Reproducible research 1

Literate programming

Literate programming

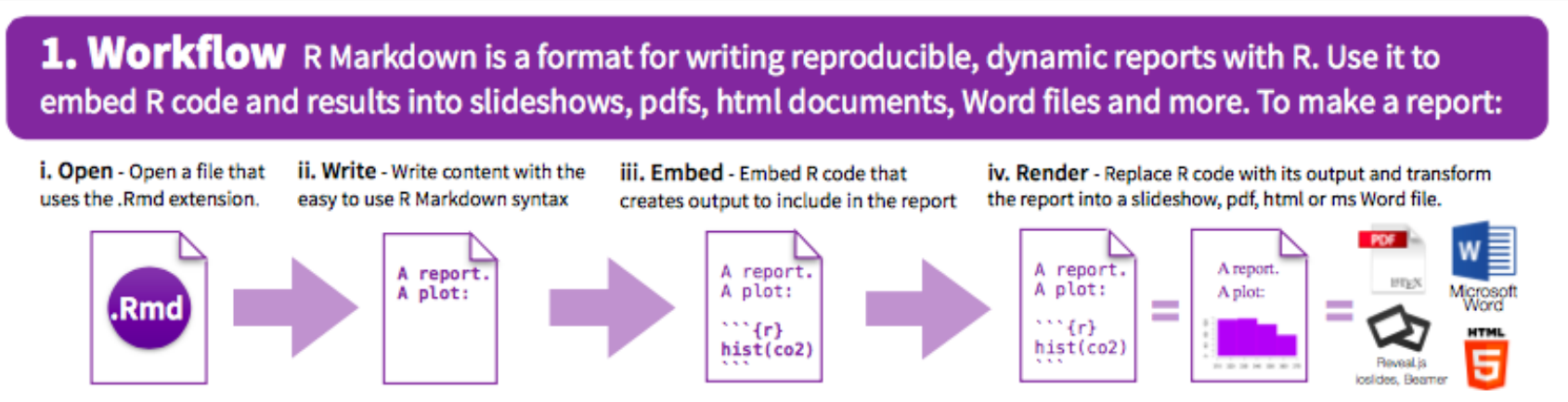
- **Literate programming** mixes code that can be executed with regular text.
- The files you create can then be rendered, to run any embedded code.
- The final output will have results from your code and the regular text.

Literate programming

Literate programming was developed by **Donald Knuth**.

Literate programming with `knitr`

The `knitr` package can be used for literate programming in R.



(Source: RMarkdown Cheatsheet, RStudio)

In essence, `knitr` allows you to write an R Markdown file that can be rendered into a pdf, Word, or HTML document.

Basics

- To open a new RMarkdown file, go to "File" -> "New File" -> "RMarkdown..." -> for now, chose a "Document" in "HTML" format.
- This will open a new R Markdown file in RStudio. The file extension for RMarkdown files is ".Rmd".
- The new file comes with some example code and text. You can run the file as-is to try out the example. You will ultimately delete this example code and text and replace it with your own.
- Once you "knit" the R Markdown file, R will render an HTML file with the output. This is automatically saved in the same directory where you saved your .Rmd file.
- Write everything besides R code using Markdown syntax.

Chunk syntax

To include R code in an RMarkdown document, separate the code chunk using the following syntax:

````
```{r}
my_vec <- 1:10
```
````

Naming chunks

You can specify a name for each chunk, if you'd like, by including it after "r" when you begin your chunk.

For example, to give the name `load_nepali` to a code chunk that loads the `nepali` dataset, specify that name in the start of the code chunk:

````
```{r load_nepali}
library(faraway)
data(nepali)
```
````

Some tips:

- Chunk names must be unique across a document.
- Any chunks you don't name are given numbers by `knitr`.

Naming chunks

You do not have to name each chunk. However, there are some advantages:

- It will be easier to find any errors.
- You can use the chunk labels in referencing for figure labels.
- You can reference chunks later by name.

Chunk options

You can add options when you start a chunk. Many of these options can be set as TRUE / FALSE and include:

Option	Action
`echo`	Print out the R code?
`eval`	Run the R code?
`messages`	Print out messages?
`warnings`	Print out warnings?
`include`	If FALSE, run code, but don't print code or results

Chunk options

Other chunk options take values other than TRUE / FALSE. Some you might want to include are:

Option	Action
`results`	How to print results (e.g., `hide` runs the code, but doesn't print the results)
`fig.width`	Width to print your figure, in inches (e.g., `fig.width = 4`)
`fig.height`	Height to print your figure

Chunk options

Add these options in the opening brackets and separate multiple ones with commas:

````
```{r  messages = FALSE, echo = FALSE}
nepali[1, 1:3]
```
````

We will go over other options later, once you've gotten the chance to try adding R code into RMarkdown files.

Global options

You can set "global" options at the beginning of the document. This will create new defaults for all of the chunks in the document.

For example, if you want `echo`, `warning`, and `message` to be `FALSE` by default in all code chunks, you can run:

````
```{r  global_options}
knitr::opts_chunk$set(echo = FALSE, message = FALSE,
  warning = FALSE)
```
````

Global options

Options that you set specifically for a chunk will take precedence over global options.

For example, running a document with:

````
```{r  global_options}
knitr::opts_chunk$set(echo = FALSE, message = FALSE,
  warning = FALSE)
```
````

````
```{r  check_nepali, echo = TRUE}
head(nepali, 1)
```
````

would print the code for the `check_nepali` chunk.

Inline code

You can also include R output directly in your text ("inline") using backticks:

There are `` `r nrow(nepali)` `` observations in the `nepali` data set. The average age is `` `r mean(nepali$age, na.rm = TRUE)` `` months.

Once the file is rendered, this gives:

There are 1000 observations in the `nepali` data set. The average age is 37.662 months.