# Code Club: R Markdown (from Rstudio)

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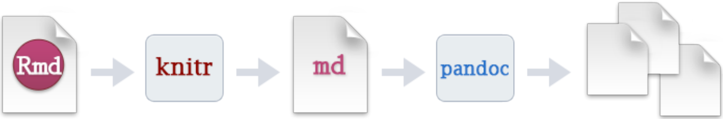
# Why R Markdown?

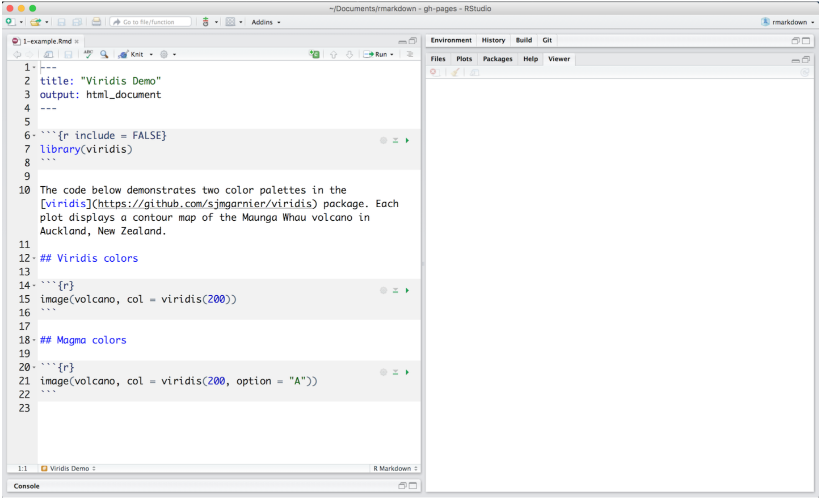
- Merge data, code and text
  - resulting in less errors (instead of `Ctrl+C`–`Ctrl+V`)
- Good reproducibility
- Formatting is performed only at the end
  - creating templates (reports, manuscripts, presentations ...)
- Easy collaboration
  - output: HTML, PDF, MS word and lot's more
  - instead of only PDF in LaTeX

# How it works



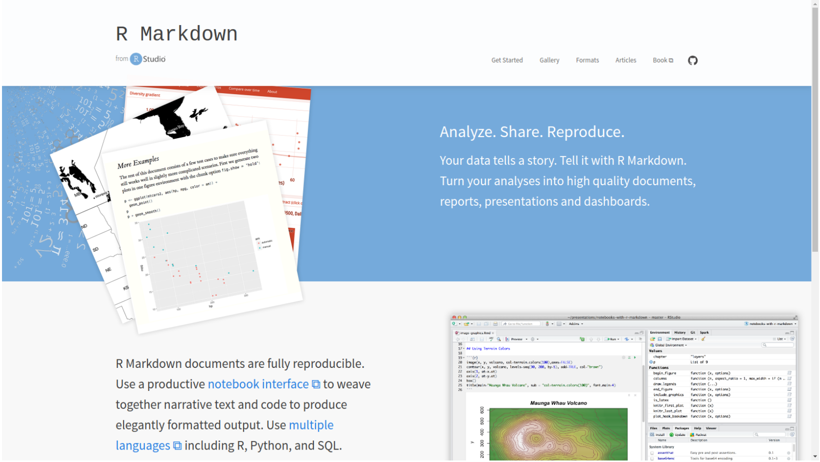
- The R package knitr forms the backbone for knitting in Rstudio
- Pandoc processes the markdown file
- The creator of Rmarkdown from Rstudio and knitr: Yihui Xie (software engineer at RStudio)

# R Markdown from Rstudio http://rmarkdown.rstudio.com



~~~
---
title: "Viridis Demo"
output: html_document
---

```{r include = FALSE}
library(viridis)
```

The code below demonstrates two color palettes in the [viridis](https://github.com/sjmgarnier/viridis) package. Each plot displays a contour map of the Maunga Whau volcano in Auckland, New Zealand.

## Viridis colors

```{r}
image(volcano, col = viridis(200))
```

## Magma colors

```{r}
image(volcano, col = viridis(200, option = "A"))
```

~~~

# R Markdown from Rstudio http://rmarkdown.rstudio.com



Analyze. Share. Reproduce.

Your data tells a story. Tell it with R Markdown. Turn your analyses into high quality documents, reports, presentations and dashboards.

