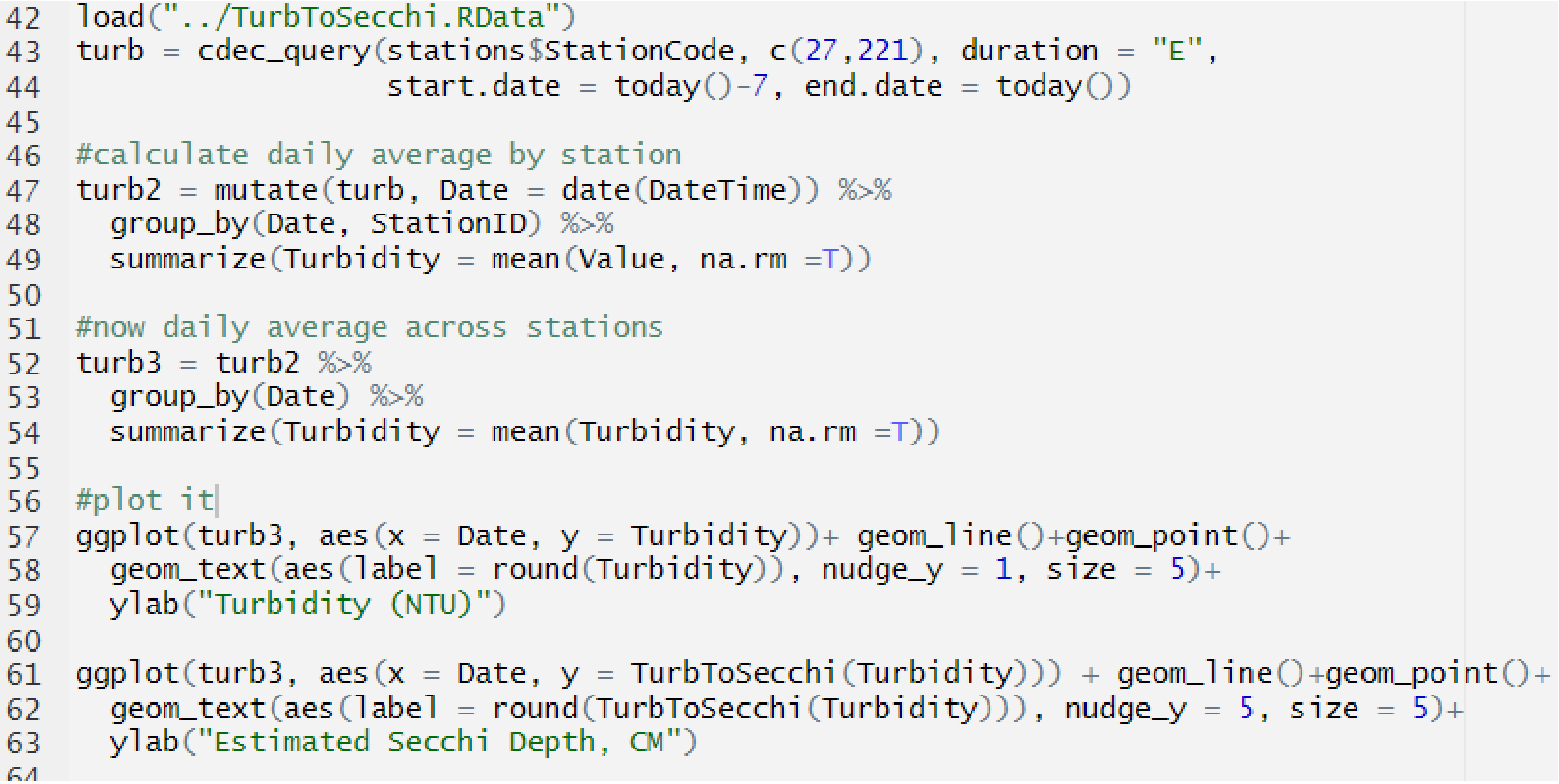
Quarto
~~RMarkdown~~

A flexible way to write code and reproducible reports

Rosemary Hartman

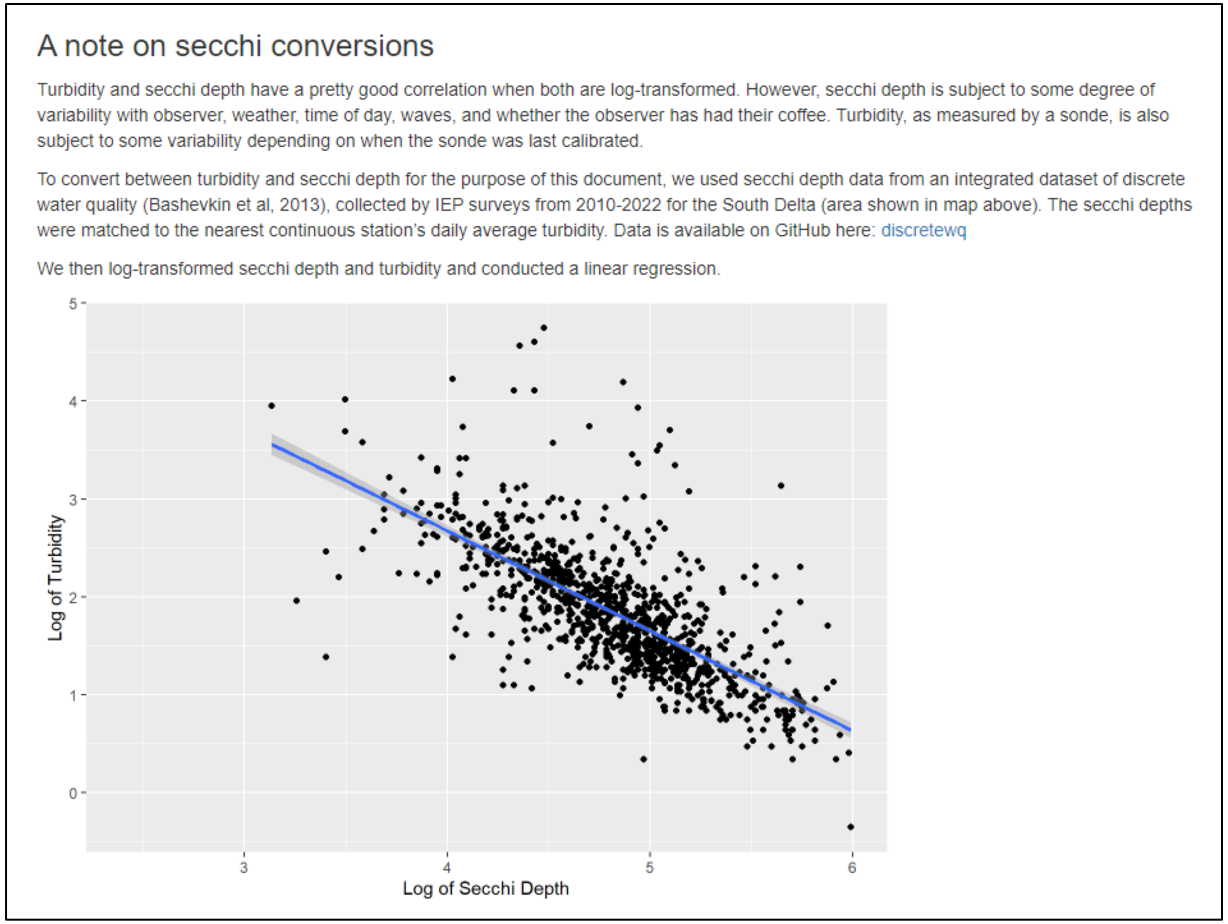
2024-4-18

Code is hard to read



```r
load("../TurbToSecchi.RData")
turb = cdec_query(stations$StationCode, c(27,221), duration = "E",
                  start.date = today()-7, end.date = today())

#calculate daily average by station
turb2 = mutate(turb, Date = date(DateTime)) %>%
  group_by(Date, StationID) %>%
  summarize(Turbidity = mean(Value, na.rm =T))

#now daily average across stations
turb3 = turb2 %>%
  group_by(Date) %>%
  summarize(Turbidity = mean(Turbidity, na.rm =T))

#plot it
ggplot(turb3, aes(x = Date, y = Turbidity))+ geom_line()+geom_point()+
