REPRODUCIBLE RESEARCH

R MARKDOWN + KNITR

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VISUAL ANALYTICS

based on slides by Roger Peng
(Reproducible Research MOOC)

MARKDOWN

"Markdown is a text-to-HTML conversion tool for web writers. Markdown allows you to write using an easy-to-read, easy-to-write plain text format, then convert it to structurally valid XHTML (or HTML).“

John Gruber, creator of Markdown

EXAMPLE

```
*This text will appear italicized!*
```

This text will appear italicized!

EXAMPLE

```
**This text will appear bold!**
```

This text will appear bold!

EXAMPLE

```
## This is a secondary heading
### This is a tertiary heading
```

This is a secondary heading

This is a tertiary heading

RESOURCES

- http://daringfireball.net/projects/markdown

R MARKDOWN

- R markdown files can be used to generate reproducible reports
- Text and R code are integrated
- Very easy to create in Rstudio

→ no need to generate Readme files

R MARKDOWN

- R markdown is the integration of R code with markdown
- Allows one to create documents containing "live" R code
- R code is evaluated as part of the processing of the markdown
- Results from R code are inserted into markdown document
- A core tool in literate statistical programming

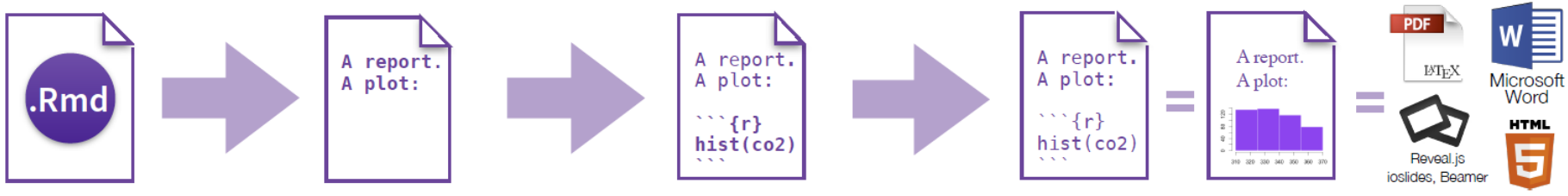
WORKFLOW

i. Open - Open a file that uses the .Rmd extension.

ii. Write - Write content with the easy to use R Markdown syntax

iii. Embed - Embed R code that creates output to include in the report

iv. Render - Replace R code with its output and transform the report into a slideshow, pdf, html or ms Word file.



OPEN FILE

- In Rstudio
  - File -> New File -> R Markdown…
  - Give it a title, leave defaults, click OK

RStudio

File Edit Code View Plots Session Build Debug Tools Help

Go to file/function

Source Viewer | PA1_template.Rmd | logfileReader.R | ExtendingData.R | Code.R | DinoFunWorldExample.Rmd

Knit HTML | Run | Chunks

```
---
title: "Mayhem at DinoFunWorld"
author: "Petra Isenberg"
date: "October 5, 2015"
output: html_document
---

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```{r}
summary(cars)
```

You can also embed plots, for example:

