More on data visualization

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1 This document

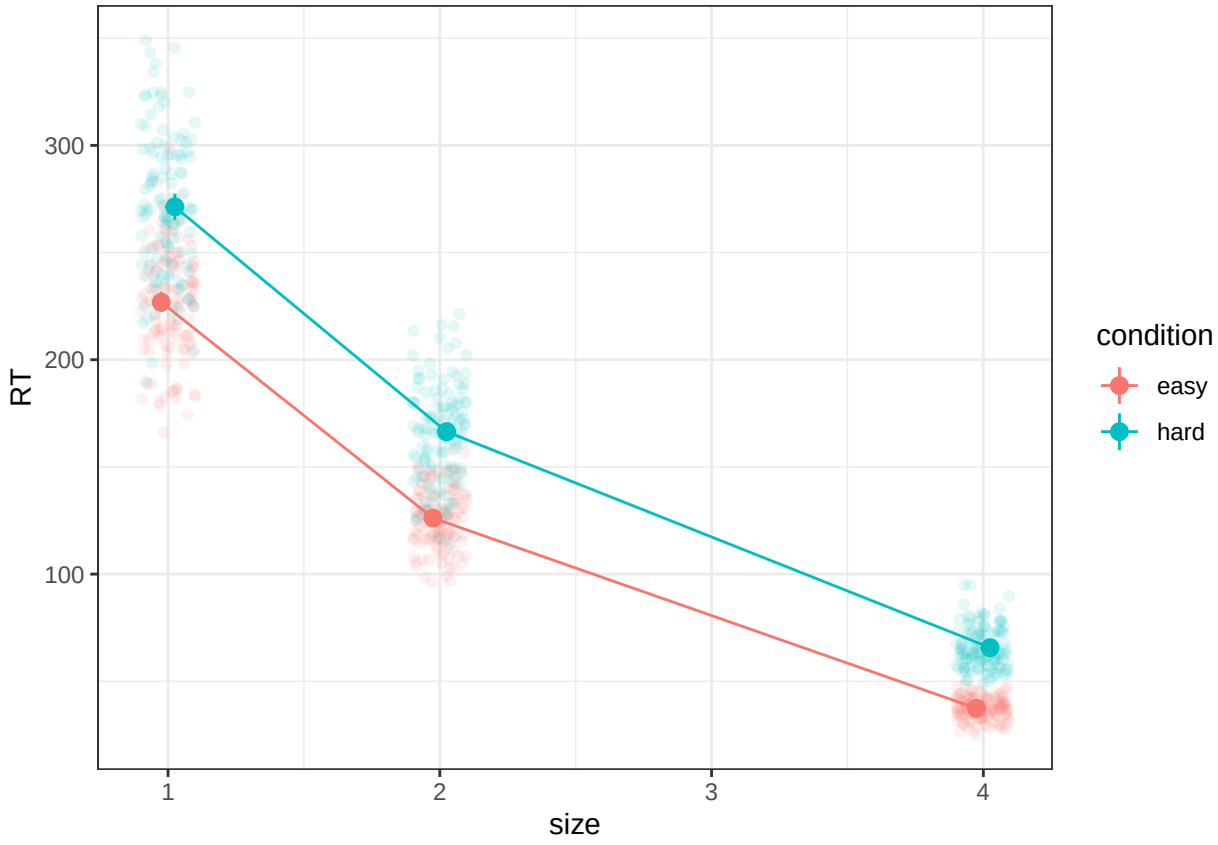
This document is part of a series of lectures that introduce students to basic data wrangling, plotting, and general approaches to data analysis. Please see the overview lecture. This and all other lectures are created in R markdown. R markdown combines text with R code, allowing us to see the code and its output, embedded within the text describing the code. If you have the original R markdown file (file extension .Rmd), you can 'knit' the document into an HMTL, PDF, or Word file.

2 Overview

This tutorial introduces you to additional aspects of plotting in R, such as the use of themes to fine-tune your plots.