  geom_text(aes(label = round(Turbidity)), nudge_y = 1, size = 5)+
  ylab("Turbidity (NTU)")

ggplot(turb3, aes(x = Date, y = TurbToSecchi(Turbidity))) + geom_line()+geom_point()+
  geom_text(aes(label = round(TurbToSecchi(Turbidity))), nudge_y = 5, size = 5)+
  ylab("Estimated Secchi Depth, CM")
```

Automation is the best!

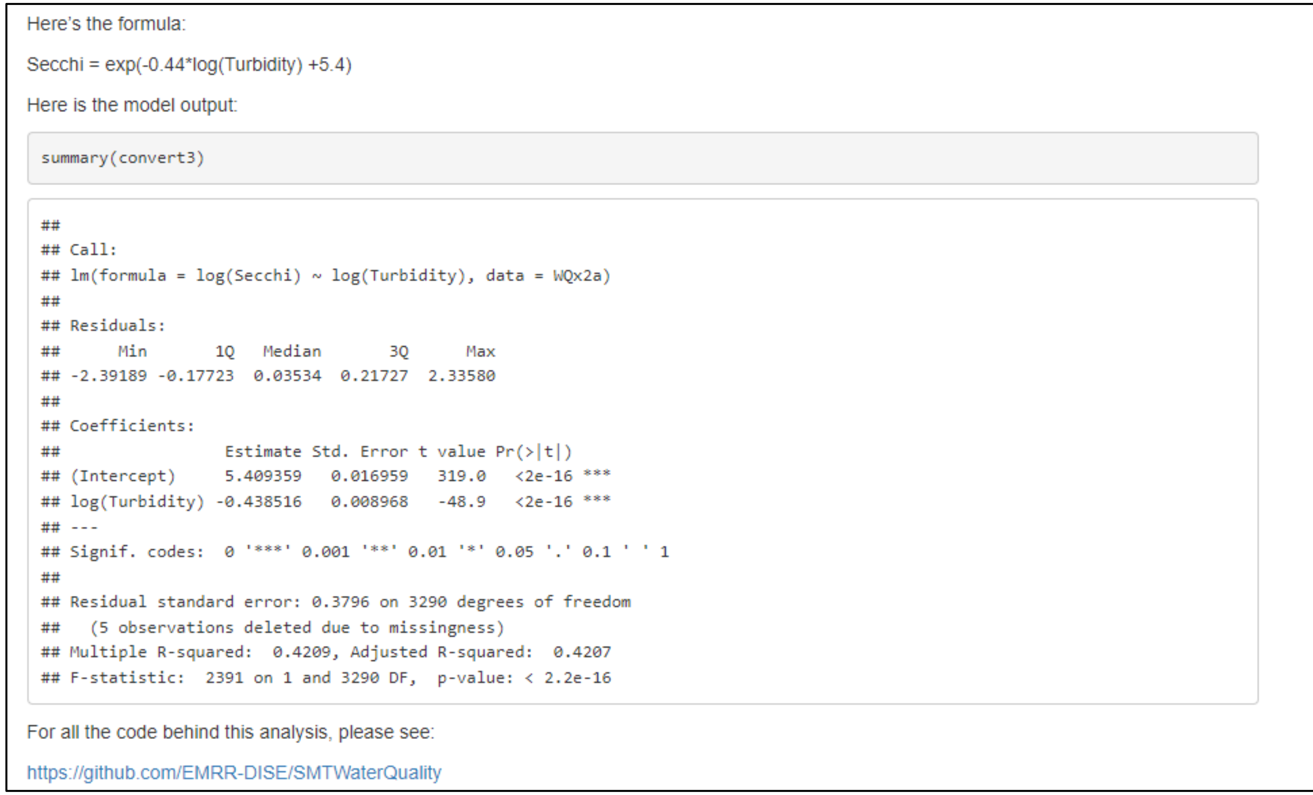


A note on secchi conversions

Turbidity and secchi depth have a pretty good correlation when both are log-transformed. However, secchi depth is subject to some degree of variability with observer, weather, time of day, waves, and whether the observer has had their coffee. Turbidity, as measured by a sonde, is also subject to some variability depending on when the sonde was last calibrated.

