Data Analysis in R: Overview of R Markdown and its Various Applications

About me

➢ Education

- Ph.D. candidate in Mathematics & Statistics at McGill
- MSc in Mathematics & Statistics at McGill (2018-2020)
- BSc in Statistics at AUB (2014-2018)

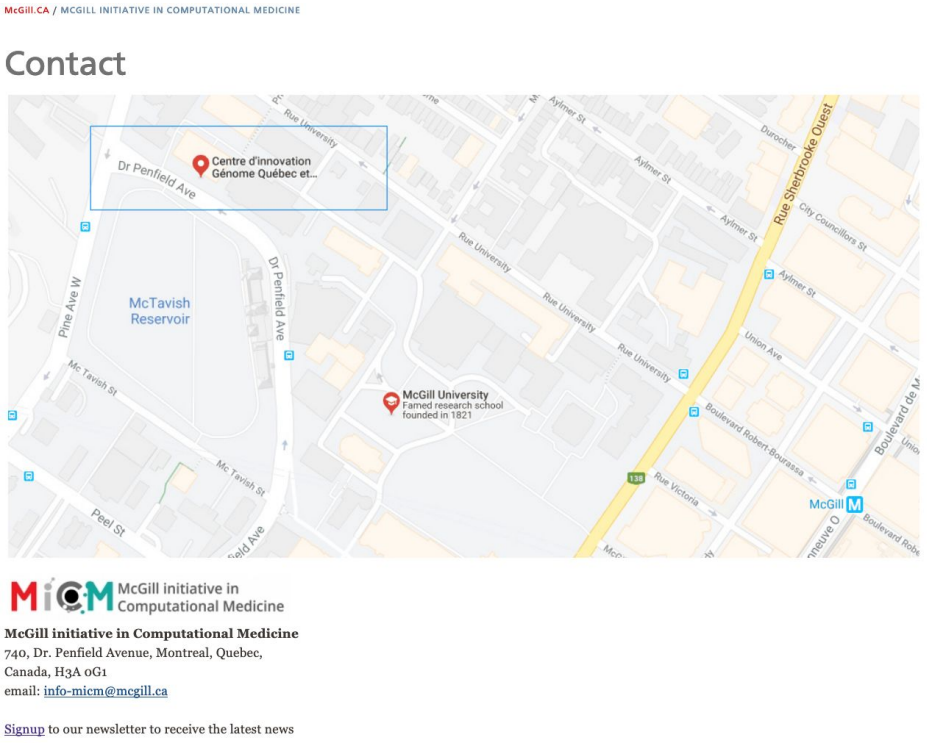
➢ Research Interests

- Bayesian Learning
- Variational Inference
- Applied Deep/Reinforcement Learning
- Adversarial Networks (GANs)

➢ Current Position

- Data analyst and machine learning developer at the Canadian Food Inspection Agency (CFIA), AI Lab
- Graduate Teaching Assistant, McGill University

Mission : aims to deliver inter-disciplinary research programs and empower the use of data in health research and health care delivery



https://www.mcgill.ca/micm

Outline for this afternoon

1:00-1:30 PM Opening Session

1:30-2:15 PM Introduction to Rmd

2:15-2:45 PM Introduction to `flexdashboard` (dashboards)

2:45-3:00 PM BREAK

3:00-3:30 PM Introduction to `learnr` (interactive documents)

3:30-4:15 PM Introduction to `shiny` (shiny apps)

4:15-4:30 PM Introduction to `blogdown` (websites)

4:30-4:45 PM Rmd is NOT ONLY for R

4:45-5:00 PM Share your ideas + Conclusion

Opening Session

Where are you from? Click on the map to drop your pin

Powered by Poll Everywhere

Start the presentation to see live content. For screen share software, share the entire screen. Get help at **pollev.com/app**

Opening Session

Training Data
(CelebA)

Sample Generator
(Karras et al, 2017)

Introduce the REAL you...

https://shiny.rstudio.com/gallery/file-upload.html

What is R Markdown?

Welcome to R Markdown!

What is it about?