3 Read in example data

3.1 Example plot

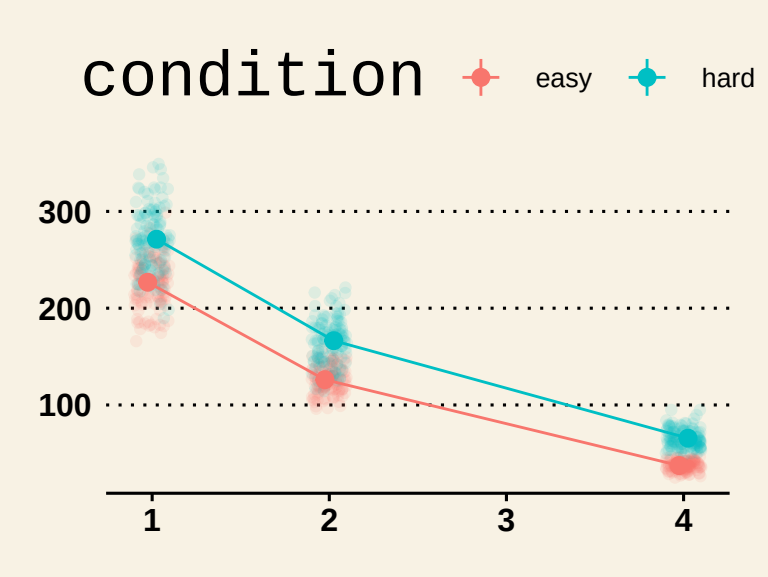


4 Storing plots at specific sizes and aspect ratios

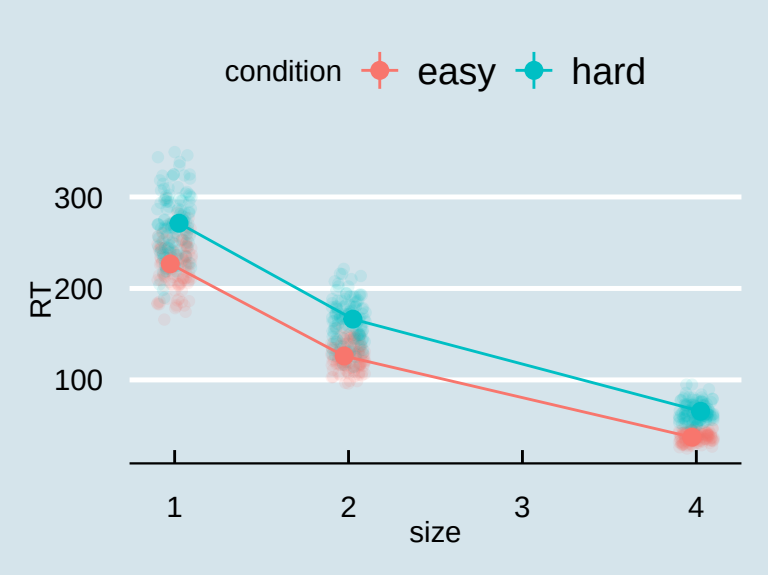
5 Themes

Themes can be used to customize any detail of a plot. There are many customized themes, including in additional libraries (e.g., *ggthemes*). Here a few examples:

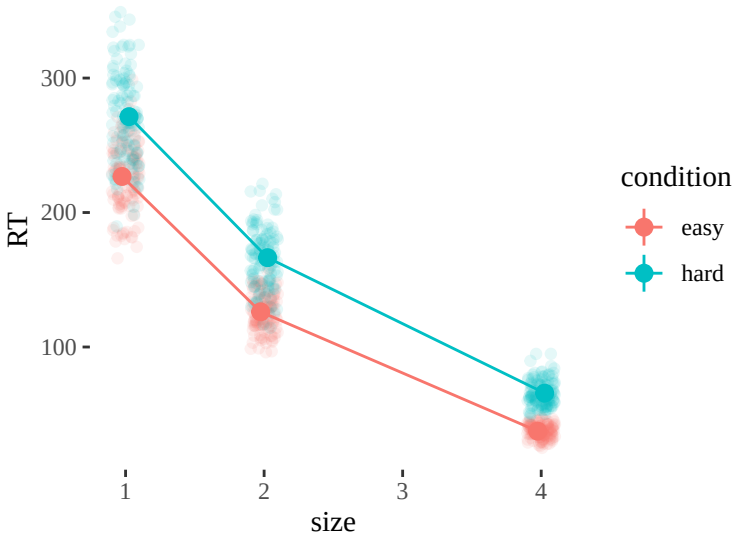
```
p + theme_wsj()
```




```
p + theme_economist()
```




```
p + theme_tufte()
```




```
# etc.
```