To convert between turbidity and secchi depth for the purpose of this document, we used secchi depth data from an integrated dataset of discrete water quality (Bashevkin et al, 2013), collected by IEP surveys from 2010-2022 for the South Delta (area shown in map above). The secchi depths were matched to the nearest continuous station's daily average turbidity. Data is available on GitHub here: discretewq

We then log-transformed secchi depth and turbidity and conducted a linear regression.



Here's the formula:

Secchi = exp(-0.44*log(Turbidity) +5.4)

Here is the model output:

```
summary(convert3)
```

```
##
## Call:
## lm(formula = log(Secchi) ~ log(Turbidity), data = WQx2a)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.39189 -0.17723  0.03534  0.21727  2.33580
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)     5.409359   0.016959   319.0   <2e-16 ***
## log(Turbidity) -0.438516   0.008968   -48.9   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3796 on 3290 degrees of freedom
##   (5 observations deleted due to missingness)
## Multiple R-squared:  0.4209, Adjusted R-squared:  0.4207
## F-statistic:  2391 on 1 and 3290 DF,  p-value: < 2.2e-16
```

For all the code behind this analysis, please see:

https://github.com/EMRR-DISE/SMTWaterQuality

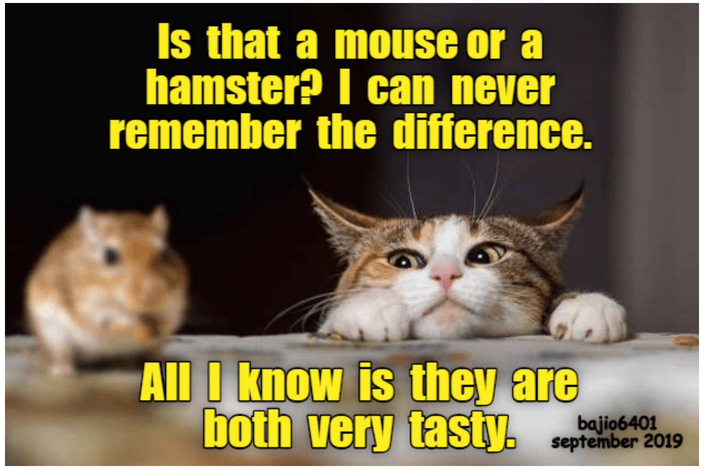
Quarto versus RMarkdown

Quarto

- More functionality
- New standard
- More code languages supported
- Does not require R