In the world of reproducible research, you want your work and your analysis to be easily reproduced by other researchers. Otherwise, how am I going to believe that you have analyzed your data properly?

R Markdown allows you to create documents that serve as a neat record of your analysis. With RMarkdown you can present your **code** alongside its output (graphs, tables, etc.) with conventional text to explain it, a bit like a notebook. You can also share your file by uploading it to an **online repository such as Github**.

Create an R Markdown (.Rmd) file

- To get R Markdown working in RStudio, you need the `rmarkdown` package, which you can get from `CRAN` by running the following commands in R or RStudio:

```
#install.packages("rmarkdown")
#library(rmarkdown)
```

- Create a new RMarkdown file (.Rmd) by selecting: `File -> New File -> R Markdown`, then choose the file type you want to create.

YAML header material

The YAML header is the top section of an R Markdown script and it is enclosed by `---`. By default it includes:

- Title
- Author
- Date
- File Type (for the output)

Rmd Output Format

Documents

- -Notebook
- -HTML document
- -PDF document
- -Word document
- - OpenDocument Text (ODT) document
- - Rich Text Format (RTF) document
- -Markdown document

Presentations

- -ioslides
- -Slidy
- -Beamer
- -PowerPoint

Dashboard (using `flexdashboard`)

- Dashboards are usually used to highlight brief and key summaries of any research project.

- You can present your work in a grid-based layout (components arranged in boxes of various sizes).

- The `` `flexdashboard` `` package in R allows you to publish any related data visualizations as a dashboard.

`flexdashboard` **Examples:**

https://rmarkdown.rstudio.com/flexdashboard/examples.html

Interactive Tutorials (using `learnr`)

Create tutorials along with interactive components including:

- Narrative, figures, illustrations, and equations
- Code exercises (R code chunks that users can edit and execute directly)
- Quiz questions
- Videos (supported services include YouTube and Vimeo)
- Interactive Shiny components

Tutorials Examples:

- ➢ https://rstudio.github.io/learnr/examples.html
- ➢ **My Classes**

Shiny Apps (using `shiny`)

- `shiny` is an R package that makes it easy to build interactive web applications (apps).

- Plenty of resources and example here: https://shiny.rstudio.com/tutorial/#written-tutorials

Advantages & Limitations

One advantage of htmlwidgets is that they embed their data directly in their host web page.

True

False

When poll is active, respond at **pollev.com/elioabiyoune456**

Shiny app might crash when uploading large datasets!

