R for Document Creation

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R for Document Creation

This workshop will provide an overview of how to create polished documents in multiple formats that incorporate R code chunks and are authored in the **RStudio** environment.

Figure 1:

Goals

Participants will learn...

- The basics of RStudio and why it's useful for creating documents using R
- How to create documents of multiple types
- R packages knitr, pandoc and rmarkdown
- Basics of R Markdown
- The structure of an R Markdown file
- How to embed R code into documents
- How to convert files into different types
- Chunk commands

RStudio

R Studio is a free and open-source integrated development environment (IDE) for R, a programming language for statistical computing and graphics. This is the software we will be using to create our documents.

You must install R before installing RStudio.

Required R packages

- rmarkdown - R package that converts R Markdown documents into a variety of formats. Based on pandoc. Already included with RStudio.
- knitr - R package that generates dynamic reports. Combines a bunch of packages into one tool. Already included with RStudio.
- pandoc - R package for converting documents from one markup format to another. Included in RStudio.
- LaTeX (for PDFs) - software not included, must be installed separately. Typesetting system designed for the production of technical and scientific documentation.
  - MacTeX (Mac)
  - MiKTeX (Windows)

More information about how these packages work together

Types of documents you create:

- HTML files / websites
- PDF
- Microsoft Word
- Interactive documents (Shiny apps)
- Slide presentations
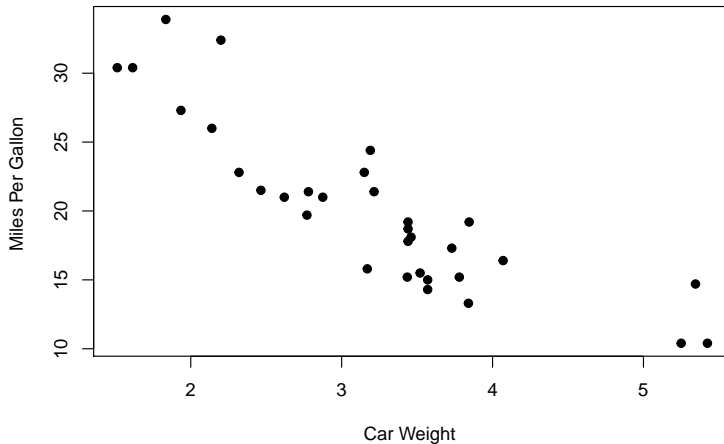- Books
- Journal articles
- etc

Slide with Embedded Code

```r
head(mtcars, 5)
```

```
##                    mpg cyl disp  hp drat    wt  qsec vs am
## Mazda RX4         21.0   6  160 110 3.90 2.620 16.46  0  1
## Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02  0  1
## Datsun 710        22.8   4  108  93 3.85 2.320 18.61  1  1
## Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44  1  0
## Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0
```

Scatterplot Example

R Markdown

R Markdown is a tool for authoring documents. Based on Markdown, which is similar to HTML, only easier.

You can use a single R Markdown file to. . .

- save and execute code (written in R, Python, etc)
- generate high quality reports that can be shared with an audience (with knitr)

R Markdown documents usually include both code chunks and plain text. They can include static or dynamic visualizations.

R Markdown documents are fully reproducible and support dozens of static and dynamic output formats.

Examples from the R Markdown Gallery

How it works

An R Markdown file is the file that you will use to create your document. You can create this file in the RStudio editor, run it and generate the document using the Knit button. R Markdown files have extension (.Rmd)

A typical file has three components:

- header
- R code chunks
- text

Example R Markdown File

```r
1  ---
2  title: "R for Document Creation"
3  author: "Alison Blaine"
4  date: "January 30, 2017"
5  output: slidy_presentation
6  ---
7
8  ```{r setup, include=FALSE}
9  knitr::opts_chunk$set(echo = FALSE)
10 ```
11
12 ## R for Document Creation
13 This workshop will provide an overview of how to create polished documents in multiple formats that incorporate R
   code chunks and are authored in the **RStudio** environment.
14
15 ![](https://www.r-project.org/Rlogo.png)
16
```

Figure 2:

The arrows on the right let you run each code chunk.