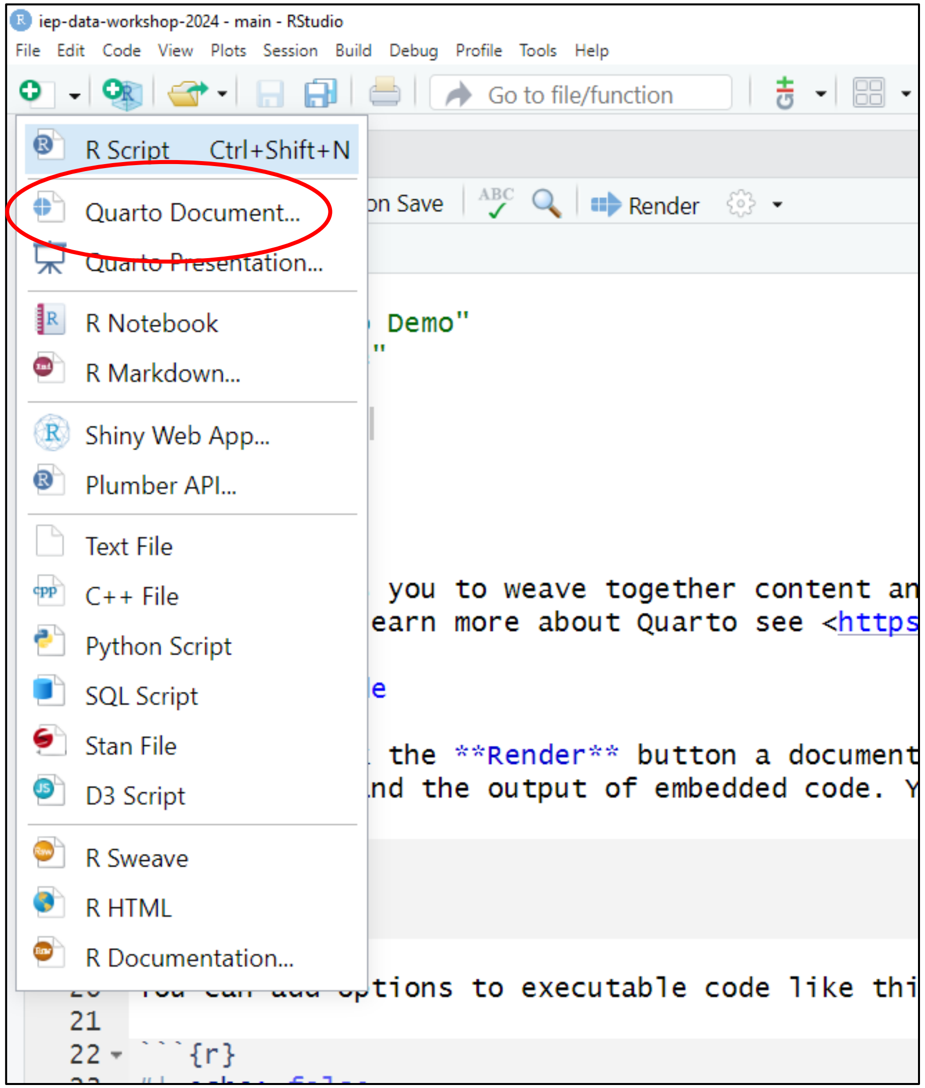
Rmarkdown

- Previous standard
- R-specific

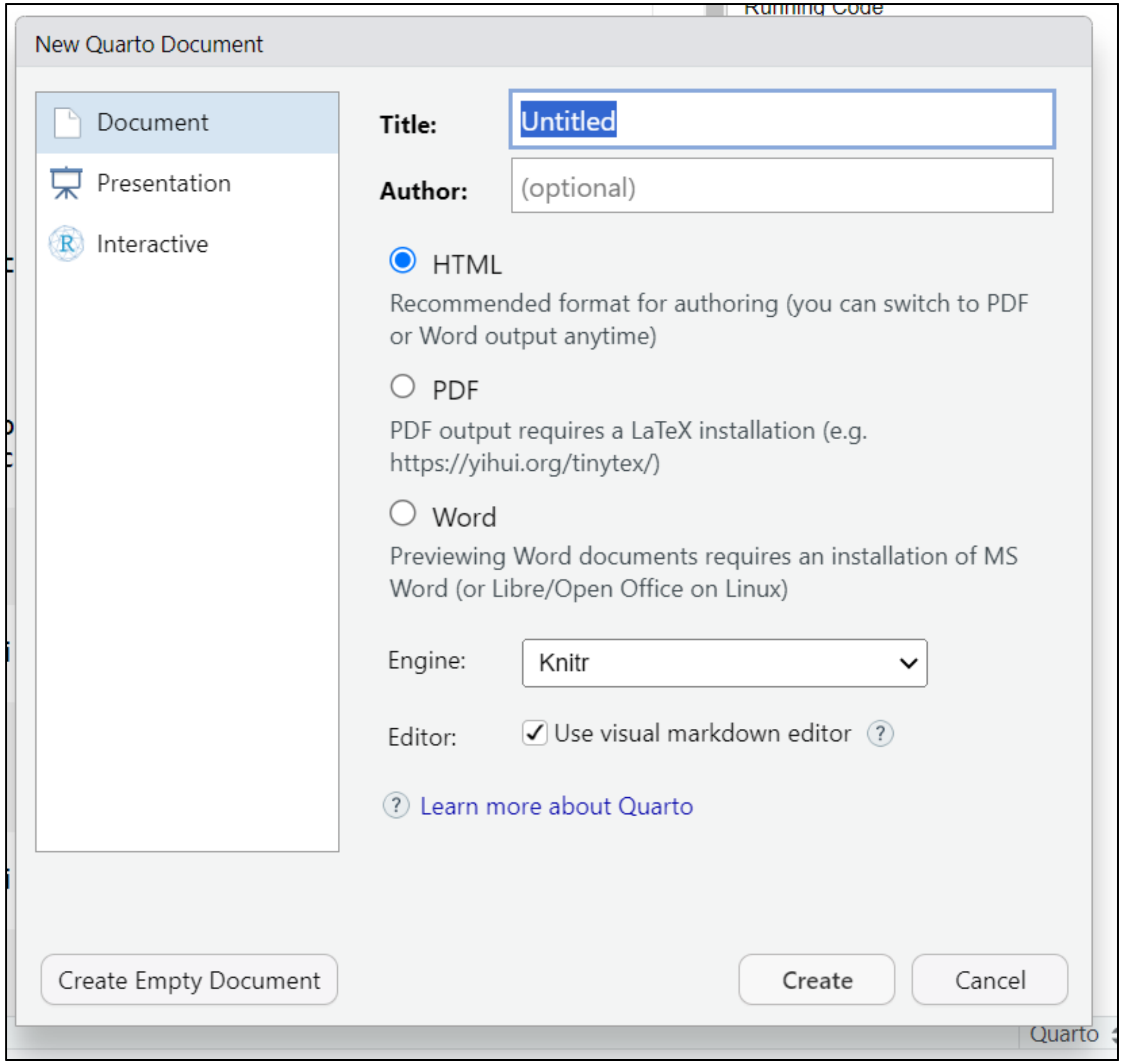

Is that a mouse or a hamster? I can never remember the difference.
All I know is they are both very tasty.
bajio6401
september 2019

But really they are basically the same thing…

Rstudio integration



~~~
 Demo"
"
you to weave together content an
earn more about Quarto see <https
e
 the **Render** button a document
nd the output of embedded code. Y
You can add options to executable code like thi