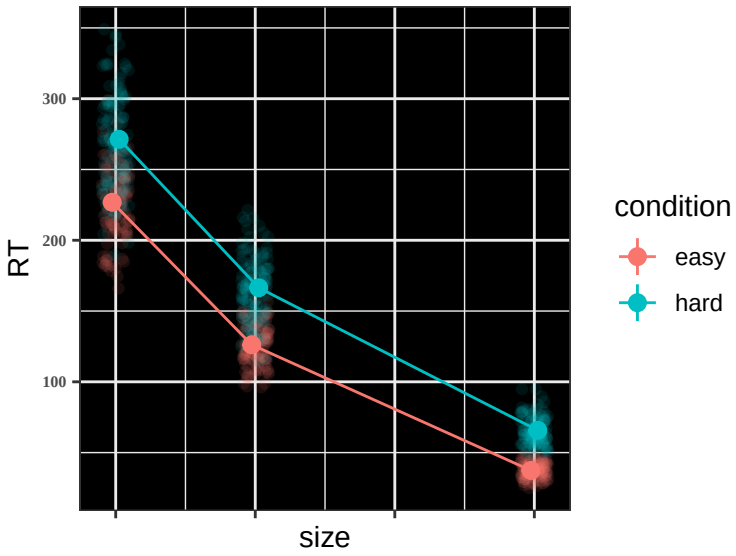
If fact, any ggplot has a theme, even if you don't specify one. In that case, *ggplot2* uses the default theme. There are now *many* prepared themes that you can choose from:

- The core (https://ggplot2.tidyverse.org/reference/ggtheme.html)
- Some extensions (https://www.statology.org/best-ggplot2-themes/)
- The endless supply (https://www.datanovia.com/en/blog/ggplot-themes-gallery/)
- Make your theme gallery (https://www.r-bloggers.com/2020/05/vignette-generate-your-own-ggplot-theme-gallery/)