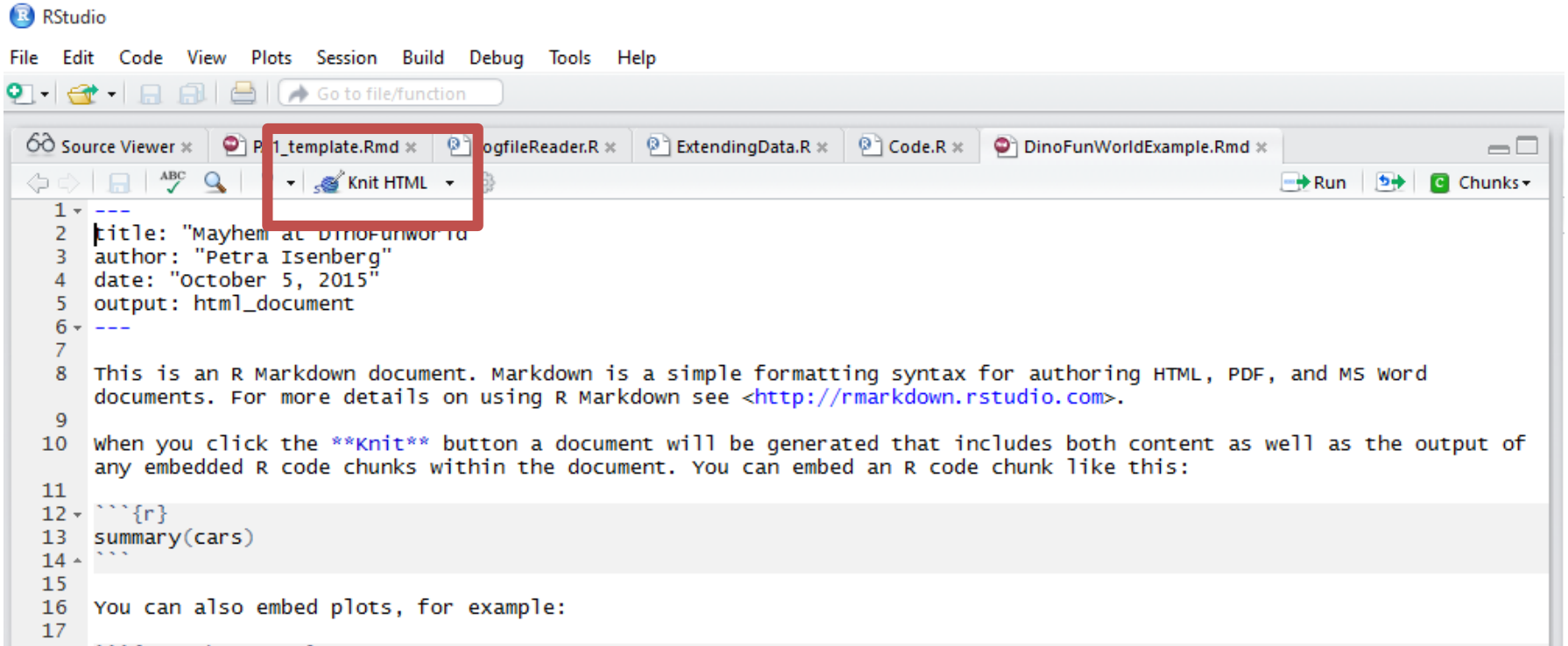
```{r, echo=FALSE}
plot(cars)
```

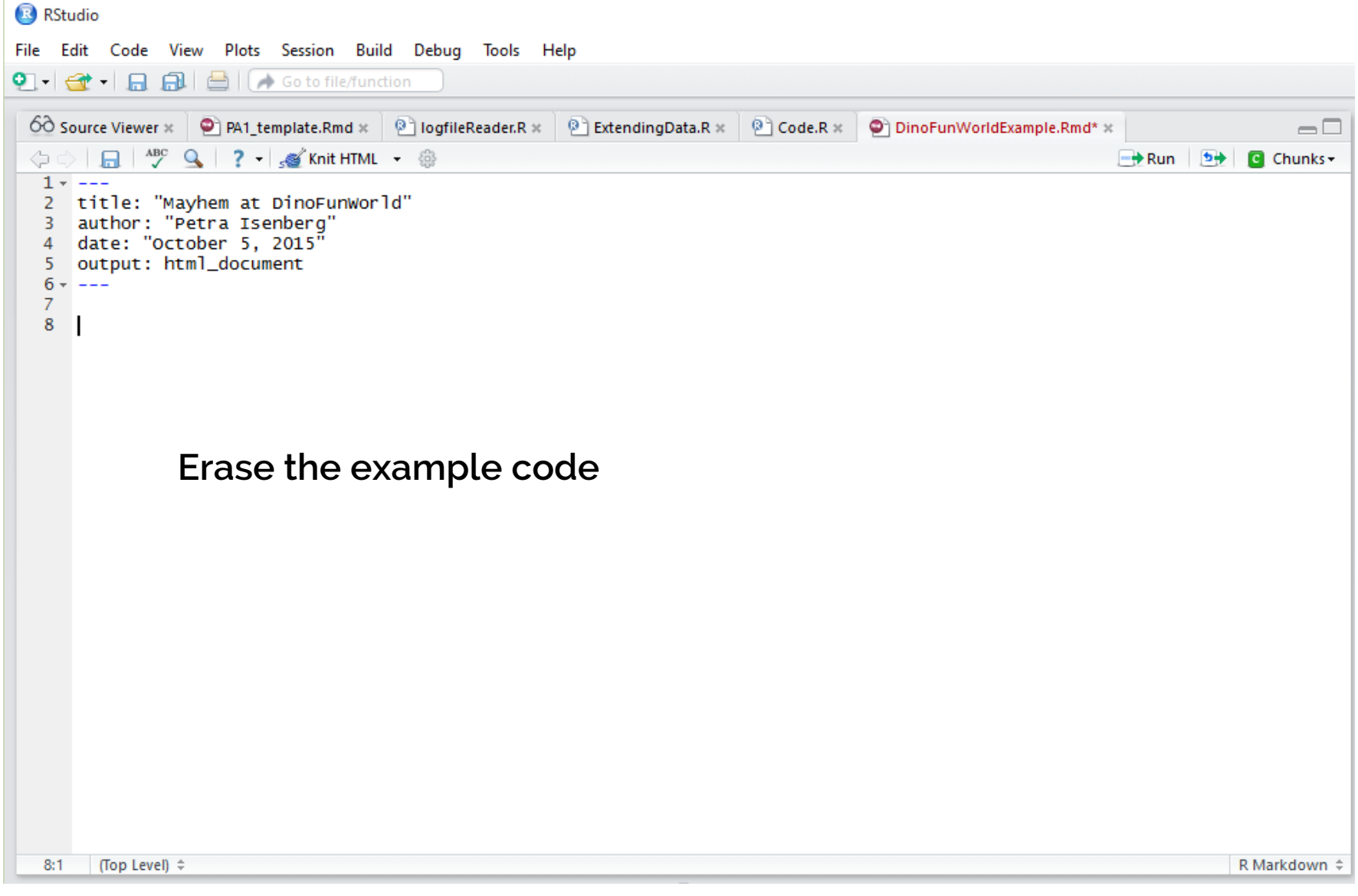
Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.
```

2:1 (Top Level) R Markdown

NEXT

- Click on the Knit HTML Button




RStudio
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Go to file/function
Source Viewer
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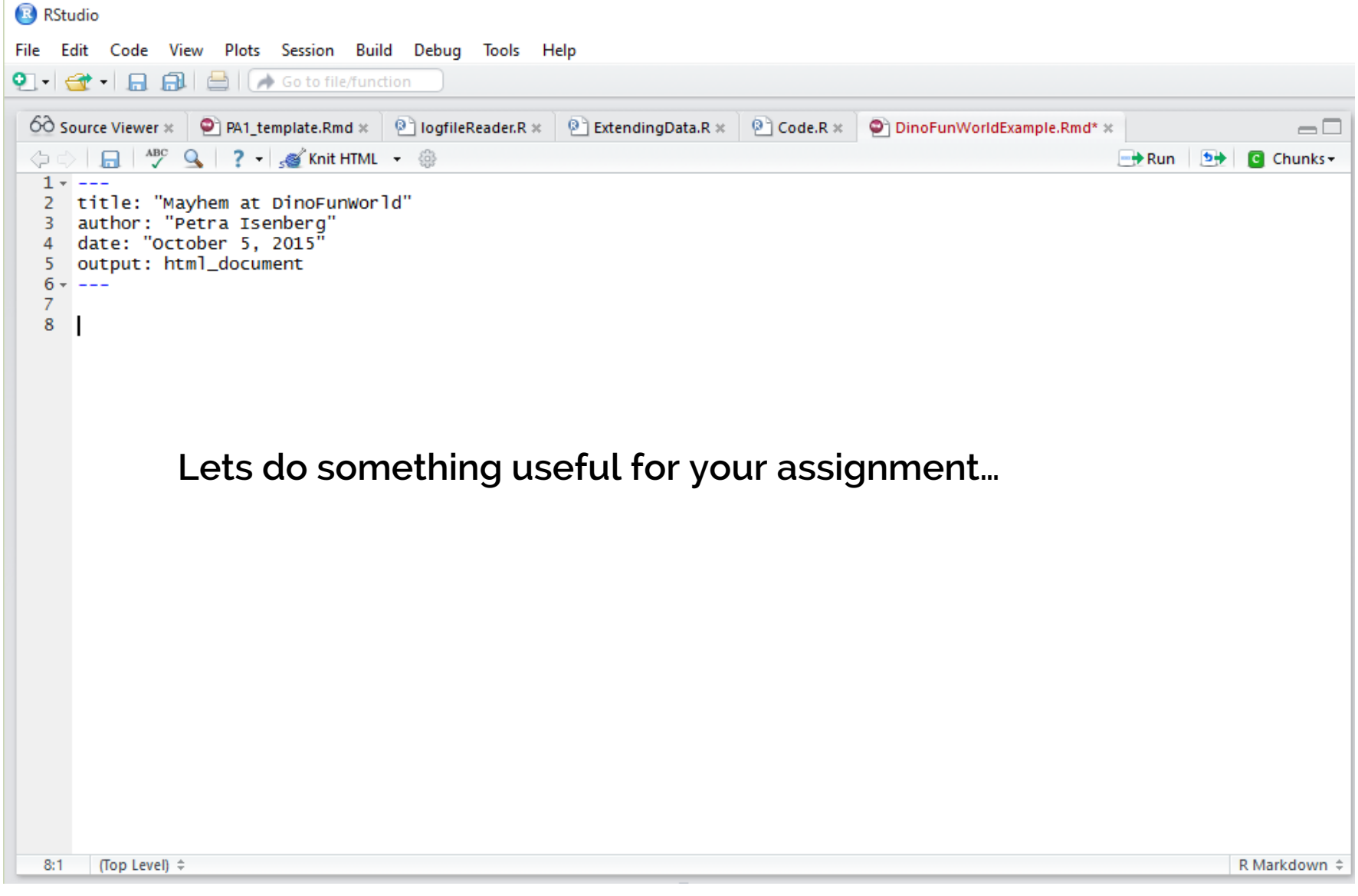
Chunks
1 ---
2 title: "Mayhem at DinoFunWorld"
3 author: "Petra Isenberg"
4 date: "October 5, 2015"
5 output: html_document
6 ---
7
8
Erase the example code
8:1
(Top Level)