```{r}
~~~



Title: Untitled

Author: (optional)

● HTML
Recommended format for authoring (you can switch to PDF or Word output anytime)

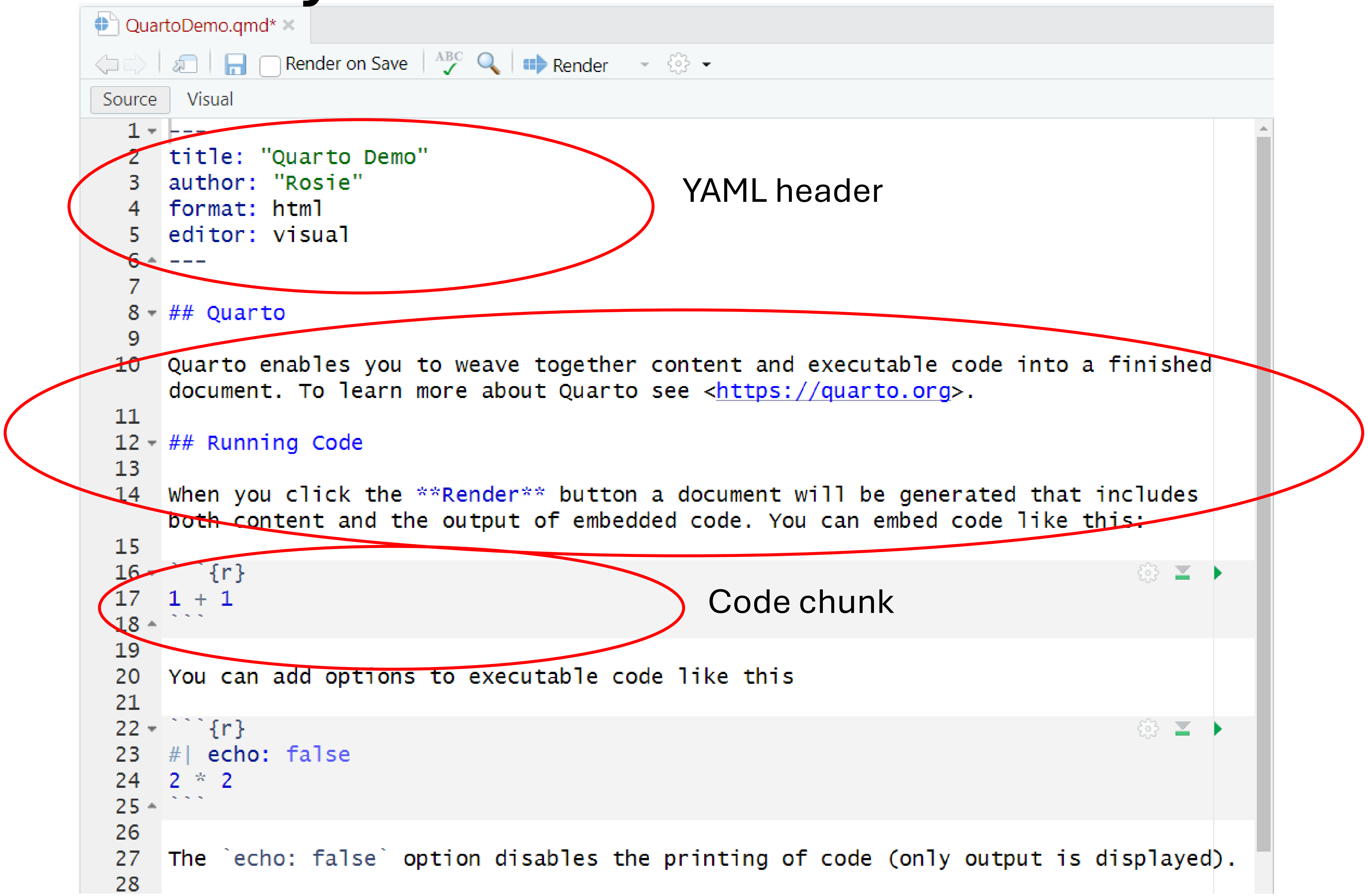
○ PDF
PDF output requires a LaTeX installation (e.g. https://yihui.org/tinytex/)

○ Word
Previewing Word documents requires an installation of MS Word (or Libre/Open Office on Linux)

Engine: Knitr

Editor: ☑ Use visual markdown editor

Anatomy



~~~
---
title: "Quarto Demo"
author: "Rosie"
format: html
editor: visual
---

## Quarto

Quarto enables you to weave together content and executable code into a finished document. To learn more about Quarto see <https://quarto.org>.

## Running Code

When you click the **Render** button a document will be generated that includes both content and the output of embedded code. You can embed code like this:

```{r}
1 + 1
```

You can add options to executable code like this

```{r}
#| echo: false
2 * 2
```

