the sections are named "Introduction", "Assignment", "More LaTeX " and "What To Turn In".
- List structure - such as enumerate (numbering) or itemize (bullets). If you want to challenge yourself, change the numbering to Roman and change the bullet shape.
- Incorporate at least one external graphic from a file (make certain you upload the graphic(s) you used when submitting your assignment for grading)

- Show some R code and its results

```
x <- c(8,6,7,5,3,0,9)
x
```

```
> [1] 8 6 7 5 3 0 9
```

```
x^3
```

```
> [1] 512 216 343 125  27   0 729
```

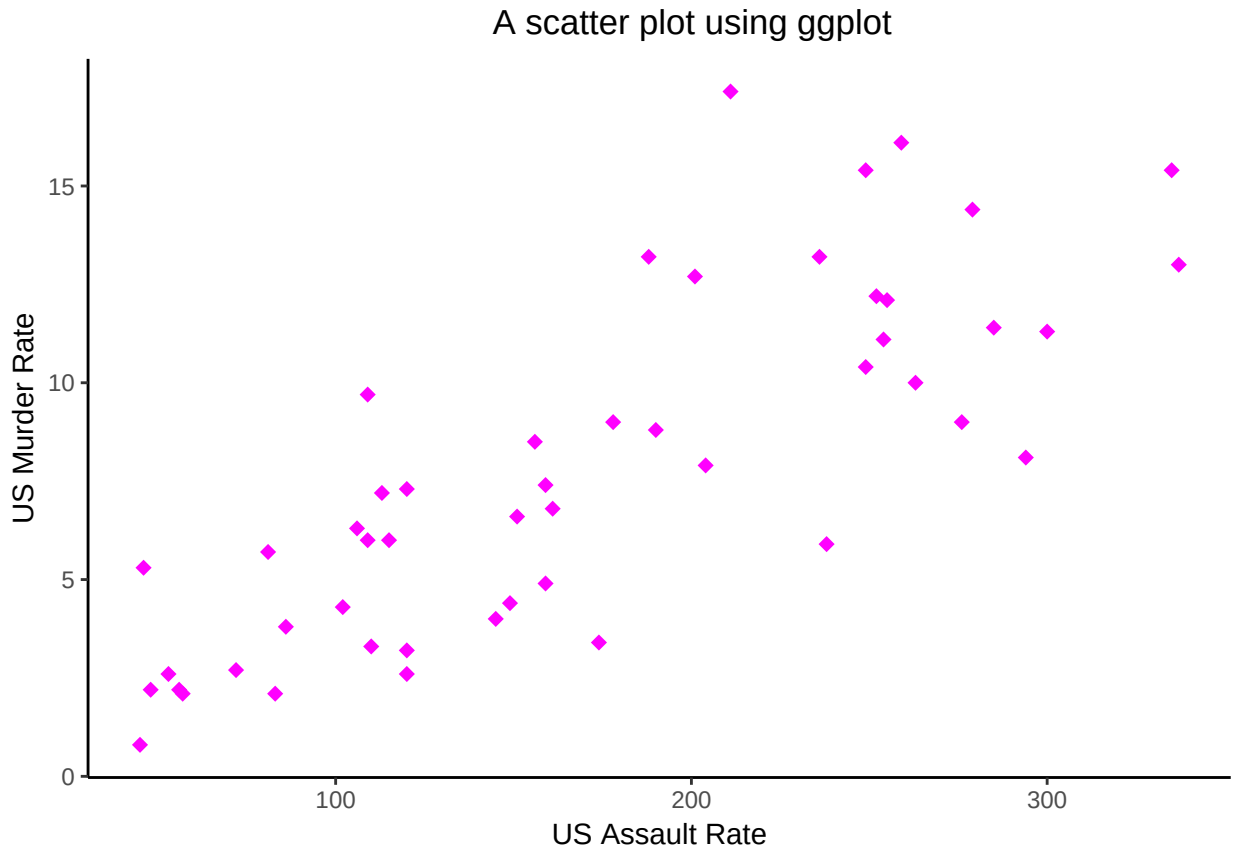
Table 1: Table Example

Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3.0	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa
5.0	3.6	1.4	0.2	setosa
5.4	3.9	1.7	0.4	setosa

```
head(USArrests)
```

```
>            Murder Assault UrbanPop Rape
> Alabama      13.2     236       58 21.2
> Alaska       10.0     263       48 44.5
> Arizona       8.1     294       80 31.0
> Arkansas      8.8     190       50 19.5
> California    9.0     276       91 40.6
> Colorado      7.9     204       78 38.7
```

Also please demonstrate that you are able to suppress the printing of your R code:



And nicely format tables using R Markdown and R

Table 2: Demo Table

speed	dist
4	2
4	10
7	4
7	22
8	16
9	10

More LaTeX

- Please demonstrate the use of mathematics, please use at least one Greek symbol such as α and create at least two lines
  1. For a random sample $X_1, \cdots, X_n$ the *likelihood function* is given as the product of probability or density functions, i.e. $L(\theta) = f(x_1;\theta)f(x_2;\theta)\cdots f(x_n;\theta)$.
  2. The *maximum likelihood estimatate* of θ maximizes $L(\theta)$. If we denote $\hat{\theta} = \theta(x_1, \cdots, x_n)$ to be the maximum likelihood estimate, The *maximum likelihood estimator* (MLE) of θ is $\hat{\theta} = \hat{\theta}(X_1, \cdots, X_n)$. **Note:** x_i are numbers while X_i are random variables.
  3. When the sample size is large, the maximum likelihood estimator of θ is approximately unbiased. The MLE of θ is approximately the MVUE of θ. This is why it is the most widely used parameter estimation technique.
  4. If explicit density function is not available, you can not apply MLE. In this case apply the method of moment matching.
  5. (Invariance Principle) If $\hat{\theta}_1, \hat{\theta}_2$ are the MLE's of θ_1, θ_2, the MLE of $h(\theta_1, \theta_2)$ is $h(\hat{\theta}_1, \hat{\theta}_2)$.
- A table with at least 2 rows and 2 columns
- A matrix with at least 2 rows and 2 columns

$$\begin{bmatrix} x_{11} & x_{12} & x_{13} & \dots & x_{1n} \\ x_{21} & x_{22} & x_{23} & \dots & x_{2n} \\ & \dots\dots\dots\dots & & & \\ x_{d1} & x_{d2} & x_{d3} & \dots & x_{dn} \end{bmatrix} = \begin{bmatrix} x_{11} & x_{12} & x_{13} & \dots & x_{1n} \\ x_{21} & x_{22} & x_{23} & \dots & x_{2n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ x_{d1} & x_{d2} & x_{d3} & \dots & x_{dn} \end{bmatrix}$$

What To Turn In

This assignment is due January 24, 2018 before 11:59pm uploaded under the Assignment 3 Submission link in Week 2 of the course website. Please upload your input file (e.g., .Rmd, .Rnw), your output file (PDF only) and any associated graphics (you may use as many as 9). Late submissions will receive a zero.