Bad data & Outliers

true

2022-10-17

Table of contents


```
pacman::p_load(
  broom,
  conflicted,
  here,
  janitor,
  readxl,
  tidyverse
)
```

There are two download links:

- Download the **original** excel file here.
- Download the **formatted** excel file here.

1 Data

Imagine that this dataset was obtained by you. You spent an entire day walking around the campus of a university and asked a total of 29 people for things like how old they are (`Ages`) and you also tested how well they could see on a scale of 1-10 (`Vision`).

1.1 Import

Assuming you are working in a R-project, save the formatted file somewhere within the project directory. I have saved it within a sub folder called `data` so that the relative path to my file is `data/vision_fixed.xls`.

```
path <- here("data", "vision_fixed.xls")
dat <- read_excel(path)

dat
```

```
# A tibble: 29 x 9
   Person     Ages Gender `Civil state` Height Profession Vision Dista~1 PercD~2
   <chr>     <dbl> <chr>  <chr>          <dbl> <chr>       <dbl>   <dbl>   <dbl>
 1 Andrés       25 M      S                180 Student        10     1.5    15
 2 Anja         29 F      S                168 Professio~     10     4.5    45
 3 Armando      31 M      S                169 Professio~      9     4.5    50
 4 Carlos       25 M      M                185 Professio~      8     6      75
 5 Cristina     23 F      <NA>             170 Student        10     3      30
 6 Delfa        39 F      M                158 Professio~      6     4.5    75
 7 Eduardo      28 M      S                166 Professio~      8     4.5    56.2
 8 Enrique      NA <NA>   <NA>              NA Professio~     NA     6      NA
 9 Fanny        25 F      M                164 Student         9     3      33.3
10 Francisco    46 M      M                168 Professio~      8     4.5    56.2
# ... with 19 more rows, and abbreviated variable names 1: Distance,
#   2: PercDist
```

1.2 Goal

Very much like in the previous chapter, our goal is to look at the relationship of two numeric variables: `Ages` and `Vision`. What is new about this data is, that it (i) has missing values and (ii) has a potential outlier.

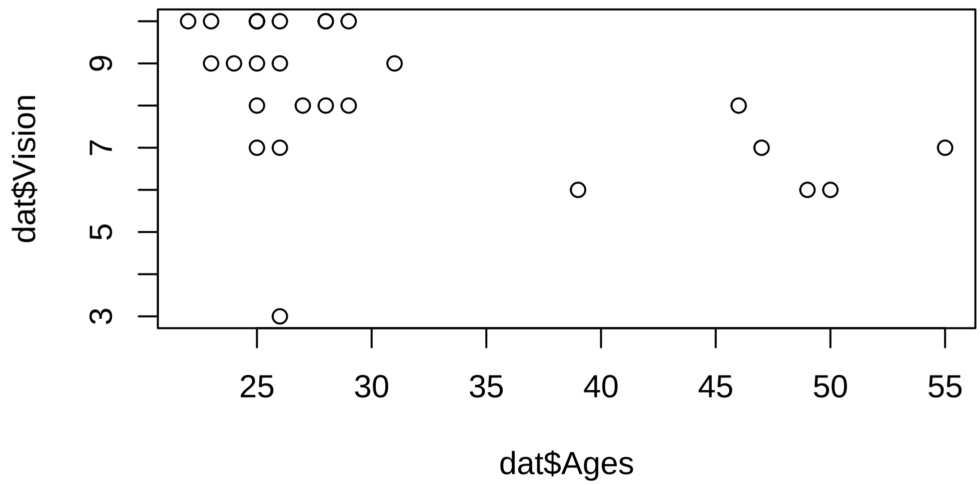
1.3 Exploring

To quickly get a first feeling for this dataset, we can use `summary()` and draw a plot via `plot()` or `ggplot()`.

