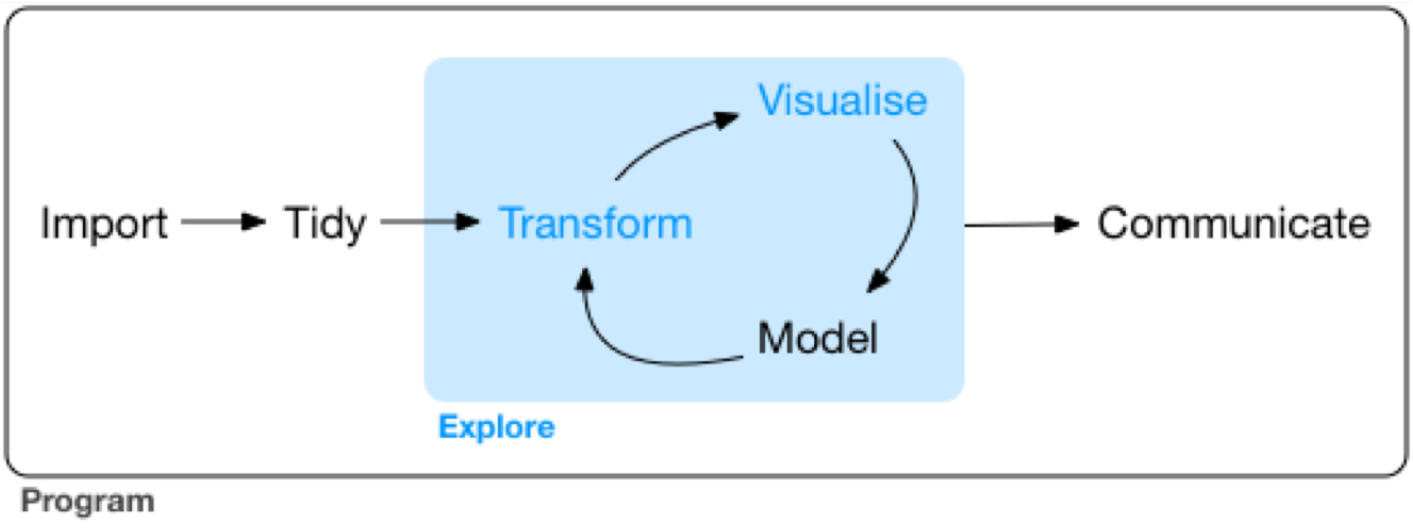
10. R Markdown - Communicating Results

Data Science for OR - J. Duggan

R Markdown

- R Markdown provides a unified authoring framework for data science, combining your code, results and prose commentary
- R Markdown documents are fully reproducible and support many output formats (pdfs, slideshows, and more).
- Course slides developed with RMarkdown, see https://github.com/JimDuggan/DSORR



Why use R Markdown?

- For communicating to decision makers, who want to focus on conclusions, not the code behind the analysis.
- For collaborating with other data scientists, who are interested in your conclusions, and how you reached them
- As an environment in which to do data science, where you capture not only what you did, but what you were thinking

R Markdown Elements

- An (optional) YAML header surrounded by —
- Chunks of R Code, surrounded by “‘
- Text mixed with simple text formatting

R Markdown Example

````
---
title: "Diamond Sizes"
date: 2017-08-25
output:
  html_document: default
---

Here is an example of using **R Markdown**.

```{r setup, include=FALSE}
library(ggplot2)
library(dplyr)
```

```{r, echo=FALSE}
smaller <- diamonds %>%
  filter(carat <= 2.5)
```

We have data about `r nrow(diamonds)`
diamonds in our data set.
Only **`r nrow(diamonds) - nrow(smaller)`**
are larger than 2.5 carats.

The distribution of the remainder is show below:

```{r, echo=FALSE}
smaller %>%
  ggplot(aes(carat)) +
  geom_freqpoly(binwidth=0.01)

```
````


