CS&SS 569 Visualizing Data and Models

Lab 2: Intro to LaTeX with `R Markdown` and `Overleaf`

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Agenda

1. `R Markdown` and HW1
2. LaTeX and `Overleaf`

Homework Submission

- **Use Canvas** not email

`R Markdown` and HW1

- Problem 1: Attach files (PDF/picture), and offer your critique and remedy
- Problem 2: Read data and reproduce the plot
  - *Do not spend more than two hours*

R Markdown

- R Markdown file (.Rmd) offers an integrated framework
  - To contain both narrative text, code chunks and outputs such as graphs
  - To render ("knit") high quality, reproducible outputs
    - HTML, PDF, Word, Beamer, etc.
    - I write my slides using R Markdown (in Beamer: a LaTeX class of presentation slides)
    - Great way to submit your homework
  - LaTeX code is supported

R-Markdown

- If any of you is looking for an general introduction for `RMarkdown`, I suggest you to check Chapter 27 from Wickham and Grolemund (2017) - **R for Data Science**.
- If you want a more comprehensive guide, then check Xie et al. (2021) - **R Markdown: The Definitive Guide**.
- Another, more applied, resource is Xie et al. (2022) - **R Markdown Cookbook**.

R-Markdown

- `RMarkdown` is a document format that allows you to integrate `R` **code** and **output** into a single document.
- Besides `R` code and output, it can also include **text**, **images**, and other **multimedia elements**, allowing for rich and informative documents.
- *Pandoc* is a free and open-source **document converter** that can convert documents from one markup language to another.
  - In the context of `Rmarkdown`, pandoc is the underlying document converter (sfotware) that converts the R-markdown file into a final output format, such as **HTML**, **PDF**, or **Word**.

R-Markdown

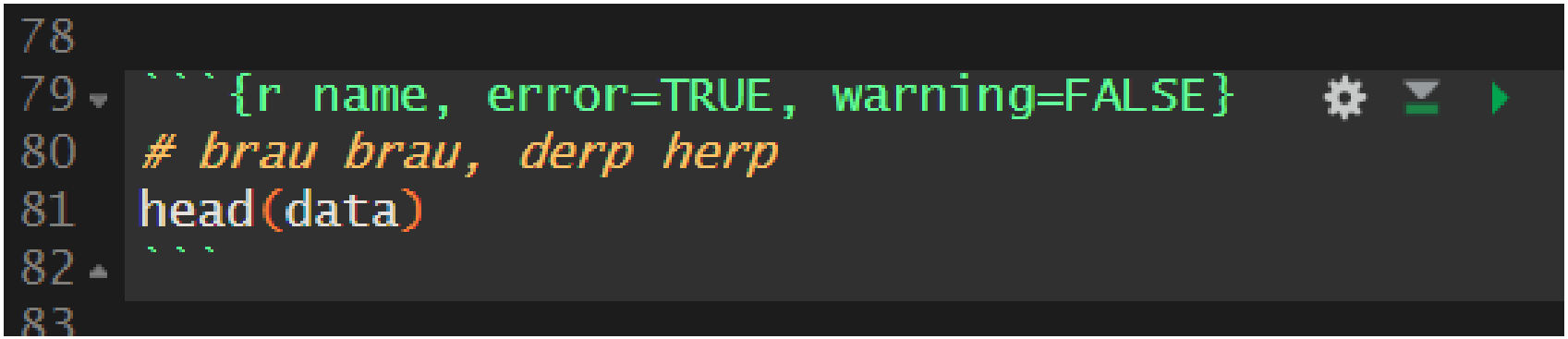
- The output format of the final document can be customized using options in the **YAML header** or external templates.

```yaml
---
title: "Lab 1 - Intro to RMarkdown"
author: "Your name"
date: \today
output:
  pdf_document:
    latex_engine: pdflatex
fontsize: 12pt
editor_options:
  chunk_output_type: console
---
```

- The YAML header in RMarkdown is a block of configuration settings at the beginning of the document enclosed by three hyphens (---).
- It is used to specify document metadata and other settings such as the document title, author, output format, and more.