R Markdown formatting tells the software how to format the text and whether to display/run the code.

Header

```
1   ---
2   title: "R for Document Creation"
3   author: "Alison Blaine"
4   date: "January 30, 2017"
5   output: slidy_presentation
6   ---
```

Figure 3:

Written in YAML, a format common for configuration files

Title is whatever you want to title it

output options (choose one): html_document, pdf_document, word_document, md_document, ioslides_presentation, slidy_presentation, beamer_presentation

Code chunks

Make a code chunk with 3 backticks then {r}. End chunk with 3 backticks:

```r
107   ```{r mtcars}
108   attach(mtcars)
109   plot(wt, mpg, main="Scatterplot Example",
110       xlab="Car Weight ", ylab="Miles Per Gallon ", pch=19)

111   ```
```

Figure 4:

Text

Formatting text requires R Markdown notation. See R Markdown Reference Guide for more examples.

```
114    normal text
115
116    *italics*
117
118    **bold**
119
120    [hyperlink example](http://www.ncsu.edu)
121
```

Figure 5:

normal text

italics

Practice: Create an HTML file

Instructions:

1. Open RStudio
2. Files > New Folder
3. Create a folder called "RDocsWorkshop"
4. Set as working directory (Click "More" > "Set as Working Directory")
5. File > New File > R Markdown
6. Select HTML
7. Title it "HelloWorld"
8. Click the save button. Save as "HelloWorld"
9. Click "Knit Html" to see it render as an HTML file
10. Change "Knit Html" using the dropdown to Knit to Word" to convert it to a Microsoft Word file

Chunk options

Using chunk options, you can set rules for your code chunks. Use cases:

- to specify the dimensions of a figure
- to make it so a code chunk does not appear in the final document
- to not run the code in the code chunk
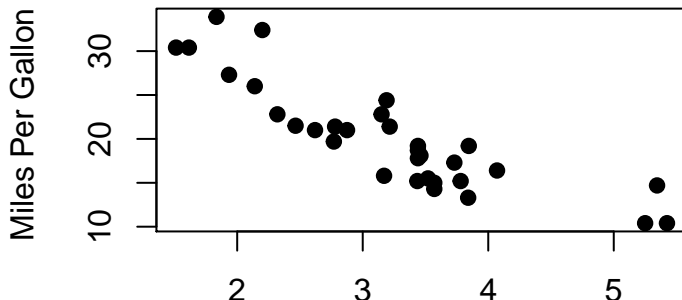- to not display error messages generated by the code

See R Markdown reference guide for more examples!

Example 1:

Using {r echo=TRUE}

```
plot(wt, mpg, main="Scatterplot Example",
    xlab="Car Weight ", ylab="Miles Per Gallon ", pch=19)
```
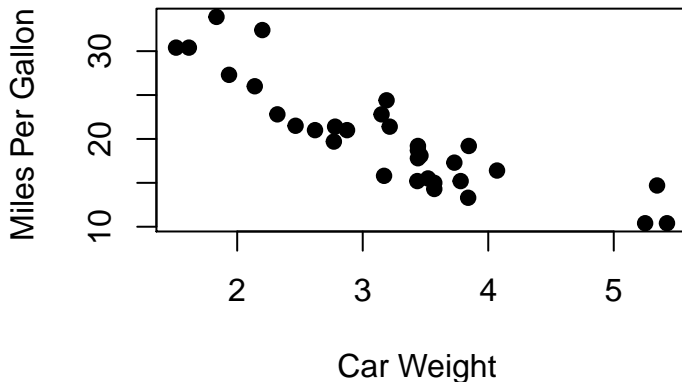

Scatterplot Example

Example 2:

Using {r echo=FALSE}

Scatterplot Example

How to set global Chunk Options

These provide rules for all of the chunks in the document.