The `echo: false` option disables the printing of code (only output is displayed).

~~~

YAML header

Markdown chunk

Code chunk

Markdown formatting

- Pandoc markdown
- https://quarto.org/docs/authoring/markdown-basics.html
- css style sheets for fancy formatting

Input

Output

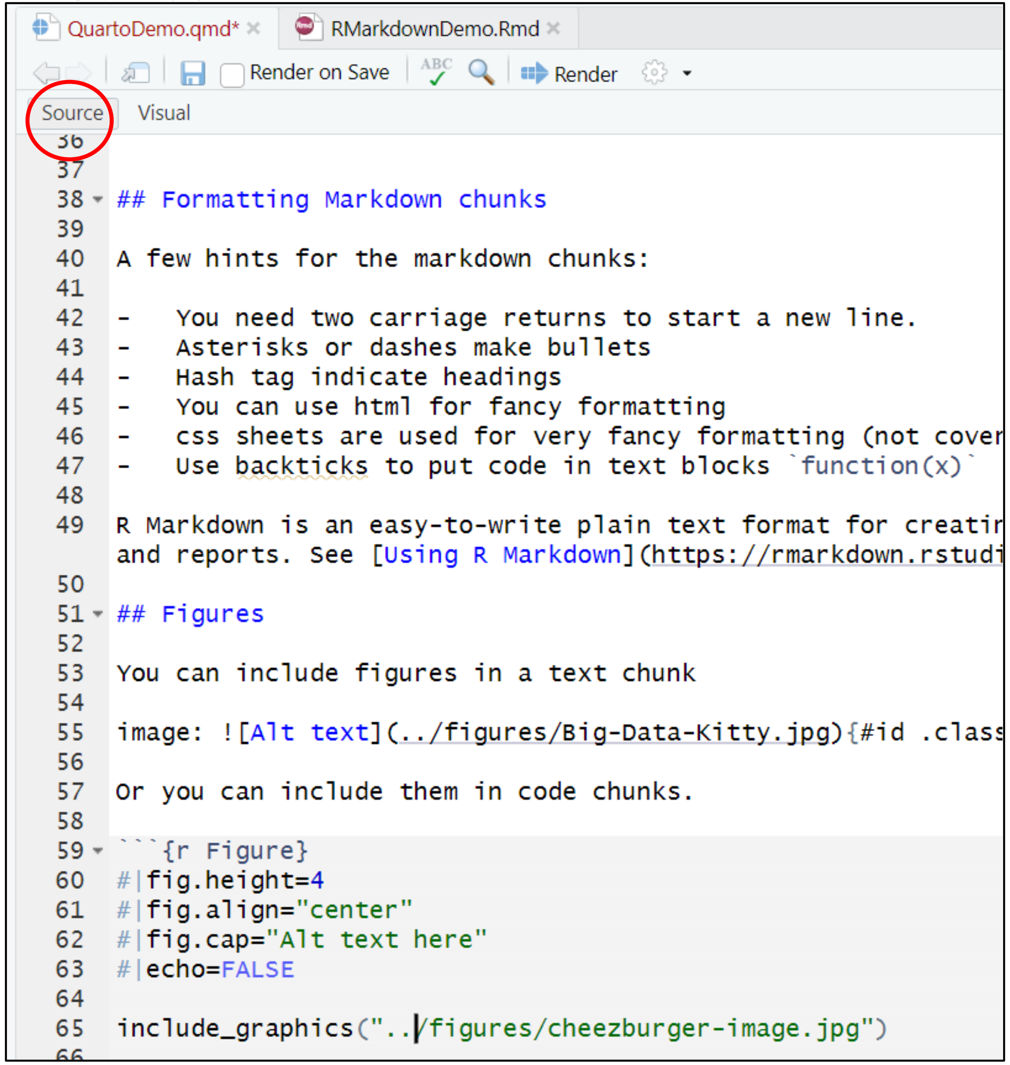
Syntax	Becomes
`Plain text`	Plain text

`End a line with two spaces`
`to start a new paragraph.`
	End a line with two spaces to start a new paragraph.

`*italics* and _italics_`	*italics* and *italics*
`**bold** and __bold__`	**bold** and **bold**
`superscript^2^`	superscript^{2}
`~~strikethrough~~`	~~strikethrough~~
`[link](www.rstudio.com)`	link
`# Header 1`	**Header 1**
`## Header 2`	**Header 2**
`### Header 3`	**Header 3**
`#### Header 4`	**Header 4**
`##### Header 5`	**Header 5**
`###### Header 6`	**Header 6**
`endash: --`	endash: –
`emdash: ---`	emdash: —
`ellipsis: ...`	ellipsis: …
`inline equation: $A = \pi*r^{2}$`	inline equation: $A = \pi * r^{2}$
`image: ![](path/to/smallorb.png)`	image:
`horizontal rule (or slide break):`	horizontal rule (or slide break):
`***`	
`> block quote`	block quote

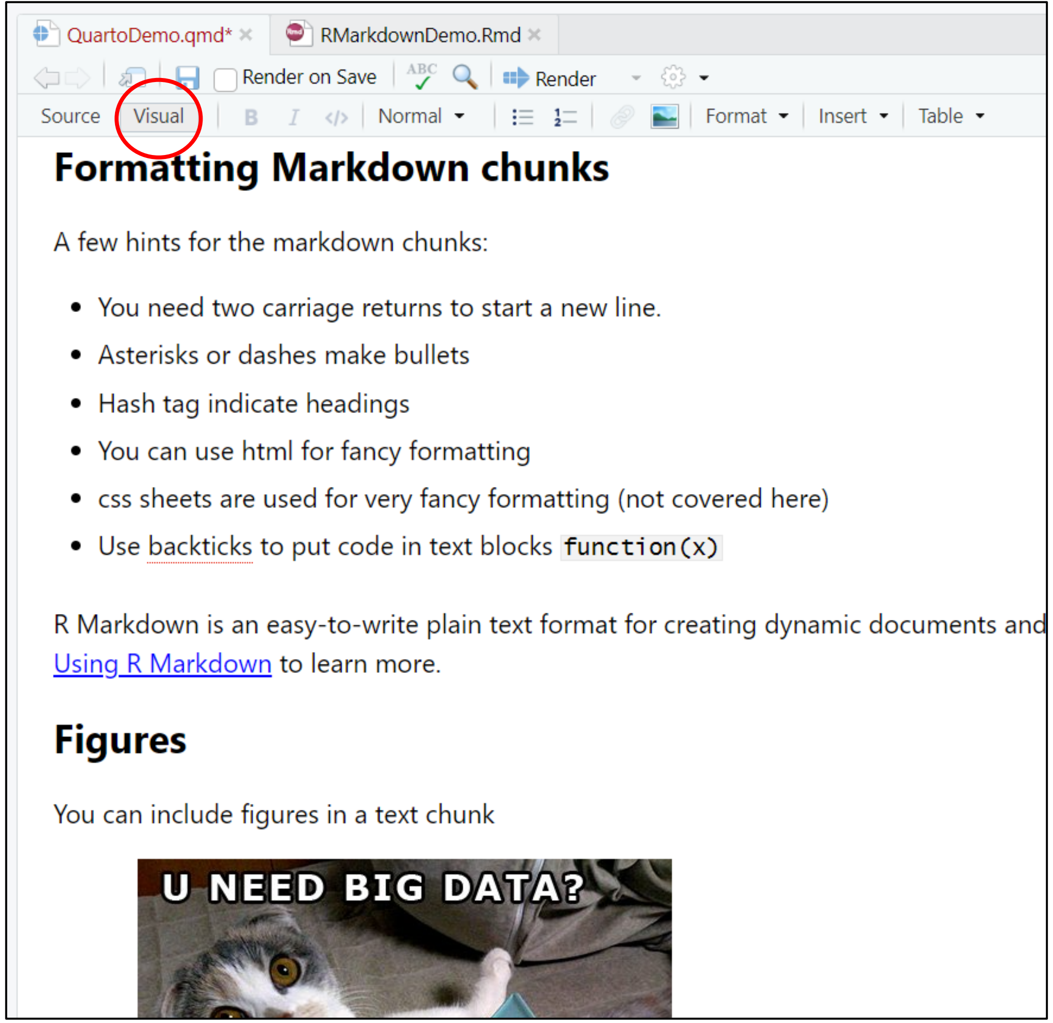
Source versus Visual editing

Source



~~~
## Formatting Markdown chunks

A few hints for the markdown chunks:

-   You need two carriage returns to start a new line.
-   Asterisks or dashes make bullets
-   Hash tag indicate headings
-   You can use html for fancy formatting
-   css sheets are used for very fancy formatting (not cover
-   Use backticks to put code in text blocks `function(x)`

R Markdown is an easy-to-write plain text format for creatir
and reports. See [Using R Markdown](https://rmarkdown.rstudi

## Figures

You can include figures in a text chunk

image: ![Alt text](../figures/Big-Data-Kitty.jpg){#id .class

Or you can include them in code chunks.

```{r Figure}
#|fig.height=4
#|fig.align="center"
#|fig.cap="Alt text here"
#|echo=FALSE

include_graphics("../figures/cheezburger-image.jpg")
~~~