R Markdown documents are fully reproducible. Use a productive notebook interface to weave together narrative text and code to produce elegantly formatted output. Use multiple languages including R, Python, and SQL.

~~~
## Using Terrain Colors

```{r}
image(x, y, volcano, col=terrain.colors(100),axes=FALSE)
contour(x, y, volcano, levels=seq(90, 200, by=5), add=TRUE, col="brown")
axis(1, at=x.at)
axis(2, at=y.at)
box()
title(main="Maunga Whau Volcano", sub = "col=terrain.colors(100)", font.main=4)
```
~~~

Values

| | |
|---|---|
| chapter | "layers" |
| p | List of 9 |

Functions

| | |
|---|---|
| begin_figure | function (x, options) |
| columns | function (n, aspect_ratio = 1, max_width = if (n ... |
| draw_legends | function (...) |
| end_figure | function (x, options) |
| include_graphics | function (x, options) |
| is_latex | function () |
| knitr_first_plot | function (x) |
| knitr_last_plot | function (x) |
| plot_hook_bookdown | function (x, options) |

| Name | Description | Version |
|---|---|---|
| System Library | | |
| assertthat | Easy pre and post assertions. | 0.1 |
| base64enc | Tools for base64 encoding | 0.1-3 |

# R Markdown from Rstudio http://rmarkdown.rstudio.com

## R Markdown Cheat Sheet

learn more at rmarkdown.rstudio.com

RStudio

### .Rmd files

An R Markdown (.Rmd) file is a record of your research. It contains the code that a scientist needs to reproduce your work along with the narration that a reader needs to understand your work.

### Reproducible Research

At the click of a button, or the type of a command, you can rerun the code in an R Markdown file to reproduce your work and export the results as a finished report.

### Dynamic Documents

You can choose to export the finished report as a html, pdf, MS Word, ODT, RTF, or markdown document; or as a html or pdf based slide show.

## Workflow

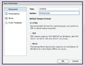
**1 Open a new .Rmd file** at File ▶New File ▶R Markdown. Use the wizard that opens to pre-populate the file with a template

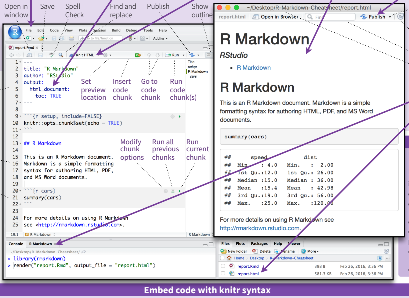
**2 Write document** by editing template

**3 Knit document to create report** Use knit button or **render()** to knit

**4 Preview Output** in IDE window

**5 Publish** (optional) to web or server





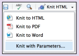
~~~
---
title: "R Markdown"
author: "RStudio"
output:
  html_document:
    toc: TRUE
---

```{r setup, include=FALSE}
knitr::opts_chunk$set(echo = TRUE)
~~~

## R Markdown

This is an R Markdown document.
Markdown is a simple formatting
syntax for authoring HTML, PDF,
and MS Word documents.

```{r cars}
summary(cars)
```

For more details on using R Markdown
see <http://rmarkdown.rstudio.com>.
```

```
> library(rmarkdown)
> render("report.Rmd", output_file = "report.html")
```

R Markdown

*RStudio*

- R Markdown

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents.

```
summary(cars)
```

```
##      speed           dist
##  Min.   : 4.0   Min.   :  2.00
##  1st Qu.:12.0   1st Qu.: 26.00
##  Median :15.0   Median : 36.00
##  Mean   :15.4   Mean   : 42.98
##  3rd Qu.:19.0   3rd Qu.: 56.00
##  Max.   :25.0   Max.   :120.00
```

For more details on using R Markdown see http://rmarkdown.rstudio.com.

| | | | |
|---|---|---|---|
| report.Rmd | 398 B | Feb 26, 2016, 3:36 PM |
| report.html | 581.3 KB | Feb 26, 2016, 3:36 PM |

Synch publish button to accounts at

- rpubs.com,
- shinyapps.io
- RStudio Connect

Reload document

Find in document

File path to output document

**6 Examine build log** in R Markdown console

**7 Use output file** that is saved alongside .Rmd

### .Rmd structure

**YAML Header**
Optional section of render (e.g. pandoc) options written as key:value pairs (YAML).

- At start of file
- Between lines of - - -

**Text**
Narration formatted with markdown, mixed with:

**Code chunks**
Chunks of embedded code. Each chunk:

- Begins with ```{r}
- ends with ```

R Markdown will run the code and append the results to the doc.

