ExploratoryDataAnalysis

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Today we will discuss Exploratory Data Analysis (EDA).

This is the process of exploring your data using visualization and transformations and modeling (will discuss modeling more later).

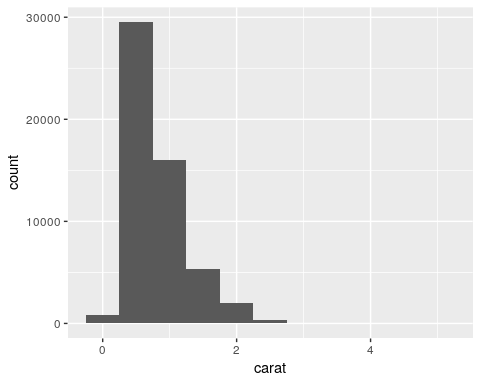
library(tidyverse)

Lets take a look at the *diamonds* data set and the variable carat.

diamonds

## # A tibble: 53,940 x 10  
## carat cut color clarity depth table price x y z  
## <dbl> <ord> <ord> <ord> <dbl> <dbl> <int> <dbl> <dbl> <dbl>  
## 1 0.23 Ideal E SI2 61.5 55 326 3.95 3.98 2.43  
## 2 0.21 Premium E SI1 59.8 61 326 3.89 3.84 2.31  
## 3 0.23 Good E VS1 56.9 65 327 4.05 4.07 2.31  
## 4 0.290 Premium I VS2 62.4 58 334 4.2 4.23 2.63  
## 5 0.31 Good J SI2 63.3 58 335 4.34 4.35 2.75  
## 6 0.24 Very Good J VVS2 62.8 57 336 3.94 3.96 2.48  
## 7 0.24 Very Good I VVS1 62.3 57 336 3.95 3.98 2.47  
## 8 0.26 Very Good H SI1 61.9 55 337 4.07 4.11 2.53  
## 9 0.22 Fair E VS2 65.1 61 337 3.87 3.78 2.49  
## 10 0.23 Very Good H VS1 59.4 61 338 4 4.05 2.39  
## # ... with 53,930 more rows

ggplot(data = diamonds) +  
 geom\_histogram(mapping = aes(x = carat), binwidth = 0.5)

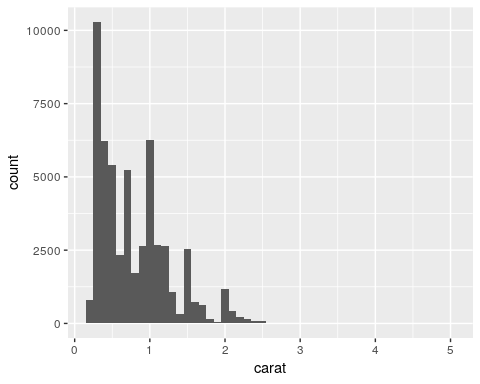


diamonds %>%   
 count(cut\_width(carat, 0.5))

## # A tibble: 11 x 2  
## `cut\_width(carat, 0.5)` n  
## <fct> <int>  
## 1 [-0.25,0.25] 785  
## 2 (0.25,0.75] 29498  
## 3 (0.75,1.25] 15977  
## 4 (1.25,1.75] 5313  
## 5 (1.75,2.25] 2002  
## 6 (2.25,2.75] 322  
## 7 (2.75,3.25] 32  
## 8 (3.25,3.75] 5  
## 9 (3.75,4.25] 4  
## 10 (4.25,4.75] 1  
## 11 (4.75,5.25] 1

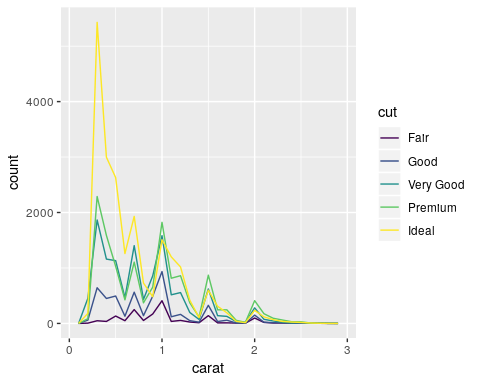
Looking at the smaller diamonds.

smaller <- diamonds %>%   
 filter(carat < 3)  
   
diamonds %>% ggplot(mapping = aes(x = carat)) +  
 geom\_histogram(binwidth = 0.1)