R-Markdown

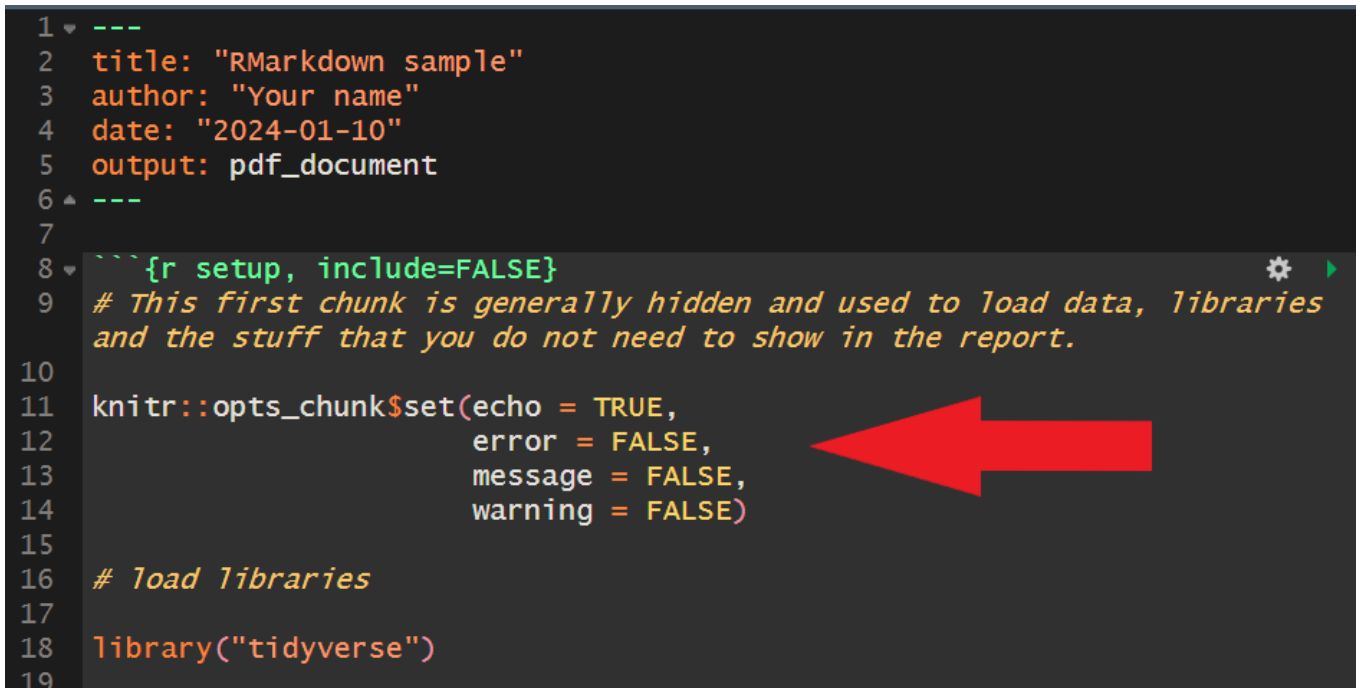
- **Code chunks** are sections of `R` code that can be executed and embedded within an `RMarkdown` document.



- Code chunks can be inserted using the syntax `{r}` and closed with “‘.
  - Short cut in Windows: `Ctrl + Alt + I`
  - Short cut in macOS: `Cmd + Option + I`
- Code chunks can be customized with various **chunk options**.

R-Markdown

- **Note**: set the function `knitr::opts_chunk$set()` with any general setting without repeating it in every code chunk.
- Recommendation chunck options for Homework



R-Markdown

- In RMarkdown, **rendering** a document means converting the source RMarkdown file into its final output format (using pandoc).
- To render a document, we need to Knit, knitting is the process of taking the RMarkdown file and converting it into a single, cohesive document that can be rendered into different formats (HTML, PDF, etc).
- To compile a R Markdown document to PDF, you need to install LaTeX
  - If you haven't installed any previous LaTeX distribution, I recommend TinyTeX