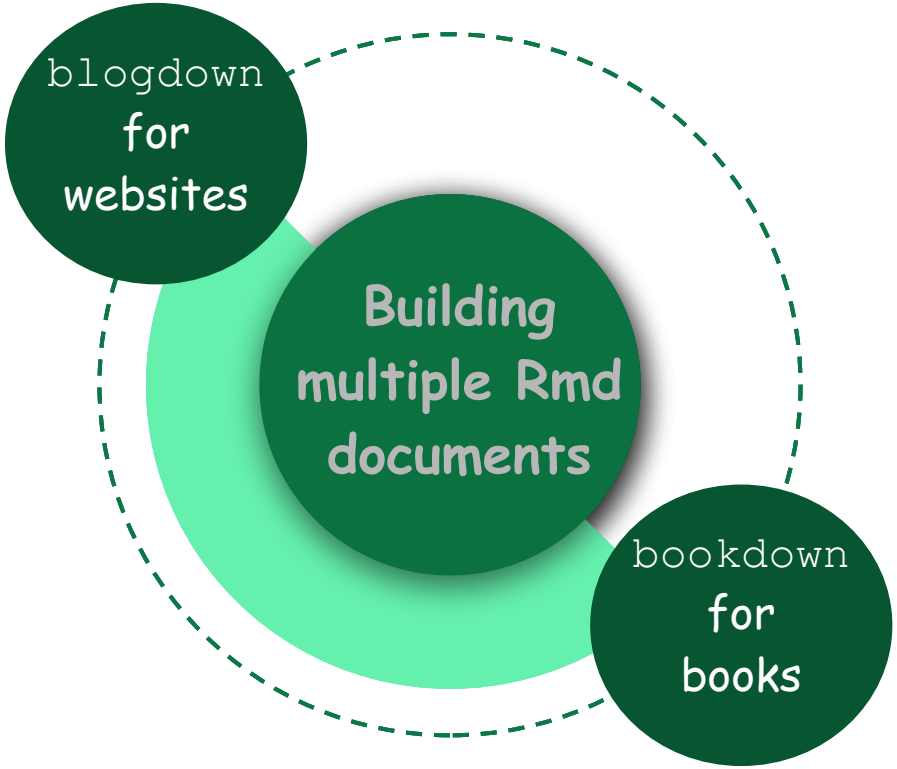
True

False

Powered by Poll Everywhere

Start the presentation to see live content. For screen share software, share the entire screen. Get help at **pollev.com/app**

From Single Documents to Multiple Rmd Documents



Websites

- With `blogdown`, you can write a blog post or a general page in an Rmd document.

- You will build the source documents into a static website (folder containing static HTML files and associated assets such as images and CSS files).

- You can publish this folder to any web server as a website.

Get Started with blogdown

Examples of websites created with R Markdown:

- The rmarkdown documentation:

  https://rmarkdown.rstudio.com.

- The flexdashboard documentation:

  https://rmarkdown.rstudio.com/flexdashboard/.

Reference book: https://bookdown.org/yihui/blogdown/

Get Started with `blogdown`

- You can install blogdown from CRAN. If you want to test the development version, you may also install it from GitHub:

```
# from CRAN
install.packages("blogdown")
# or the development version from GitHub
devtools::install_github("rstudio/blogdown")
```

- RStudio menu

```
File -> New Project -> New Directory -> Website using blogdown
```

- Not using RStudio?

  Call the function `blogdown::new_site()`

R Markdown is NOT ONLY for R…

- Many other languages are supported in R Markdown through the `knitr` package.

- You could change the language name by editing the first word in the curly braces after the three opening backticks, i.e. by replacing the little `r` in ```` ```{r} ```` by ```` ```{python} ```` for example, you indicate that the code chunk contains Python code.

- In `knitr`, each language is supported through a ***language engine*** managed through the object `knitr::knit_engines`.

  Check the existing engines via: `names(knitr::knit_engines$get())`

Have an idea to integrate into your research?

References

[1] ———. 2016. *Bookdown: Authoring Books and Technical Documents with R Markdown*. Boca Raton, Florida: Chapman; Hall/CRC. https://github.com/rstudio/bookdown.

[2] ———. 2021a. *Bookdown: Authoring Books and Technical Documents with r Markdown*.
Xie, Yihui, Christophe Dervieux, and Alison Presmanes Hill. 2021. *Blogdown: Create Blogs and Websites with r Markdown*.

[3] Iannone, Richard, JJ Allaire, and Barbara Borges. 2020. *Flexdashboard: R Markdown Format for Flexible Dashboards*. http://rmarkdown.rstudio.com/flexdashboard.

[4] Schloerke, Barret, JJ Allaire, and Barbara Borges. 2020. *Learnr: Interactive Tutorials for r*. https://CRAN.R-project.org/package=learnr.

[5] Wickham, Hadley, and Garrett Grolemund. 2016. *R for Data Science*. O'Reilly Media, Inc.
Xie, Yihui. 2015. *Dynamic Documents with R and Knitr*. 2nd ed. Boca Raton, Florida: Chapman; Hall/CRC. https://yihui.org/knitr/.

[6] Xie, Yihui, Alison Presmanes Hill, and Amber Thomas. 2017. *Blogdown: Creating Websites with R Markdown*. Boca Raton, Florida: Chapman; Hall/CRC. https://github.com/rstudio/blogdown.

[7] Xie, Yihui, Romain Lesur, Brent Thorne, and Xianying Tan. 2021. *Pagedown: Paginate the HTML Output of r Markdown with CSS for Print*. https://github.com/rstudio/pagedown.