"knit" to HTML

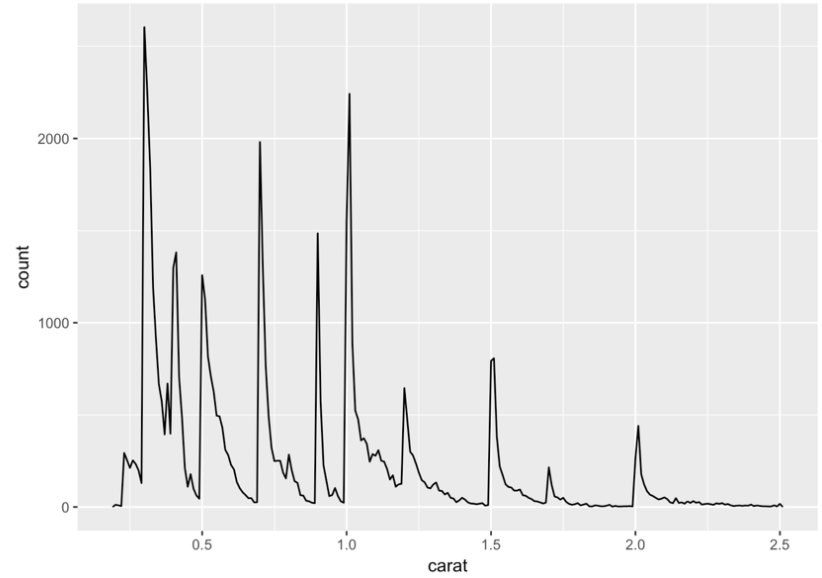
Diamond Sizes

2017-08-25

Here is an example of using **R Markdown**.

We have data about 53940 diamonds in our data set. Only **126** are larger than 2.5 carats.

The distribution of the remainder is show below:



"knit" to PDF

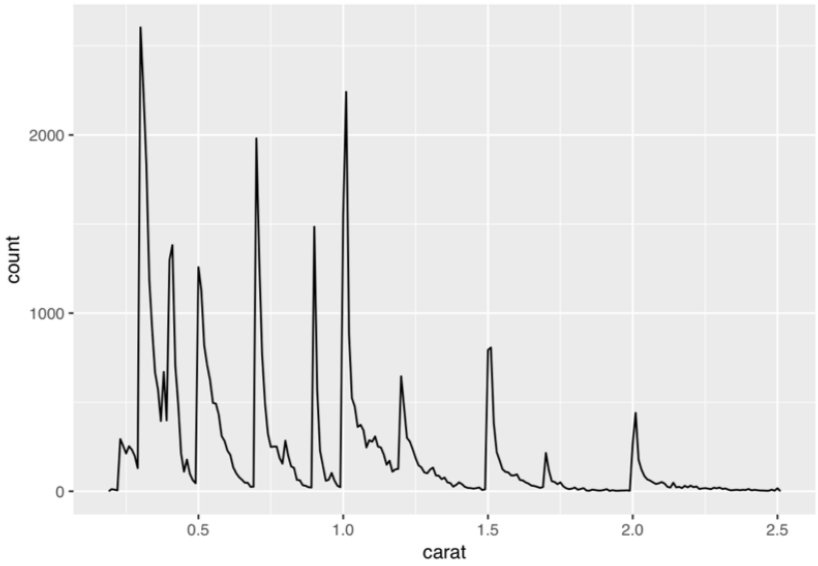
Diamond Sizes

2017-08-25

Here is an example of using **R Markdown**.

We have data about 53940 diamonds in our data set. Only **126** are larger than 2.5 carats.

The distribution of the remainder is show below:



Text formatting with Markdown

- Text Formatting
  - *italic*
  - **bold**
  - ‘code‘
- Headings
  - # First Level header
  - ## Second Level header
  - ### Third Level header
- Lists
  - * Bulleted list item 1
  - 1 Numbered list item 1

Inserting Chunks

This table summarizes what types of output each option suppresses. . .

Option	Run code	Show Code	Output	Plots	Messages	Warnings
eval = FALSE	X		X	X	X	X
include = FALSE		X	X	X	X	X
echo = FALSE		X				
results= “hide”			X			
fig.show=“hide”				X		
message=FALSE					X	
Warning=FALSE						X

Creating a Table

````
---
title: "Table Test"
output: html_document
---

```{r}
mtcars[1:5,1:10]
```

```{r}
knitr::kable(
  mtcars[1:5,1:10],
  caption="A knitr kable"
)

```
````

Table Test

```
mtcars[1:5,1:10]
```

```
##                   mpg cyl disp  hp drat    wt  qsec vs am gear
## Mazda RX4         21.0   6  160 110 3.90 2.620 16.46  0  1    4
## Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02  0  1    4
## Datsun 710        22.8   4  108  93 3.85 2.320 18.61  1  1    4
## Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44  1  0    3
## Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0    3
```

```
knitr::kable(
  mtcars[1:5,1:10],
  caption="A knitr kable"
)
```