Visual



Formatting Markdown chunks

A few hints for the markdown chunks:

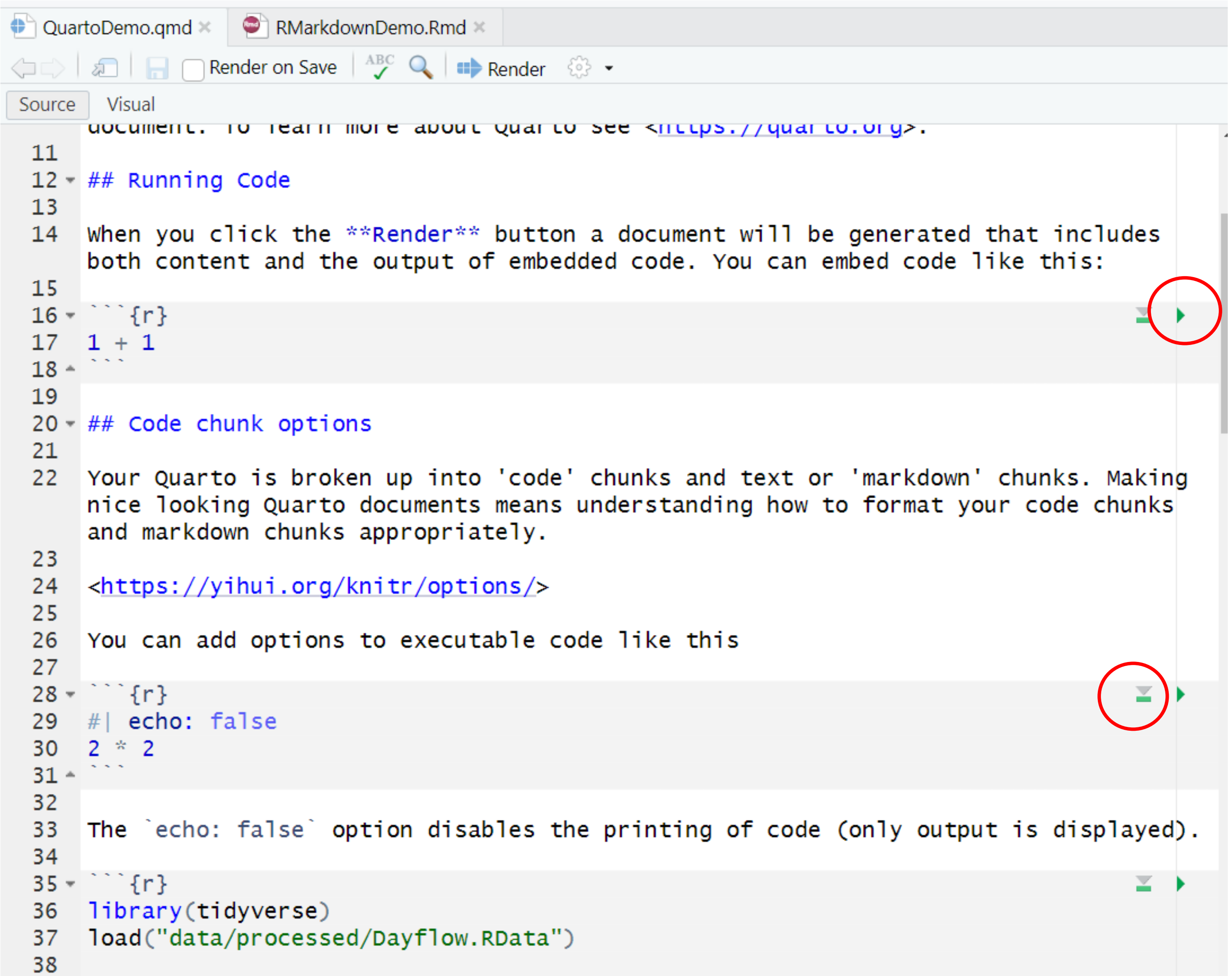
- You need two carriage returns to start a new line.
- Asterisks or dashes make bullets
- Hash tag indicate headings
- You can use html for fancy formatting
- css sheets are used for very fancy formatting (not covered here)
- Use backticks to put code in text blocks `function(x)`

R Markdown is an easy-to-write plain text format for creating dynamic documents and
Using R Markdown to learn more.

Figures

You can include figures in a text chunk

Running code



~~~
document. To learn more about Quarto see <https://quarto.org>.

## Running Code

When you click the **Render** button a document will be generated that includes
both content and the output of embedded code. You can embed code like this:

```{r}
1 + 1
```

## Code chunk options

Your Quarto is broken up into 'code' chunks and text or 'markdown' chunks. Making
nice looking Quarto documents means understanding how to format your code chunks
and markdown chunks appropriately.

<https://yihui.org/knitr/options/>

You can add options to executable code like this

```{r}
#| echo: false
2 * 2
```

The `echo: false` option disables the printing of code (only output is displayed).