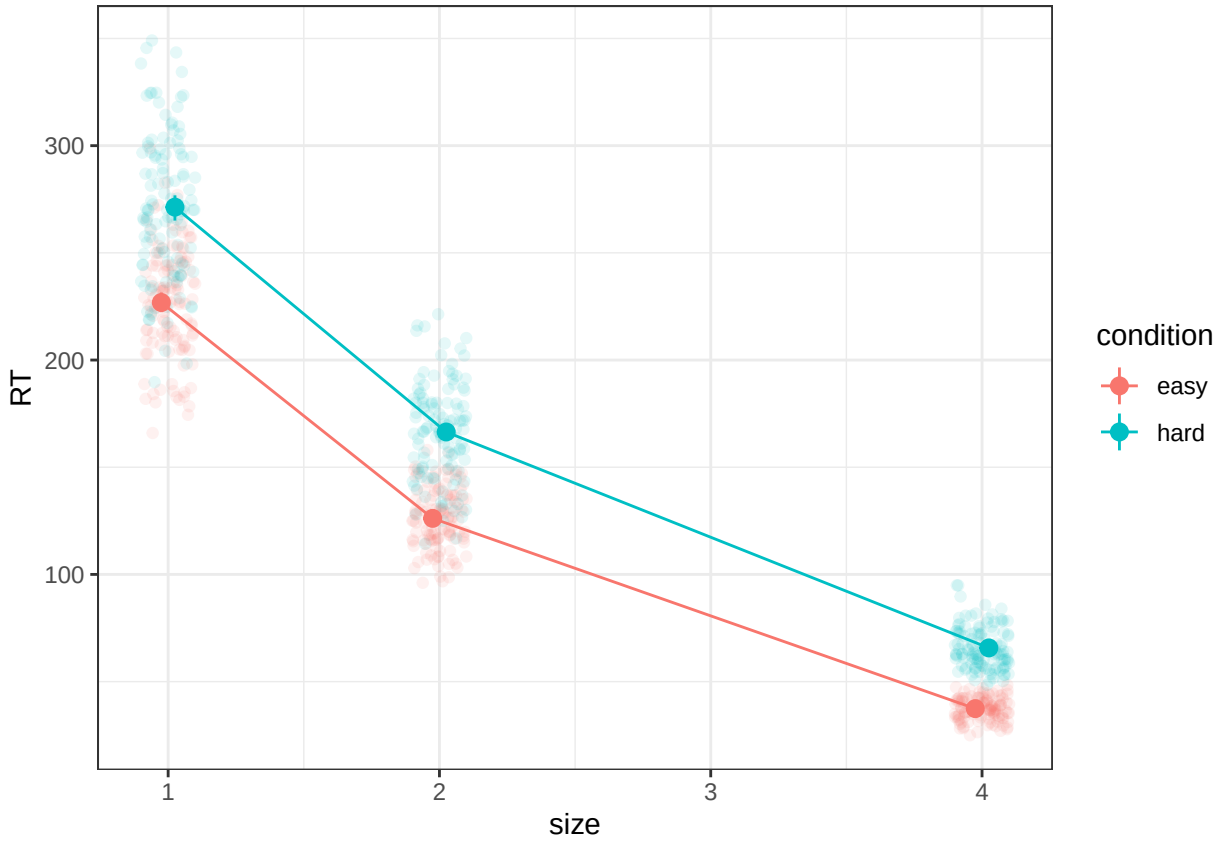
5.1 Make your own

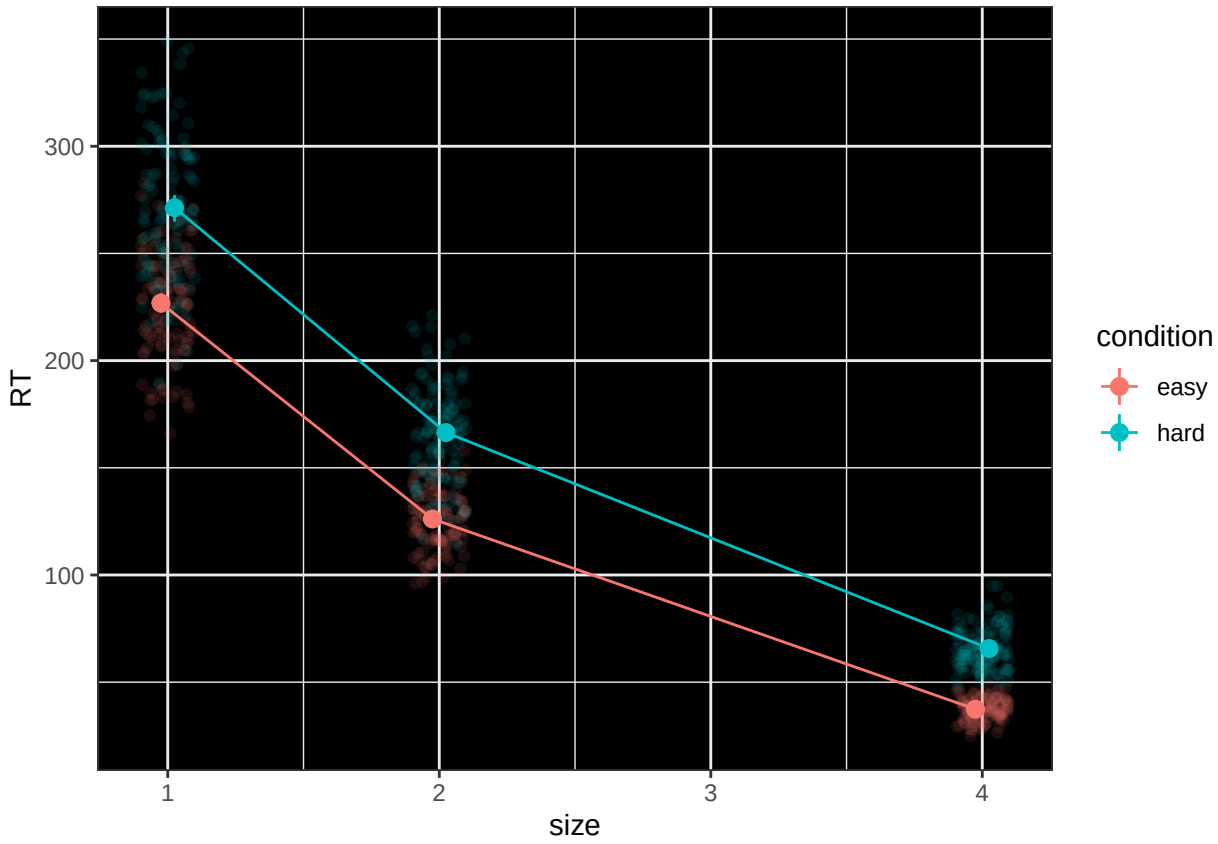
Check out *?theme for more information. For example, to remove the x-axis labels, and to change the font of the y-axis labels:

```
p + theme(
  panel.background = element_rect(fill = "black"),
  axis.text.x = element_blank(),
  axis.text.y = element_text(family = "Times", face = "bold", size = 6))
```

