2.exploration (exercises)

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Contents

1. VARIATION

[from https://r4ds.hadley.nz/eda#variation]

[see https://jrnold.github.io/r4ds-exercise-solutions/exploratory-data-analysis.html]

[see https://mine-cetinkaya-rundel.github.io/r4ds-solutions/EDA.html]

1.1. TYPICAL VALUES

a) Explore the distribution of each of the x, y, and z variables in diamonds. What do you learn? Think about a diamond and how you might decide which dimension is the length, width, and depth.

b) Explore the distribution of price. Do you discover anything unusual or surprising? (Hint: Carefully think about the binwidth and make sure you try a wide range of values.)

c) How many diamonds are 0.99 carat? How many are 1 carat? What do you think is the cause of the difference?

d) Compare and contrast coord_cartesian() vs xlim() or ylim() when zooming in on a histogram. What happens if you leave binwidth unset? What happens if you try and zoom so only half a bar shows?

1.2. UNUSUAL VALUES

[No exercises]

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2. MISSING VALUES

[from https://r4ds.hadley.nz/missing-values]

[see https://jrnold.github.io/r4ds-exercise-solutions/exploratory-data-analysis.html]

[see https://mine-cetinkaya-rundel.github.io/r4ds-solutions/EDA.html]

2.1. EXPLICIT MISSING VALUES

a) What happens to missing values in a histogram? What happens to missing values in a bar chart? Why is there a difference?

b) What does na.rm = TRUE do in mean() and sum()?

2.2. IMPLICIT MISSING VALUES

a) Can you find any relationship between the carrier and the rows that appear to be missing from planes?

2.3. FACTORS AND EMPTY GROUPS

[no exercises]

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3. COVARIATION

[from https://r4ds.hadley.nz/eda#covariation]

[see https://jrnold.github.io/r4ds-exercise-solutions/exploratory-data-analysis.html]

[see https://mine-cetinkaya-rundel.github.io/r4ds-solutions/EDA.html]

3.1. CATEGORICAL AND NUMERICAL VARIABLES

a) Use what you've learned to improve the visualization of the departure times of cancelled vs. non-cancelled flights.

b) What variable in the diamonds dataset is most important for predicting the price of a diamond? How is that variable correlated with cut? Why does the combination of those two relationships lead to lower quality diamonds being more expensive?

c) One problem with boxplots is that they were developed in an era of much smaller datasets and tend to display a prohibitively large number of "outlying values". One approach to remedy this problem is the letter value plot. Install the lvplot package, and try using geom_lv() to display the distribution of price vs. cut. What do you learn? How do you interpret the plots?

d) Create a visualization of diamond prices vs. a categorical variable from the diamonds dataset using geom_violin(), then a faceted geom_histogram(), then a colored geom_freqpoly(), and then a colored geom_density(). Compare and contrast the four plots. What are the pros and cons of each method of visualizing the distribution of a numerical variable based on the levels of a categorical variable?

e) If you have a small dataset, it's sometimes useful to use geom_jitter() to avoid overplotting to more easily see the relationship between a continuous and categorical variable. The ggbeeswarm package provides a number of methods similar to geom_jitter(). List them and briefly describe what each one does.

3.2. TWO CATEGORICAL VARIABLES

a) How could you rescale the count dataset above to more clearly show the distribution of cut within color, or color within cut?

b) What different data insights do you get with a segmented bar chart if color is mapped to the x aesthetic and cut is mapped to the fill aesthetic? Calculate the counts that fall into each of the segments.

c) Use geom_tile() together with dplyr to explore how average flight delays vary by destination and month of year. What makes the plot difficult to read? How could you improve it?

3.3. TWO NUMERICAL VARIABLES

a) Instead of summarizing the conditional distribution with a box plot, you could use a frequency polygon. What do you need to consider when using cut_width() vs cut_number()? How does that impact a visualization of the 2d distribution of carat and price?