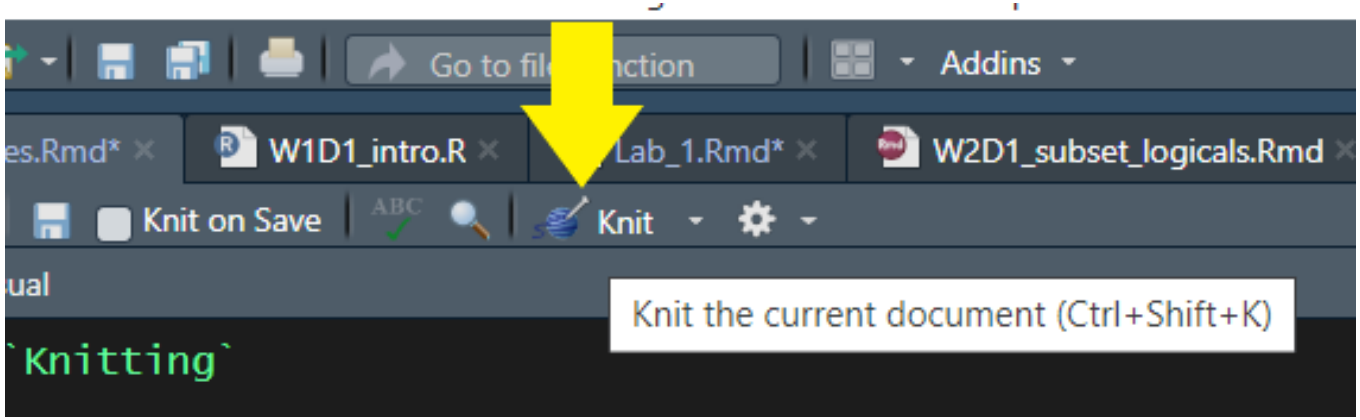
R Markdown and TinyTeX

- "TinyTeX is a lightweight, portable, cross-platform, and easy-to-maintain LaTeX distribution":

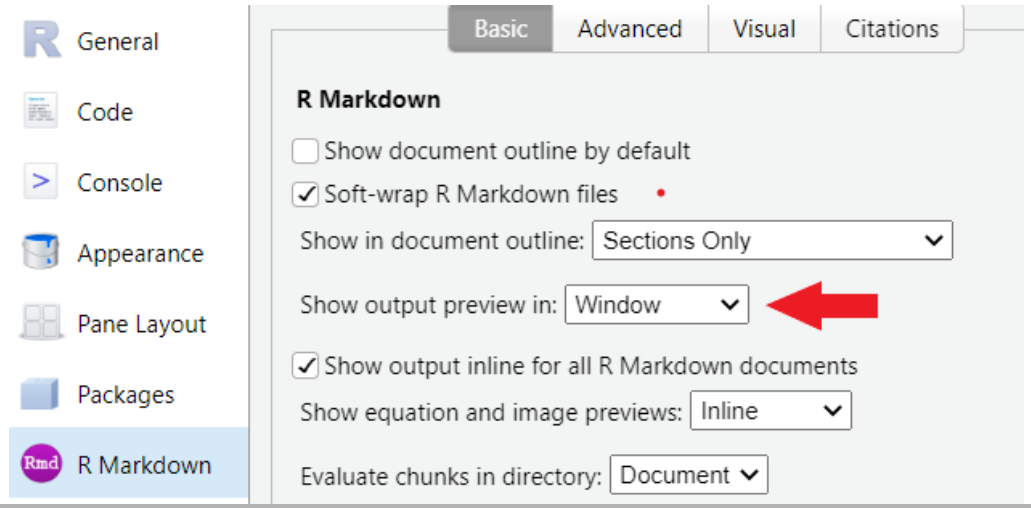
```
install.packages('tinytex')
tinytex::install_tinytex()
```

Knitting

- To knit:



- Auxiliary window for output preview:



`R Markdown` in practices: two examples

- `lab2_RMarkdownSample.Rmd`: cover most of the basic functionalities in R Markdown; good for future reference
- `CSSS569HW1Start.Rmd`: a template to get started with HW 1!

Intro to LaTeX with Overleaf

- Alternatively, we have Overleaf: https://www.overleaf.com/
  - An online LaTeX editor
    - Integrated PDF preview panel
    - Quality of life features: auto-complete commands, auto-close brackets, keyboard shortcuts, etc.
    - Numerous templates: journal articles, books, CVs, slides, posters, etc.
    - Easy collaboration (But not free)
    - Integrated with Zotero and Mendeley for bibliography management
    - Integrated with Git for version control

Intro to LaTeX with Overleaf

- Before we dive in, useful resources.
  - The Not So Short Introduction to LaTeX 2$_\varepsilon$ (Oetiker et al., 2023).
    - Learn LaTeX in 280 pages / minutes.
  - Overleaf documentation.
    - Contains intro to basic LaTeX, Overleaf, and many practical guides.
  - TeX at StackExchange.
  - General: Mathematics and Tables and TikZ.
  - Beamer Theme: here.
  - Bibliography: natbib, doi2bib, text2bib
  - Other: here.

Intro to LaTeX with Overleaf

- Some useful templates:
  - Thesis: here.
  - Homework: my sample with appendix for R code here, another here.
  - Working paper: Kenya's sample and Chris's sample (*not for beginners*).
  - Academic journal: here.
  - Presentation slides (Beamer): here.
  - Poster presentations: here
  - CVs and résumés: here.
  - Graphs, trees, diagrams (TikZ): tutorial here and gallery here.

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