Applied Data Analysis School

LITERATE PROGRAMMING IN R MARKDOWN

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Setup and references

1. Pandoc
2. Latex
   - You can install a lightweight Latex flavor: TinyTex

```
install.packages('tinytex')
tinytex::install_tinytex()
```

   - or a complete distribution: MikTex or MacTex
3. Sumatra PDF or Skim
4. Markdown references
   - Markdown Guide
   - R Markdown - Get Started
   - R Rarkdown: The definitive guide

By the end of the day

you can write a report

- Claxton, G., Rae, M., Long, M., Damico, A., Foster, G. and Whitmore, H., 2017. 2017 Employer Health Benefits Survey. *Kaiser Family Foundation and Health Research & Educational Trust*.

a paper

- Hartgerink, C. H. J., Wicherts, J. M., & van Assen, M. A. L. M. (2017). Too Good to be False: Nonsignificant Results Revisited. *Collabra: Psychology*, 3(1), 9.

edit a book

- Xie, Y., Allaire, J.J. and Grolemund, G., 2018. *R Markdown: The Definitive Guide*. CRC Press.

or build your website

Introduction

- What is **Literate programming**?
  Literate programming refers to melding a descriptive narrative and computer code into a single document, from which both human-friendly documentation and computer readable files can be created
- Your work should be transparent, easy to update, easy to maintain, and easy to replicate
- Data analysis requires reproducibility of results
- Useful for teaching

Preliminaries: Pandoc

- **Pandoc** is a command line tool to convert across different document formats. Try it online **here**
- It supports many formats such as Markdown, HTML, docx, pdf, *LaTeX*, etc
- It is simple to use: to convert the file *example1.md* to
  - HTML

```
pandoc -s example1.md -o example1.html
```

  - PDF

```
pandoc -s example1.md -o example1.pdf
```

  - docx

```
pandoc -s example1.md -o example1.pdf
```

- Note: `-s` stands for source and `-o` for output

Preliminaries: Markdown

- **Markdown** is a lightweight markup language with plain text formatting syntax that was invented by John Gruber
- There are several "flavors" of Markdown
- Markdown files can be created in any text editor
- and can be easily converted to other formats
- They are text files usually with the extension ".md"
- There are many editors specific for Markdown (eg: **Typora**, **Mou**, **Draft**, etc) but you can use general editors (eg: **Atom**, **Sublime Text** or **RStudio**)
- Used in popular sites such as **GitHub**, **Reddit**,**Stack Exchange**, etc

Markdown components

1. **Metadata**: written between a pair of three dashes `---`
2. **Text**: regular text and math elements, plus tables, images and figures
3. **Code**:
   - *inline R code*: starts with `` `r `` and ends with a backtick `` ` ``
   - *code chunk*: starts with three backticks like `` ```{r} `` where `r` indicates the language name and ends with three backticks ```` ``` ````

Markdown syntax: quick introduction

- Creating Headers

```
This is header 1
================
```

or

```
Another header
--------------
```

- or headers with different levels

```
# This is Header 1
...some text...
## And now Header 2
...more text...
### Finally Header 3
... and a little more text.
```

Markdown syntax (continued)

- Emphasizing text

```
this is *Italic* but _this_ also works

this will write in **bold** but you can also __do this__

It is also possible to ~~Strikeout~~ text
```

- Creating unordered lists (use "*" “+” or “-”")

```
* Point 1
+ Point 2
```

Markdown syntax (continued)

- You can create structured lists

```
- Point 1
  - Point 12
- Point 2
  - Point 21
```

- insert links to text. Simply write

```
[text](url)
```

- insert images

```
![text](file "Description")
```

- You can add tables
- and even references

Markdown syntax (continued)

- Markdown documents are highly flexible because they can incorporate other languages
- An example is *LaTeX*. To add *LaTeX* code you need to enclose it in "$" If you write

```
$a^2+b^2=c^2$
```

you will see $a^2 + b^2 = c^2$

- Markdown also accepts raw HTML code
- You can incorporate code from other languages (eg: Python, Java, R, Stata, etc)
- This is typically done in a "code fence": lines with three or more backticks or tildes inserted before and after

Markdown syntax (continued)

- You can find a quick guide for syntax **here** or more detailed information **here**
- To get an idea how Markdown works you can use an online editor such as **Dillinger** or **Markdown here**
- and if you need to create tables you can use **this** great online tool
- You can use the Cheat sheets - also available via the Help menu in RStudio
- For the exercises explore the random text generator Lorem ipsum

Metadata

- You can add a title, author and date as metadata. Simply start the document as

```
% Fill in title
% Fill in Name
% 23 January 2019
```

- Or you can use the **YAML** format. See **Pandoc User's Guide** for more info. To add title, author and date place at the top of the document

```
---
title: Fill in title
author: Fill in name
date: 23 January 2019
---
```

Definig the output formats

- pdf_document
- html_document
- word_document
- beamer_presentation
- ioslides_presentation
- powerpoint_presentation

```
---
title: Fill in title
author: Fill in name
date: 23 January 2019
output:
  pdf_document:
    toc: true
---
```

Adding citations to the document

- it is possible to add citations from a **bibtex** file
- place the "bib" file (say "references.bib") in the working folder
- modify the YAML by adding a line pointing to the bib file

```
bibliography: references.bib
```

- At the bottom of the document add a line

```
## References
```

- use the syntax [@key] to identify the reference

Advanced use: customizing outputs

- The default style for citations is the Chicago Manual of Style author-date format.
- But you can use any style available in Citation Style Language (CSL) in the Zotero Style Repository.
- To change style download the "csl" file and add a reference to it in the YAML block. for example

```
---
title: Title of my presentation
author: My name
date: 23 January 2019
bibliography: references.bib
csl: thisstyle.csl
---
```

Further information

- LITERATE PROGRAMMING IN R MARKDOWN: GitHub repository
- Project available in RStudio Cloud