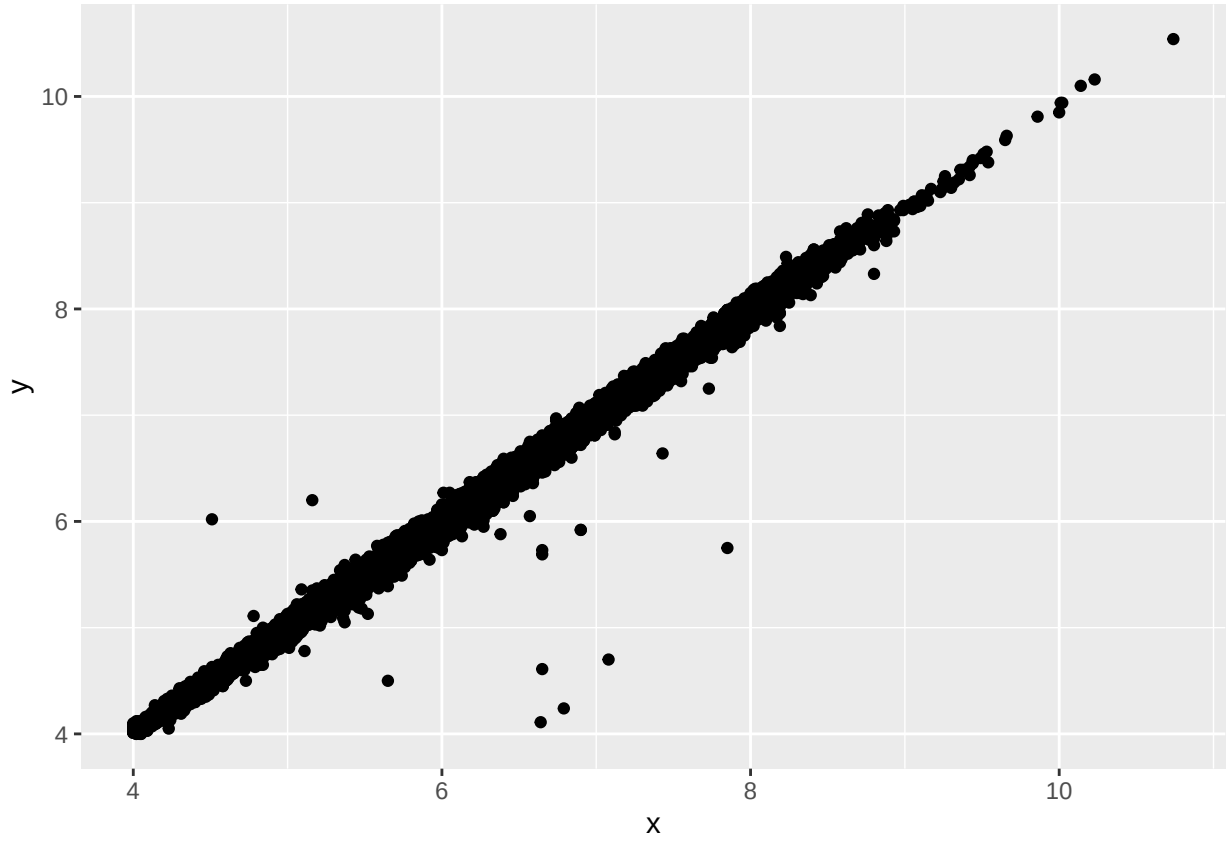
b) Visualize the distribution of carat, partitioned by price.

c) How does the price distribution of very large diamonds compare to small diamonds. Is it as you expect, or does it surprise you?

d) Combine two of the techniques you've learned to visualize the combined distribution of cut, carat, and price.

e) Two dimensional plots reveal outliers that are not visible in one dimensional plots. For example, some points in the plot below have an unusual combination of x and y values, which makes the points outliers even though their x and y values appear normal when examined separately. Why is a scatterplot a better display than a binned plot for this case?

```r
diamonds |>
  filter(between(x, 4, 11), between(y, 4, 11)) |>
  ggplot(aes(x = x, y = y)) +
  geom_point()
```



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4. PATTERNS AND MODELS

a) Obtain a sample with 20 observation from the dataset diamonds. Make the appropriate data transformation and fit a linear model between the price and the weight of diamonds. Plot the observations, the fitted value and the residuals. Take a look at geom_segment() for plotting the residuals.