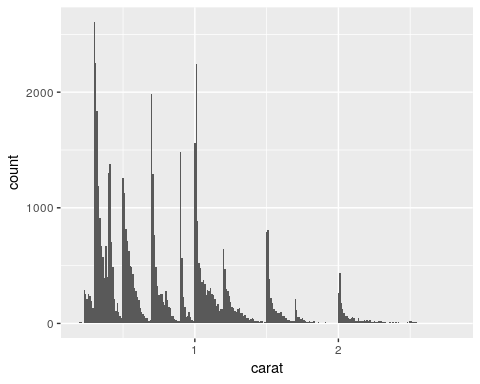
Look at carat by cut.

smaller %>% ggplot(mapping = aes(x = carat, colour = cut)) +  
 geom\_freqpoly(binwidth = 0.1)



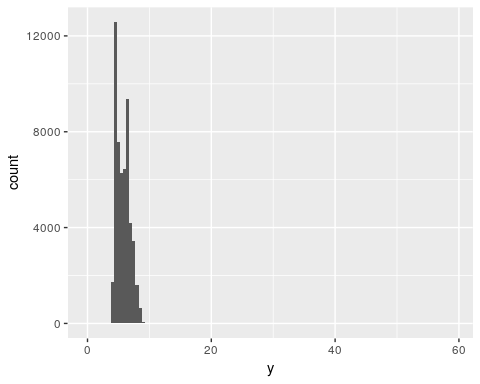
Looking for *typical values*.

smaller %>% ggplot(mapping = aes(x = carat)) +  
 geom\_histogram(binwidth = 0.01)



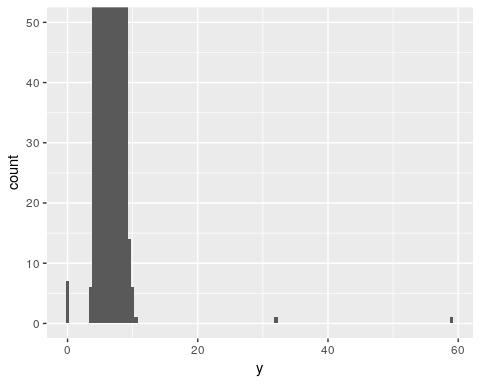
Looking for *unusual values*. Lets look at the *y* variable.

diamonds %>% ggplot(mapping = aes(x = y)) +   
 geom\_histogram(binwidth = 0.5)



Are there outliers?

diamonds %>% ggplot(mapping = aes(x = y)) +   
 geom\_histogram(binwidth = 0.5) +  
 coord\_cartesian(ylim = c(0, 50))



Lets find the outliers.

unusual <- diamonds %>%   
 filter(y < 3 | y > 20) %>%   
 select(price, x, y, z) %>%  
 arrange(y)  
unusual

## # A tibble: 9 x 4  
## price x y z  
## <int> <dbl> <dbl> <dbl>  
## 1 5139 0 0 0   
## 2 6381 0 0 0   
## 3 12800 0 0 0   
## 4 15686 0 0 0   
## 5 18034 0 0 0   
## 6 2130 0 0 0   
## 7 2130 0 0 0   
## 8 2075 5.15 31.8 5.12  
## 9 12210 8.09 58.9 8.06

Remove outliers.

diamonds2 <- diamonds %>%   
 filter(between(y, 3, 20))

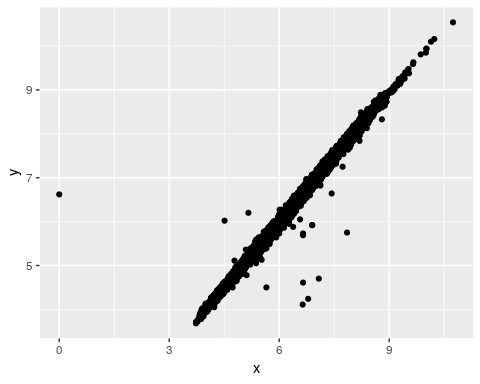
Better to convert them to **NA**, which means not available.

diamonds2 <- diamonds %>%   
 mutate(y = ifelse(y < 3 | y > 20, NA, y))

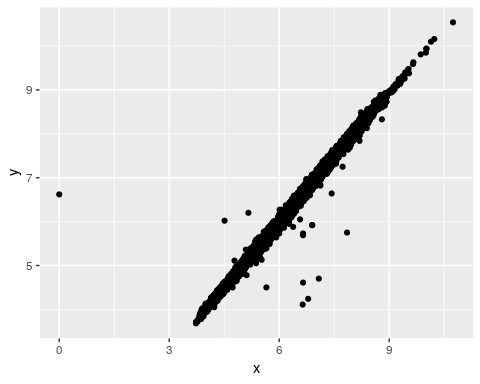
Scatterplots.