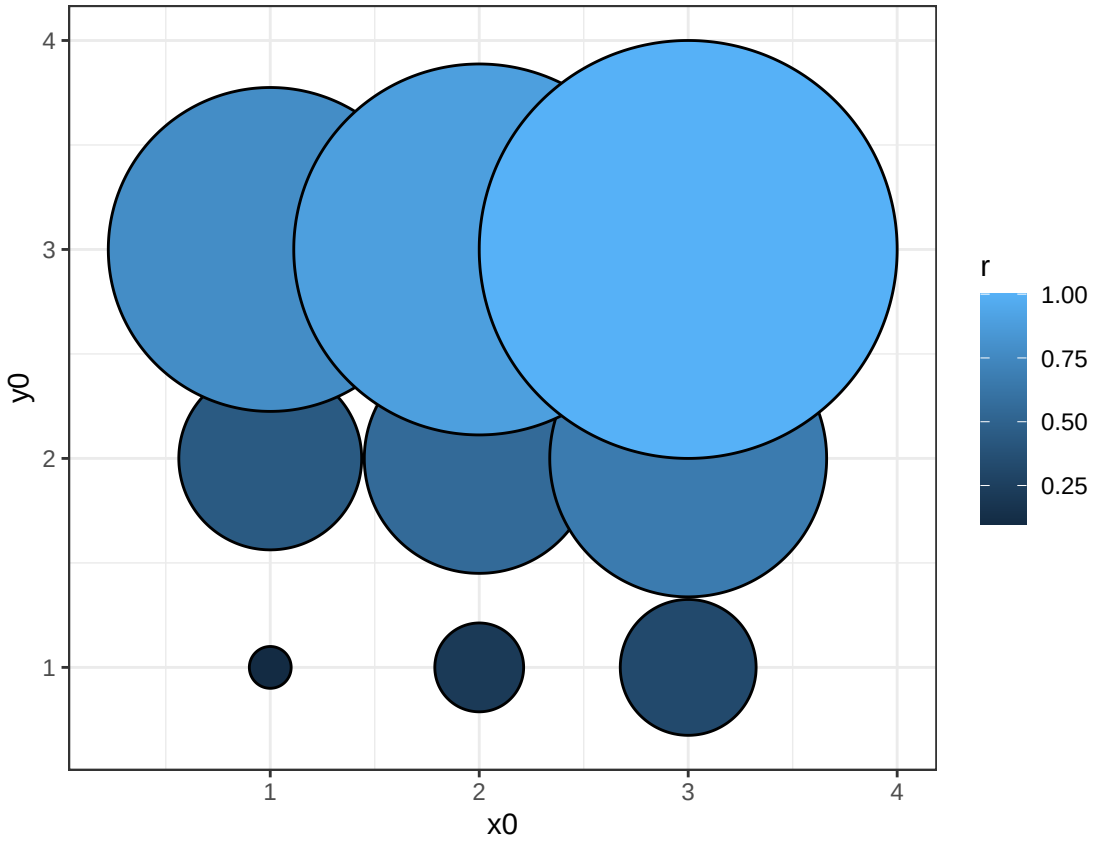


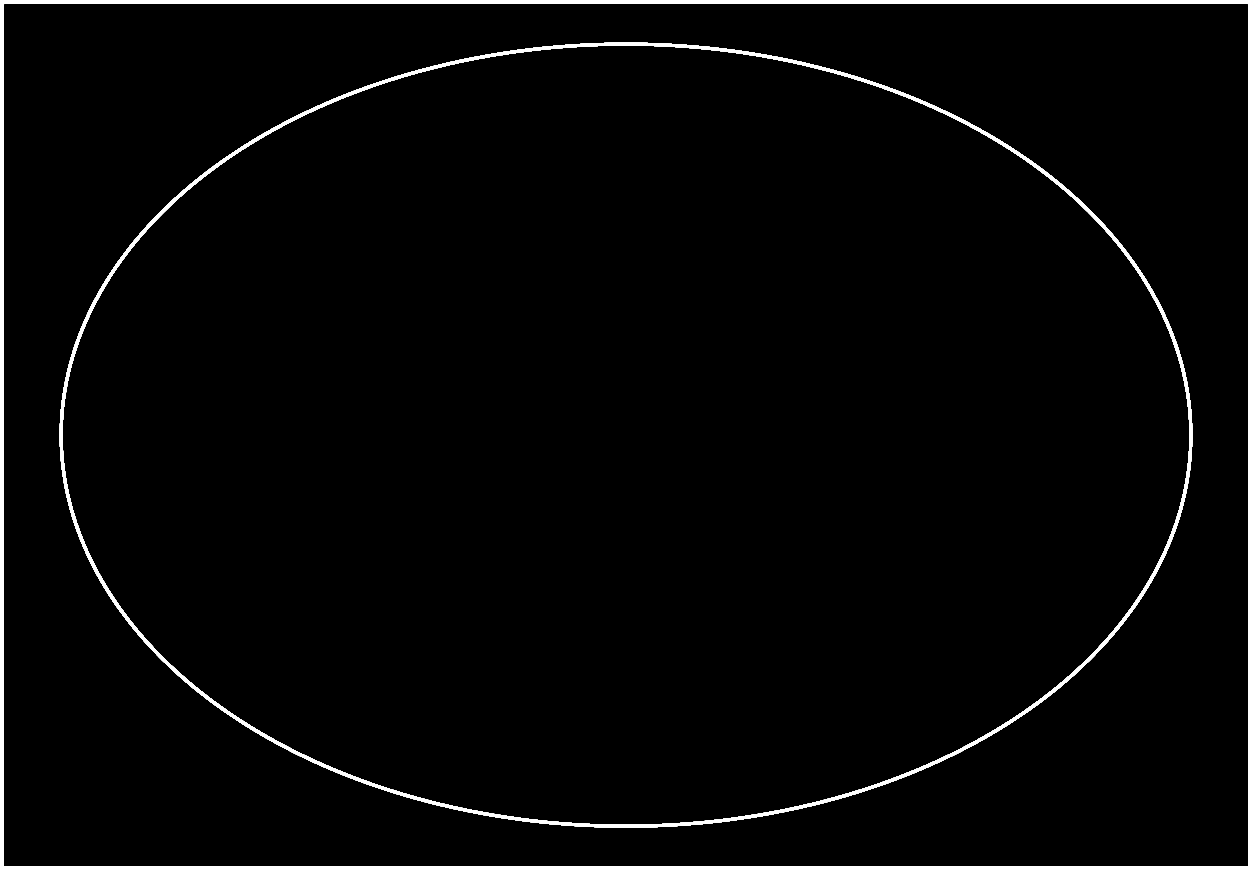
Elements that can be modified or removed include any text elements in the axis or legend (alignment, angle, size, font, emphasis, etc.), the fill or border lines of any element (incl. the background color of the panel or the entire plot area), the padding, margins, and other spacing between the elements, any tick marks on the axis, any grid lines, any aspects of the legend its orientation, shape, etc. It's worth looking into the helpfile or a *ggplot2* overview, as the themes also contain many elements that are not even visible in the default.