Example: knitr::opts_chunk$set(echo = FALSE, fig.width = 4, fig.height = 3)

```
1  ---
2  title: "R for Document Creation"
3  author: "Alison Blaine"
4  date: "January 30, 2017"
5  output: slidy_presentation
6  ---
7
8  ```{r setup, include=FALSE}
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15 ![](https://www.r-project.org/Rlogo.png)
16
```

Figure 6:

Activity

1. Knit HelloWorld.Rmd
2. Change line 9 in your HelloWorld.Rmd file to the following:

knitr::opts_chunk$set(echo = FALSE)

3. Knit the file. Examine the output. What has changed?
4. Now Change line 9 to

knitr::opts_chunk$set(eval = FALSE)

5. Knit the file. What has changed?
6. Change line 9 to

knitr::opts_chunk$set(collapse = TRUE)

Practice: Edit the text

1. Delete boilerplate text and code chunks (lines 12 to the end)
2. Give the document a new title formatted as Header 2 ("Nile Flow Rate 1880-1970")
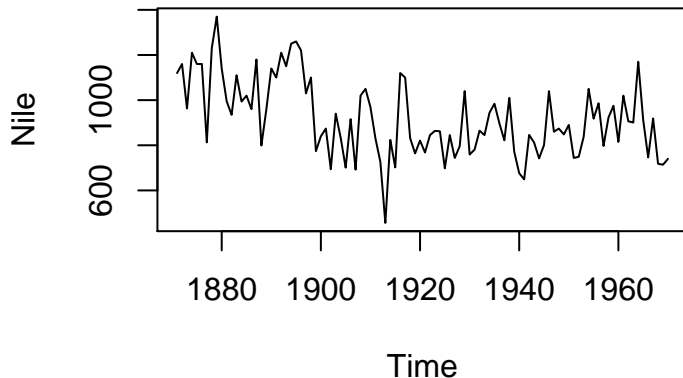3. Create an R code chunk

Load the MASS library

library(MASS)

Reveal the first rows of the data set

head(Nile)

```
## [1] 1120 1160  963 1210 1160 1160
```

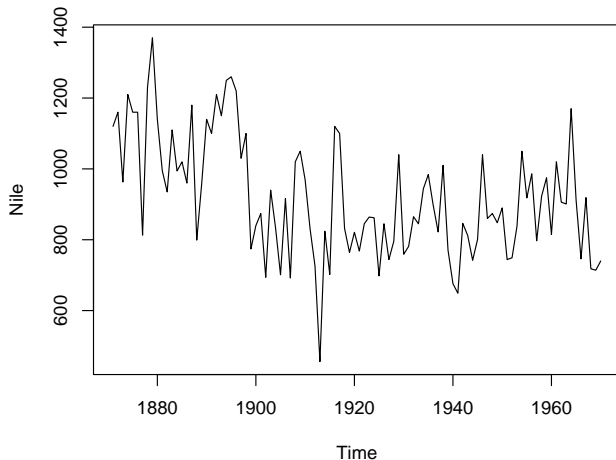# Practice: Add a Plot

Add a plot below your head(Nile) code. plot(Nile)

Practice: Resize the Plot

{r fig.width=6, fig.height=5}

plot(Nile)

Add text to the document

This is a dataset of the annual flow (in m^3) of the Nile River at Aswan from 1871–1970.

*To activate LaTeX typsetting, put dollar signs $ before and after mˆ3

Convert to Word Doc or PDF

It's easy to convert your HTML file to a PDF or Word document. Simply click the dropdown arrow next to Knit to HTML and choose a different document type.

Convert Your Document to a Slide Show

Pandoc will allow you to convert your html file into a slide presentation.

There are three types of slide presentations in pandoc:

- ioslides_presentation
- slidy_presentation
- Beamer (PDF output) - requires a LaTex installation

In the header, chance output type to "slidy_presentation"

output: ioslides_presentation knit document

Next, try output: slidy_presentation

Styling your Slides

- You can add a CSS (Cascading Style Sheet) file to your project if you want to change the styling of your Slide presentation.
- The CSS file must be included in your project directory and named in the header.

```
---
output:
  ioslides_presentation:
    css: styles.css
---
```

- You can also specify presentation size and text size in the header.

For more information, see the documentation