```{r}
library(tidyverse)
load("data/processed/Dayflow.RData")
~~~

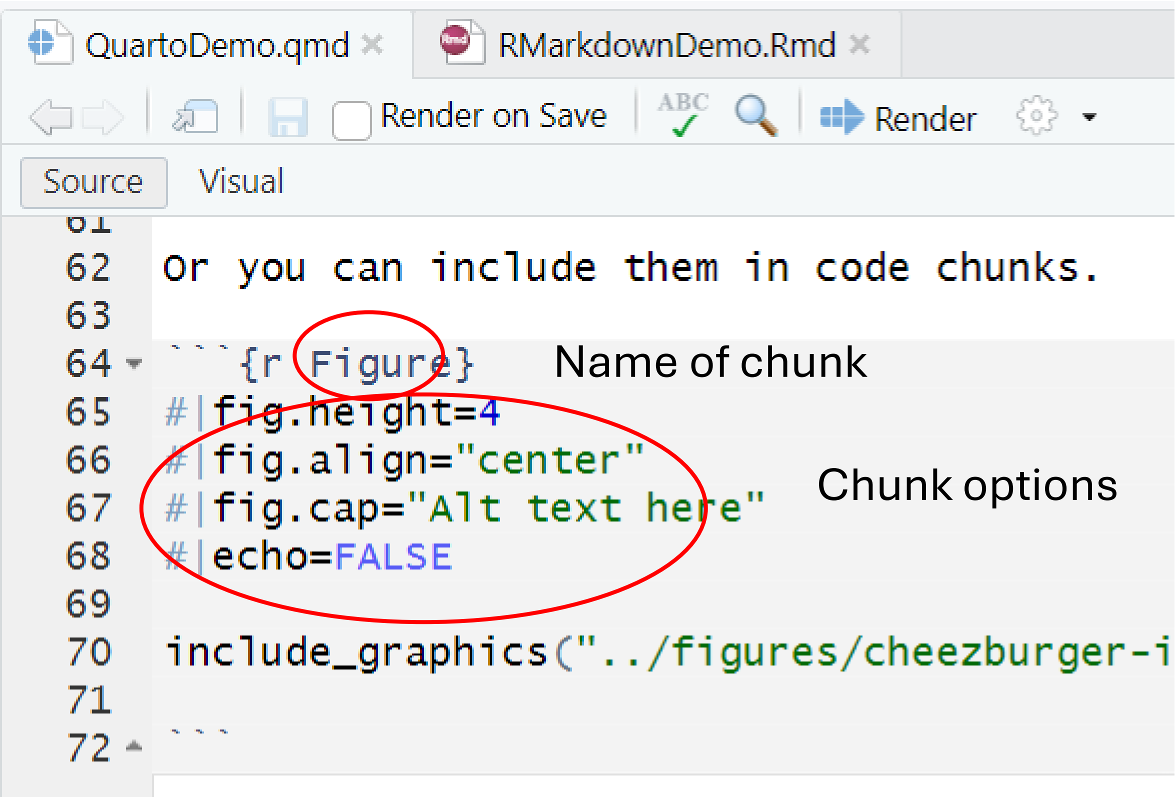
Run current chunk

Run all chunks above

Go to RStudio

- Demo running code

Chunk options



~~~
Or you can include them in code chunks.

```{r Figure}
#|fig.height=4
#|fig.align="center"
#|fig.cap="Alt text here"
#|echo=FALSE

include_graphics("../figures/cheezburger-i

```
~~~

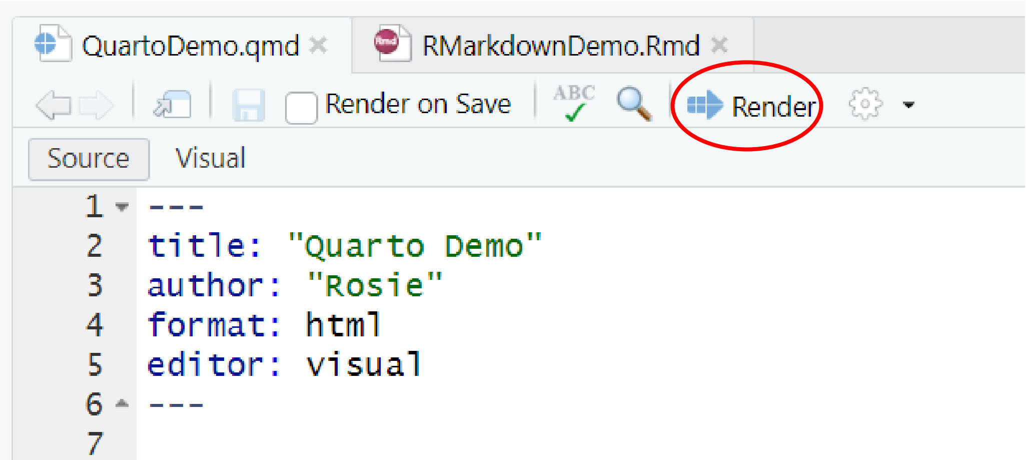
Name of chunk

Chunk options

- echo = TRUE
- eval = TRUE
- include = TRUE
- error = TRUE
- message = TRUE
- warning = TRUE

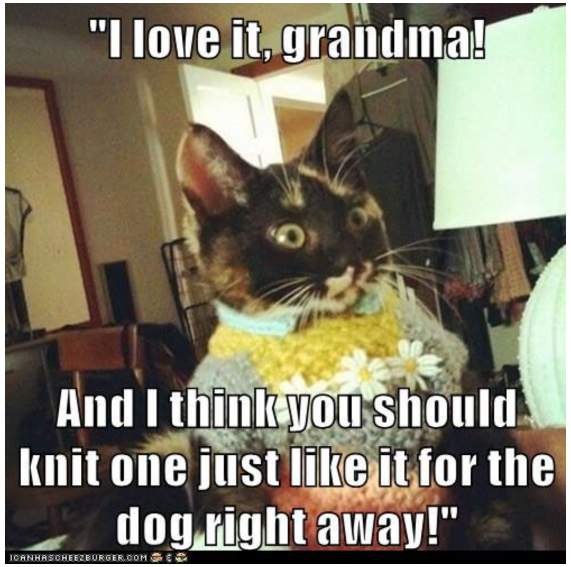
- dev = ‘png’
- dpi = 72
- fig.align = ‘default’
- fig.height, fig.width = 7
- fig.cap = NULL

Rendering (knitting)



```
---
title: "Quarto Demo"
author: "Rosie"
format: html
editor: visual
---

```

- format: html – default
- format: pdf - requires LaTex, extra installation


"I love it, grandma!
And I think you should knit one just like it for the dog right away!"
ICANHASCHEEZBURGER.COM

Go To Rstudio

- Demo rendering

This is just the beginning!

- Go to Quarto gallery
- https://quarto.org/
- https://quarto.org/docs/gallery/

Pappy always used to say, "The sky's the limit!"
Which is probably why he got fired from his job at NASA.
ICANHASCHEEZBURGER.COM

Questions?