R Markdown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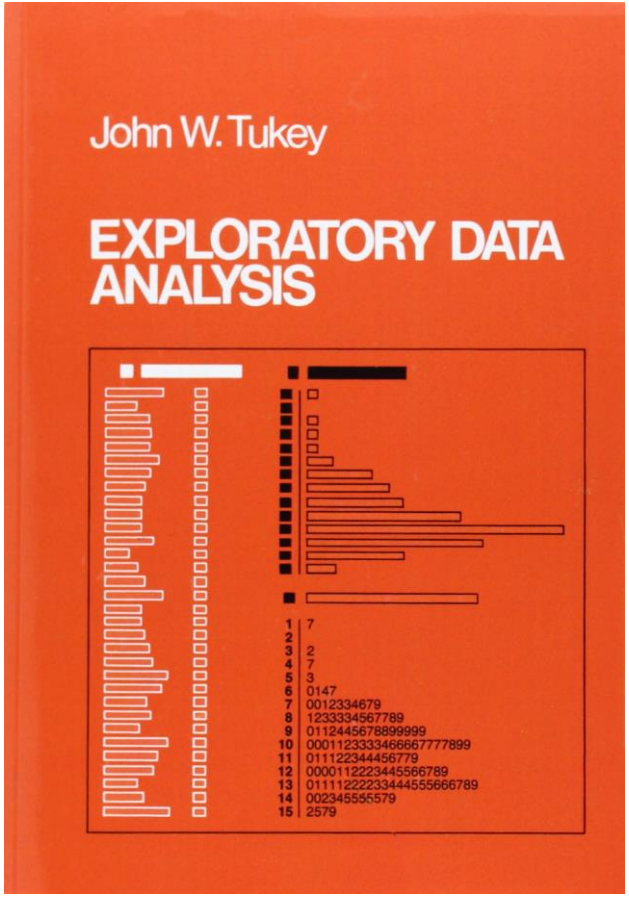
1 ---
2 title: "Mayhem at DinoFunWorld"
3 author: "Petra Isenberg"
4 date: "October 5, 2015"
5 output: html_document
6 ---
7
8
Lets do something useful for your assignment...
8:1
(Top Level)
R Markdown

EXPLORATORY DATA ANALYSIS

“EXPLORATORY DATA ANALYSIS”

JOHN TUKEY

(IN CONTRAST TO “CONFIRMATORY” DATA ANALYSIS)



Based on insights developed at Bell Labs in the 60's

Introduced a number of novel techniques for visualizing and summarizing data:

- 5-number summary
- Box plots
- Stem and leaf diagrams

EXPLORATORY ANALYSIS IS ABOUT UNDERSTANDING DATA AND CHECKING ASSUMPTIONS

- IS THE DATA **CORRECT**?
- DOES IT **MATCH OUR PREVIOUS EXPECTATIONS**?
- IS THERE **A RELATIONSHIP**?
  A CORRELATION?
  A TREND?
  ETC.?

START SIMPLE

IT’S EASY TO GET SIDETRACKED TRYING TO DO COMPLICATED ANALYSES AND MISS THE BASIC STUFF

SOME FIRST STEPS TO START WITH

1. Plot the raw data
2. Plot simple statistics
3. Look at plots together

DON’T TRY TO CREATE A WHOLE NEW CHART ALL AT ONCE!
CHECK YOUR LOGIC AT EVERY STEP.

LOOKING AT DATA WITH “THE PAINTER’S EYE”

J. BERTIN

EMBRACING “SLOW DATA”

STEPHEN FEW