diamonds2 %>% ggplot(mapping = aes(x = x, y = y)) +   
 geom\_point()

## Warning: Removed 9 rows containing missing values (geom\_point).

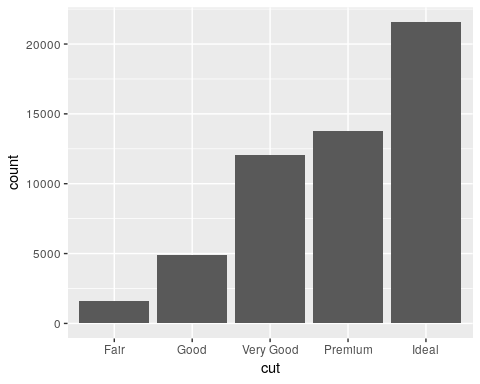


ggplot(data = diamonds2, mapping = aes(x = x, y = y)) +   
 geom\_point(na.rm = TRUE)



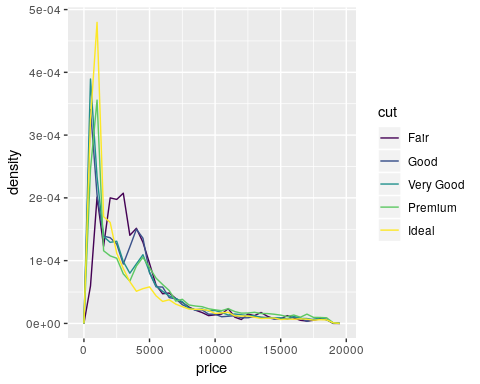
Categorical variable. cut

diamonds %>% ggplot(mapping = aes(x = cut)) +   
 geom\_bar()



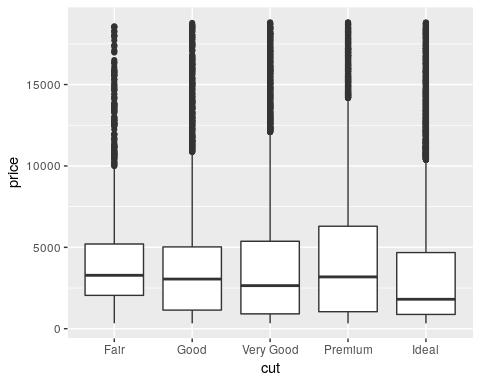
Continuous variable. price

diamonds %>% ggplot(mapping = aes(x = price, y = ..density..)) +   
 geom\_freqpoly(mapping = aes(colour = cut), binwidth = 500)



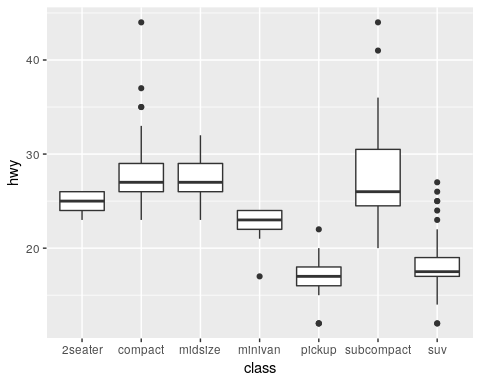
Putting them together in one plot.

diamonds %>% ggplot(mapping = aes(x = cut, y = price)) +  
 geom\_boxplot()



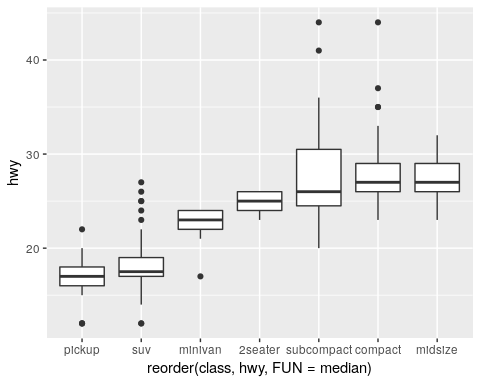
For a different data set. mpg

mpg %>% ggplot(mapping = aes(x = class, y = hwy)) +  
 geom\_boxplot()



Re-order.

mpg %>% ggplot(mapping = aes(x = reorder(class, hwy, FUN = median), y = hwy)) +  
 geom\_boxplot()



Flip.

mpg %>% ggplot(mapping = aes(x = reorder(class, hwy, FUN = median), y = hwy)) +  
 geom\_boxplot() +  
 coord\_flip()