300
200
100
RT
1
2
3
4
size
condition
easy
hard

6 Drawing elements and functions





7 Session info

```
## - Session info ---------------------------------------------------------------
##  setting  value
##  version  R version 4.3.0 (2023-04-21)
##  os       macOS Ventura 13.4.1
##  system   aarch64, darwin20
##  ui       X11
##  language (EN)
##  collate  en_US.UTF-8
##  ctype    en_US.UTF-8
##  tz       Europe/Stockholm
##  date     2023-08-19
##  pandoc   3.1.1 @ /Applications/RStudio.app/Contents/Resources/app/quarto/bin/tools/ (via rmarkdown)
##
## - Packages -------------------------------------------------------------------
##  package     * version date (UTC) lib source
##  backports     1.4.1   2021-12-13 [1] CRAN (R 4.3.0)
##  base64enc     0.1-3   2015-07-28 [1] CRAN (R 4.3.0)
##  bit           4.0.5   2022-11-15 [1] CRAN (R 4.3.0)
##  bit64         4.0.5   2020-08-30 [1] CRAN (R 4.3.0)
##  cachem        1.0.8   2023-05-01 [1] CRAN (R 4.3.0)
##  callr         3.7.3   2022-11-02 [1] CRAN (R 4.3.0)
##  cellranger    1.1.0   2016-07-27 [1] CRAN (R 4.3.0)
##  checkmate     2.2.0   2023-04-27 [1] CRAN (R 4.3.0)
```

```
##  cli           3.6.1   2023-03-23 [1] CRAN (R 4.3.0)
##  cluster       2.1.4   2022-08-22 [1] CRAN (R 4.3.0)
##  codetools     0.2-19  2023-02-01 [1] CRAN (R 4.3.0)
##  colorspace    2.1-0   2023-01-23 [1] CRAN (R 4.3.0)
##  cowplot     * 1.1.1   2020-12-30 [1] CRAN (R 4.3.0)
##  crayon        1.5.2   2022-09-29 [1] CRAN (R 4.3.0)
##  data.table    1.14.8  2023-02-17 [1] CRAN (R 4.3.0)
##  devtools      2.4.5   2022-10-11 [1] CRAN (R 4.3.0)
##  digest        0.6.33  2023-07-07 [1] CRAN (R 4.3.0)
##  dplyr       * 1.1.2   2023-04-20 [1] CRAN (R 4.3.0)
##  ellipsis      0.3.2   2021-04-29 [1] CRAN (R 4.3.0)
##  evaluate      0.21    2023-05-05 [1] CRAN (R 4.3.0)
##  fansi         1.0.4   2023-01-22 [1] CRAN (R 4.3.0)
##  farver        2.1.1   2022-07-06 [1] CRAN (R 4.3.0)
##  fastmap       1.1.1   2023-02-24 [1] CRAN (R 4.3.0)
##  forcats     * 1.0.0   2023-01-29 [1] CRAN (R 4.3.0)
##  foreign       0.8-84  2022-12-06 [1] CRAN (R 4.3.0)
##  Formula       1.2-5   2023-02-24 [1] CRAN (R 4.3.0)
##  fs            1.6.2   2023-04-25 [1] CRAN (R 4.3.0)
##  generics      0.1.3   2022-07-05 [1] CRAN (R 4.3.0)
##  ggforce     * 0.4.1   2022-10-04 [1] CRAN (R 4.3.0)
##  ggplot2     * 3.4.2   2023-04-03 [1] CRAN (R 4.3.0)
##  ggthemes    * 4.2.4   2021-01-20 [1] CRAN (R 4.3.0)
##  glue          1.6.2   2022-02-24 [1] CRAN (R 4.3.0)
##  gridExtra     2.3     2017-09-09 [1] CRAN (R 4.3.0)
##  gtable        0.3.3   2023-03-21 [1] CRAN (R 4.3.0)
##  Hmisc         5.1-0   2023-05-08 [1] CRAN (R 4.3.0)
##  hms           1.1.3   2023-03-21 [1] CRAN (R 4.3.0)
##  htmlTable     2.4.1   2022-07-07 [1] CRAN (R 4.3.0)
##  htmltools     0.5.5   2023-03-23 [1] CRAN (R 4.3.0)
##  htmlwidgets   1.6.2   2023-03-17 [1] CRAN (R 4.3.0)
##  httpuv        1.6.11  2023-05-11 [1] CRAN (R 4.3.0)
##  httr          1.4.6   2023-05-08 [1] CRAN (R 4.3.0)
##  jsonlite      1.8.7   2023-06-29 [1] CRAN (R 4.3.0)
##  knitr         1.43    2023-05-25 [1] CRAN (R 4.3.0)
##  labeling      0.4.2   2020-10-20 [1] CRAN (R 4.3.0)
##  later         1.3.1   2023-05-02 [1] CRAN (R 4.3.0)
##  lazyeval      0.2.2   2019-03-15 [1] CRAN (R 4.3.0)
##  lifecycle     1.0.3   2022-10-07 [1] CRAN (R 4.3.0)
##  lubridate   * 1.9.2   2023-02-10 [1] CRAN (R 4.3.0)
##  magrittr    * 