```
#Exploratory Data Analysis with RMarkdown

##Loading the Data

```{r}
data <- read.csv("Paper-Author.csv")
```
```

D:/Google Drive/Teaching/VisualAnalytics Class/2016/Assignments/4_Tutorial-RMarkdown/Tutorial4-RMarkdown.html

Tutorial4-RMarkdown.html | Open in Browser | Find | Publish

Exploratory Analysis Tutorial 4

Petra Isenberg

September 28, 2016

Exploratory Data Analysis with RMarkdown

Loading the Data

```
data <- read.csv("Paper-Author.csv")
```

```
##Inspecting the Data with R

###The first few lines of the dataset

```{r}
head(data)
```


###A summary of the dataset
```{r}
str(data)
```
```

Loading the Data

```
data <- read.csv("Paper-Author.csv")
```

Inspecting the Data with R

The first few lines of the dataset

```
head(data)
```

```
##                   Paper.DOI Deduped.author.names
## 1 10.1109/TVCG.2015.2467324    Rubio-Sanchez, M.
## 2 10.1109/TVCG.2015.2467324              Raya, L.
## 3 10.1109/TVCG.2015.2467324              Diaz, F.
## 4 10.1109/TVCG.2015.2467324           Sanchez, A.
## 5 10.1109/TVCG.2015.2467471            Setlur, V.
## 6 10.1109/TVCG.2015.2467471           Stone, M.C
```

ARE THE FIELDS CORRECT?

WHAT ABOUT THE VALUES?

WHAT ABOUT THE DATA TYPES?

A summary of the dataset

```
str(data)
```

```
## 'data.frame':    9667 obs. of  2 variables:
##  $ Paper.DOI           : Factor w/ 2752 levels "10.0000/00000001",..: 1166 1166 1166 1166 1182 1182 1220 122
0 1229 1229 ...
##  $ Deduped.author.names: Factor w/ 4890 levels "","Abbasloo, A.",..: 3528 3379 882 3598 3756 4018 1937 1785
3860 115 ...
```

SOME FIRST STEPS TO START WITH

1. Plot the raw data

2. **Plot simple statistics**

3. Look at plots together

```
##Some Simple Statistics

```{r}
summary(data)
```
```

Some Simple Statistics

```
summary(data)
```

```
##                         Paper.DOI        Deduped.author.names
##  10.1109/VAST.2011.6102498  :  17   Groller, E.    :  58
##  10.1109/VISUAL.2005.1532845:  17   Kaufman, A.    :  57
##  10.1109/VISUAL.2002.1183812:  15   Kwan-Liu Ma    :  51
##  10.1109/TVCG.2009.164      :  14   Ertl, T.       :  45
##  10.1109/TVCG.2012.278      :  14   Keim, D.A.     :  44
##  10.1109/TVCG.2014.2346911  :  14   van Wijk, J.J.:  38
##  (Other)                    :9576   (Other)        :9374
```

```
##Some Simple Statistics

```{r}
summary(data)

countTable <- as.data.frame(table(data$Deduped.author.names))
colnames(countTable) <- c("Author","Freq")



median <- c(median(countTable$Freq))
mean <- c(mean(countTable$Freq))
stdev <- c(sd(countTable$Freq))

measures <- c("mean","stdev","median")
values <- c(mean,stdev,median)

descriptiveStats <-data.frame(measures,values)
descriptiveStats
```
```

```
###Plotting some simple statistics

The average and standard deviation of average paper counts per author


```{r}


library(ggplot2)


ggplot(descriptiveStats,aes(x=measures,y=values))
+ geom_bar(stat="identity")
```
```

Next, let's look at the distribution

```{r}
sortedCountTable <- countTable[order(-countTable$Freq),]

#we need to order the levels for our plotting function to have the right order
sortedCountTable$Author <- factor(sortedCountTable$Author,levels = sortedCountTable$Author)
#top1000 <- sortedCountTable[1:1000,]

boxplot(countTable$Freq,data=countTable)

qplot(Author,Freq,data=sortedCountTable)
```

Now try to find out how many authors are on a paper on average

RESOURCE

- https://www.rstudio.com/wp-content/uploads/2015/02/rmarkdown-cheatsheet.pdf