It will use the location of the .Rmd file as the **working directory**

### render()

Use rmarkdown::**render()** to render/knit at cmd line. Important args:

**input** - file to render

**output_format**

**output_options** - List of render options (as in YAML)

**output_file**

**output_dir**

**params** - list of params to use

**envir** - environment to evaluate code chunks in

**encoding** - of input file

## Interactive Documents

Turn your report into an interactive Shiny document in 4 steps

1. Add **runtime: shiny** to the YAML header.
2. Call Shiny **input** functions to embed input objects.
3. Call Shiny **render** functions to embed reactive output.
4. Render with rmarkdown::**run** or click **Run Document** in RStudio IDE

```
---
output: html_document
runtime: shiny
---

```{r, echo = FALSE}
numericInput("n",
  "How many cars?", 5)

renderTable({
  head(cars, input$n)
})
```
```

How many cars?

5

| | speed | dist |
|---|---|---|
| 1 | 4.00 | 2.00 |
| 2 | 4.00 | 10.00 |
| 3 | 7.00 | 4.00 |
| 4 | 7.00 | 22.00 |
| 5 | 8.00 | 16.00 |

Embed a complete app into your document with shiny::**shinyAppDir()**

\* *Your report will rendered as a Shiny app, which means you must choose an html output format, like **html_document,** and serve it with an active R Session.*

## Embed code with knitr syntax

### Inline code

Insert with **`r <code>`**. Results appear as text without code.

```
Built with
`r getRversion()`
```

Built with 3.2.3

### Code chunks

One or more lines surrounded with **```{r}** and **```**. Place chunk options within curly braces, after **r**. Insert with

```
```{r echo=TRUE}
getRversion()
```
```

```
getRversion()
```

```
## [1] '3.2.3'
```

### Global options

Set with knitr::**opts_chunk$set()**, e.g.

```
```{r include=FALSE}
knitr::opts_chunk$set(echo = TRUE)
```
```

### Important chunk options

**cache** - cache results for future knits (default = FALSE)

**cache.path** - directory to save cached results in (default = "cache/")

**child** - file(s) to knit and then include (default = NULL)

**collapse** - collapse all output into single block (default = FALSE)

**comment** - prefix for each line of results (default = '##')

**dependson** - chunk dependencies for caching (default = NULL)

**echo** - Display code in output document (default = TRUE)

**engine** - code language used in chunk (default = 'R')

**error** - Display error messages in doc (TRUE) or stop render when errors occur (FALSE) (default = FALSE)

**eval** - Run code in chunk (default = TRUE)

**fig.align** - 'left', 'right', or 'center' (default = 'default')

**fig.cap** - figure caption as character string (default = NULL)

**fig.height, fig.width** - Dimensions of plots in inches

**highlight** - highlight source code (default = TRUE)

**include** - Include chunk in doc after running (default = TRUE)

**message** - display code messages in document (default = TRUE)

**results** (default = 'markup')
'asis' - passthrough results
'hide' - do not display results
'hold' - put all results below all code

**tidy** - tidy code for display (default = FALSE)

**warning** - display code warnings in document (default = TRUE)

Options not listed above: R.options, aniopts, autodep, background, cache.comments, cache.lazy, cache.rebuild, cache.vars, dev, dev.args, dpi, engine.opts, engine.path, fig.asp, fig.env, fig.ext, fig.keep, fig.lp, fig.path, fig.pos, fig.process, fig.retina, fig.scap, fig.show, fig.showtext, fig.subcap, interval, out.extra, out.height, out.width, prompt, purl, ref.label, render, size, split, tidy.opts

## Parameters

Parameterize your documents to reuse with different inputs (e.g., data sets, values, etc.)

**1 Add parameters**
Create and set parameters in the header as sub-values of **params**

```
---
params:
  n: 100
  d: !r Sys.Date()
---
```

Indent 2 spaces

**2 Call parameters**
Call parameter values in code as **params$<name>**

```
Today's date
is `r params$d`
```

**3 Set parameters**
Set values wth **Knit with parameters** or the params argument of render():



render("doc.Rmd",
params = list(n = 1, d = as.Date("2015-01-01"))

versity

More cheat sheets at **http://www.rstudio.com/resources/cheatsheets/** Learn more at **rmarkdown.rstudio.com** • RStudio IDE 0.99.879 • Updated: 02/16
```

# R Markdown from Rstudio http://rmarkdown.rstudio.com

This is an R Markdown presentation!!