2.0.3   2022-03-30 [1] CRAN (R 4.3.0)
##  MASS          7.3-60  2023-05-04 [1] CRAN (R 4.3.0)
##  memoise       2.0.1   2021-11-26 [1] CRAN (R 4.3.0)
##  mime          0.12    2021-09-28 [1] CRAN (R 4.3.0)
##  miniUI        0.1.1.1 2018-05-18 [1] CRAN (R 4.3.0)
##  munsell       0.5.0   2018-06-12 [1] CRAN (R 4.3.0)
##  nnet          7.3-19  2023-05-03 [1] CRAN (R 4.3.0)
##  pillar        1.9.0   2023-03-22 [1] CRAN (R 4.3.0)
##  pkgbuild      1.4.2   2023-06-26 [1] CRAN (R 4.3.0)
##  pkgconfig     2.0.3   2019-09-22 [1] CRAN (R 4.3.0)
##  pkgload       1.3.2.1 2023-07-08 [1] CRAN (R 4.3.0)
##  plotly      * 4.10.2  2023-06-03 [1] CRAN (R 4.3.0)
##  png         * 0.1-8   2022-11-29 [1] CRAN (R 4.3.0)
##  polyclip      1.10-4  2022-10-20 [1] CRAN (R 4.3.0)
```

```
##  prettyunits   1.1.1   2020-01-24 [1] CRAN (R 4.3.0)
##  processx      3.8.2   2023-06-30 [1] CRAN (R 4.3.0)
##  profvis       0.3.8   2023-05-02 [1] CRAN (R 4.3.0)
##  promises      1.2.0.1 2021-02-11 [1] CRAN (R 4.3.0)
##  ps            1.7.5   2023-04-18 [1] CRAN (R 4.3.0)
##  purrr       * 1.0.1   2023-01-10 [1] CRAN (R 4.3.0)
##  R.matlab    * 3.7.0   2022-08-25 [1] CRAN (R 4.3.0)
##  R.methodsS3   1.8.2   2022-06-13 [1] CRAN (R 4.3.0)
##  R.oo          1.25.0  2022-06-12 [1] CRAN (R 4.3.0)
##  R.utils       2.12.2  2022-11-11 [1] CRAN (R 4.3.0)
##  R6            2.5.1   2021-08-19 [1] CRAN (R 4.3.0)
##  ragg          1.2.5   2023-01-12 [1] CRAN (R 4.3.0)
##  Rcpp          1.0.11  2023-07-06 [1] CRAN (R 4.3.0)
##  readr       * 2.1.4   2023-02-10 [1] CRAN (R 4.3.0)
##  readxl      * 1.4.3   2023-07-06 [1] CRAN (R 4.3.0)
##  remotes       2.4.2   2021-11-30 [1] CRAN (R 4.3.0)
##  rlang         1.1.1   2023-04-28 [1] CRAN (R 4.3.0)
##  rmarkdown     2.23    2023-07-01 [1] CRAN (R 4.3.0)
##  rpart         4.1.19  2022-10-21 [1] CRAN (R 4.3.0)
##  rstudioapi    0.15.0  2023-07-07 [1] CRAN (R 4.3.0)
##  scales        1.2.1   2022-08-20 [1] CRAN (R 4.3.0)
##  sessioninfo   1.2.2   2021-12-06 [1] CRAN (R 4.3.0)
##  shiny         1.7.4.1 2023-07-06 [1] CRAN (R 4.3.0)
##  stringi       1.7.12  2023-01-11 [1] CRAN (R 4.3.0)
##  stringr     * 1.5.0   2022-12-02 [1] CRAN (R 4.3.0)
##  systemfonts   1.0.4   2022-02-11 [1] CRAN (R 4.3.0)
##  textshaping   0.3.6   2021-10-13 [1] CRAN (R 4.3.0)
##  tibble      * 3.2.1   2023-03-20 [1] CRAN (R 4.3.0)
##  tidyr       * 1.3.0   2023-01-24 [1] CRAN (R 4.3.0)
##  tidyselect    1.2.0   2022-10-10 [1] CRAN (R 4.3.0)
##  tidyverse   * 2.0.0   2023-02-22 [1] CRAN (R 4.3.0)
##  timechange    0.2.0   2023-01-11 [1] CRAN (R 4.3.0)
##  tweenr        2.0.2   2022-09-06 [1] CRAN (R 4.3.0)
##  tzdb          0.4.0   2023-05-12 [1] CRAN (R 4.3.0)
##  urlchecker    1.0.1   2021-11-30 [1] CRAN (R 4.3.0)
##  usethis       2.2.2   2023-07-06 [1] CRAN (R 4.3.0)
##  utf8          1.2.3   2023-01-31 [1] CRAN (R 4.3.0)
##  vctrs         0.6.3   2023-06-14 [1] CRAN (R 4.3.0)
##  viridisLite   0.4.2   2023-05-02 [1] CRAN (R 4.3.0)
##  vroom         1.6.3   2023-04-28 [1] CRAN (R 4.3.0)
##  withr         2.5.0   2022-03-03 [1] CRAN (R 4.3.0)
##  xfun          0.39    2023-04-20 [1] CRAN (R 4.3.0)
##  xtable        1.8-4   2019-04-21 [1] CRAN (R 4.3.0)
##  yaml          2.3.7   2023-01-23 [1] CRAN (R 4.3.0)
##
##  [1] /Library/Frameworks/R.framework/Versions/4.3-arm64/Resources/library
##
## ------------------------------------------------------------------------------
```