A knitr kable

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear
Mazda RX4	21.0	6	160	110	3.90	2.620	16.46	0	1	4
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875	17.02	0	1	4
Datsun 710	22.8	4	108	93	3.85	2.320	18.61	1	1	4
Hornet 4 Drive	21.4	6	258	110	3.08	3.215	19.44	1	0	3
Hornet Sportabout	18.7	8	360	175	3.15	3.440	17.02	0	0	3

YAML Header

- Yet Another Markup Language"
- Useful features
  - Parameters
  - Bibliographies

YAML Example

```
---
title: "Parameter Test"
bibliography: ref.bib
params:
  my_class: suv
  my_time: !r lubridate::now()

output:
  html_document: default
  pdf_document: default
---

The time is now `r params$my_time`

The reference is [@paper1]
```

````
```{r setup, include=FALSE}
library(ggplot2)
library(dplyr)

class <- mpg %>% filter(class == params$my_class)

```


```{r, message=FALSE}
ggplot(class,aes(x=displ,y=hwy))+
  geom_point()+
  geom_smooth(se=F)

```
````

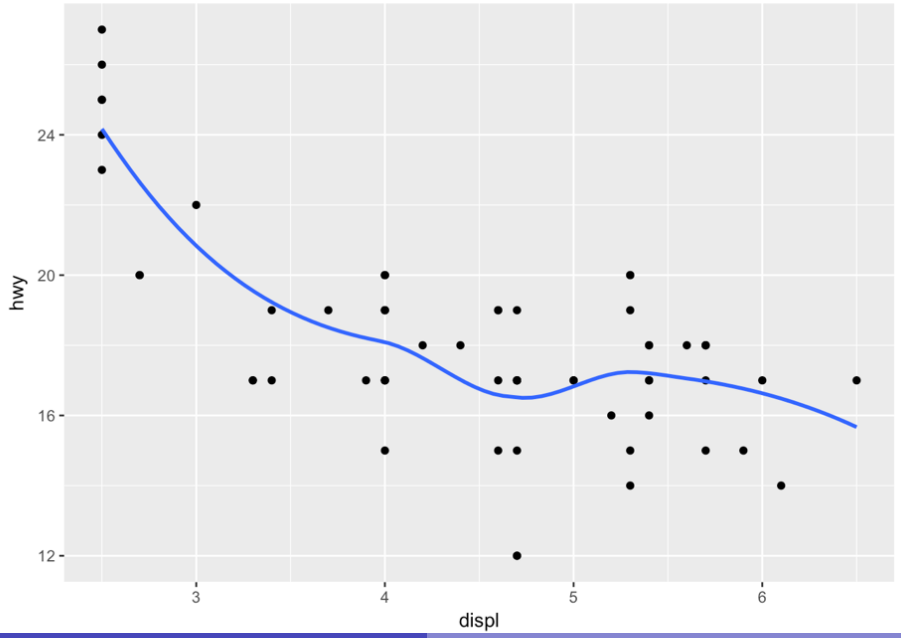
Sample Output

Parameter Test

The time is now 2017-11-15 19:41:58

The reference is (Koppeschaar et al. 2017)

```
ggplot(class,aes(x=displ,y=hwy))+
  geom_point()+
  geom_smooth(se=F)
```



Presentations

Challenge 1.3

Write an R function (evens) that filters a vector to return all the even numbers. Use the modulus operator %%, and also logical filtering of vectors.

```{r,echo=F}
evens <- function(x)x[x %% 2 == 0]
```

```{r,echo=T}
x <- 1:6
x
y <- evens(x)
y
```

Output

Challenge 1.3

Write an R function (evens) that filters a vector to return all the even numbers. Use the modulus operator %%, and also logical filtering of vectors.

```
x <- 1:6
x
```

```
## [1] 1 2 3 4 5 6
```

```
y <- evens(x)
y
```

```
## [1] 2 4 6
```


Summary

- R Markdown provides a unified authoring framework for data science, combining:
  - your code,
  - results
  - prose commentary
- R Markdown documents are fully reproducible and support many output formats (pdfs, slideshows, and more).
- See also **R Presentation** format for slide generation