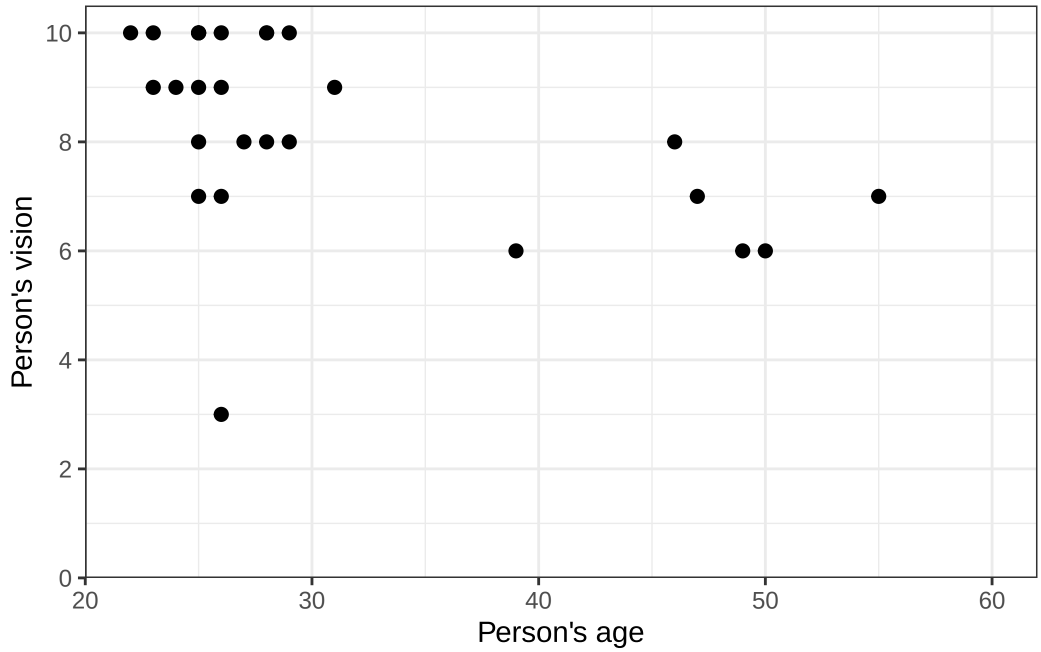
```
summary(dat)
```

```
    Person                  Ages          Gender             Civil state       
 Length:29          Min.   :22.00   Length:29          Length:29         
 Class :character   1st Qu.:25.00   Class :character   Class :character  
 Mode  :character   Median :26.00   Mode  :character   Mode  :character  
                    Mean   :30.61                                        
                    3rd Qu.:29.50                                        
                    Max.   :55.00                                        
                    NA's   :1                                            
     Height       Profession            Vision          Distance    
 Min.   :145.0   Length:29          Min.   : 3.000   Min.   :1.500  
 1st Qu.:164.8   Class :character   1st Qu.: 7.000   1st Qu.:1.500  
 Median :168.0   Mode  :character   Median : 9.000   Median :3.000  
 Mean   :168.2                      Mean   : 8.357   Mean   :3.466  
 3rd Qu.:172.8                      3rd Qu.:10.000   3rd Qu.:4.500  
 Max.   :190.0                      Max.   :10.000   Max.   :6.000  
 NA's   :1                          NA's   :1                       
    PercDist     
 Min.   : 15.00  
 1st Qu.: 20.24  
 Median : 40.18  
 Mean   : 45.45  
 3rd Qu.: 57.19  
 Max.   :150.00  
 NA's   :1       
```

```
plot(y = dat$Vision, x = dat$Ages)
```




```r
ggplot(data = dat) +
  aes(x = Ages, y = Vision) +
  geom_point(size = 2) +
  scale_x_continuous(
    name = "Person's age",
    limits = c(20, 60),
    expand = expansion(mult = c(0, 0.05))
  ) +
  scale_y_continuous(
    name = "Person's vision",
    limits = c(0, NA),
    breaks = seq(0, 10, 2),
    expand = expansion(mult = c(0, 0.05))
  ) +
    theme_bw()
```



Apparently, most people are in their 20s and can see quite well, however some people are older and they tend to have a vision that's a little worse.

2 Correlation & Regression

Let's estimate the correlation and simple linear regression and look at the results in a tidy format:

```
cor <- cor.test(dat$Vision, dat$Ages)
tidy(cor)
```

```
# A tibble: 1 x 8
  estimate statistic p.value parameter conf.low conf.high method         alter~1
     <dbl>     <dbl>   <dbl>     <int>    <dbl>     <dbl> <chr>          <chr>
1   -0.497     -2.92 0.00709        26   -0.734    -0.153 Pearson's pro~ two.si~
# ... with abbreviated variable name 1: alternative
```

```
reg <- lm(Vision ~ Ages, data = dat)
tidy(reg)
```

```
# A tibble: 2 x 5
  term        estimate std.error statistic  p.value
  <chr>          <dbl>     <dbl>     <dbl>    <dbl>
1 (Intercept)  11.1       0.996      11.2  1.97e-11
2 Ages         -0.0910    0.0311     -2.92 7.09e- 3
```

Thus, we have a negative, moderate correlation of -0.497 and for the regression we have *Vision = 11.14 + -0.09 Ages*.