Retrieval and analysis of Eurostat open data with the eurostat package (R Journal manuscript)

Leo Lahti, Janne Huovari, Markus Kainu, Przemyslaw Biecek

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This document reproduces the figures and tables in our manuscript (in preparation) on the eurostat R package, assuming that the required R extensions have been installed. The Eurostat data is accessed via the Eurostat database, which you can also browse on-line for data sets and documentation. For contact information and source code, see the package website.

For detailed explanation of the examples, see the manuscript text.

To reproduce the complete manuscript PDF, clone this repository, navigate to the ./vignettes/2017_RJournal_manuscript subdirectory and convert the Rmarkdown source code in R by navigating to the vignettes/2017_RJournal_manuscript folder, and running in R:

```r
source("main.R")
```

Alternatively, you can proceed in steps as follows. Generate this markdown page with manuscript figures (PNG) with:

```r
library(knitr)
knit("lahti-huovari-kainu-biecek.Rmd")
```

This will run the following workflow.

```r
# Load the required R packages
library(eurostat)
library(knitr)
library(xtable)
library(tidyr)
library(dplyr)
library(plotrix)
library(ggplot2)

# Set ggplot theme
theme_set(theme_bw(20))

# Set figure folder
knitr::opts_chunk$set(fig.path = "./")
```

Installation

Installing the CRAN release version:

```r
install.packages("eurostat")
```

Installing the Github development version:

```r
library(devtools)
install_github("ropengov/eurostat")
```

Search and download

To retrieve data for 'road accidents', for instance, use:

```r
library(eurostat)
query <- search_eurostat("road accidents", type = "table")
```

Investigate the first entry of our query:

```r
query$code[[1]]
```

```
## [1] "tsdtr420"
```

```r
query$title[[1]]
```

```
## [1] "People killed in road accidents"
```

To retrieve the data set with this identifier, use:

```r
dat <- get_eurostat(id = "tsdtr420", time_format = "num")
```

This produces a table:

```r
kable(head(dat))
```

unit	sex	geo	time	values
NR	T	AT	1999	1079
NR	T	BE	1999	1397
NR	T	CZ	1999	1455
NR	T	DE	1999	7772
NR	T	DK	1999	514
NR	T	EL	1999	2116

Convert to human-readable labels:

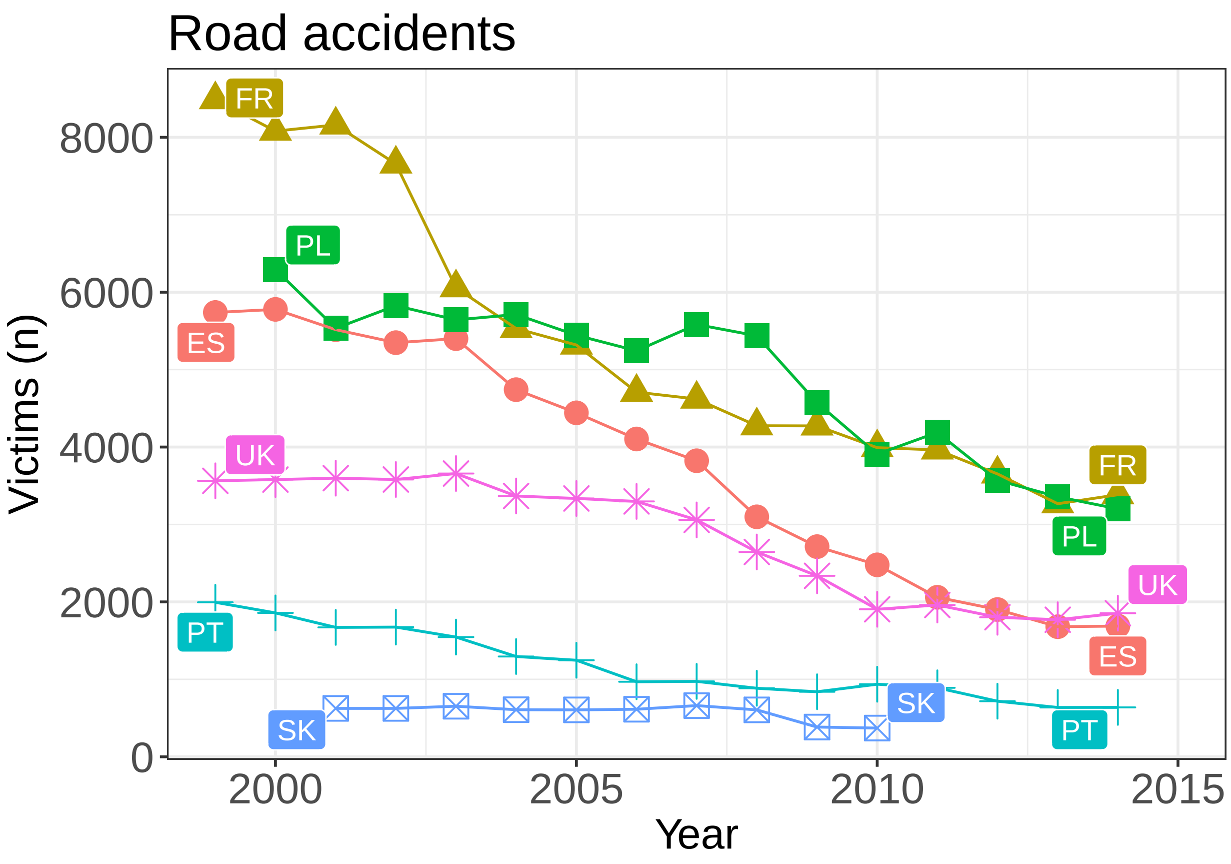
```r
# Convert into human readable labels
datl <- label_eurostat(dat)
kable(head(datl))
```

unit	sex	geo	time	values
Number	Total	Austria	1999	1079
Number	Total	Belgium	1999	1397
Number	Total	Czech Republic	1999	1455
Number	Total	Germany (until 1990 former territory of the FRG)	1999	7772
Number	Total	Denmark	1999	514
Number	Total	Greece	1999	2116

Road accidents

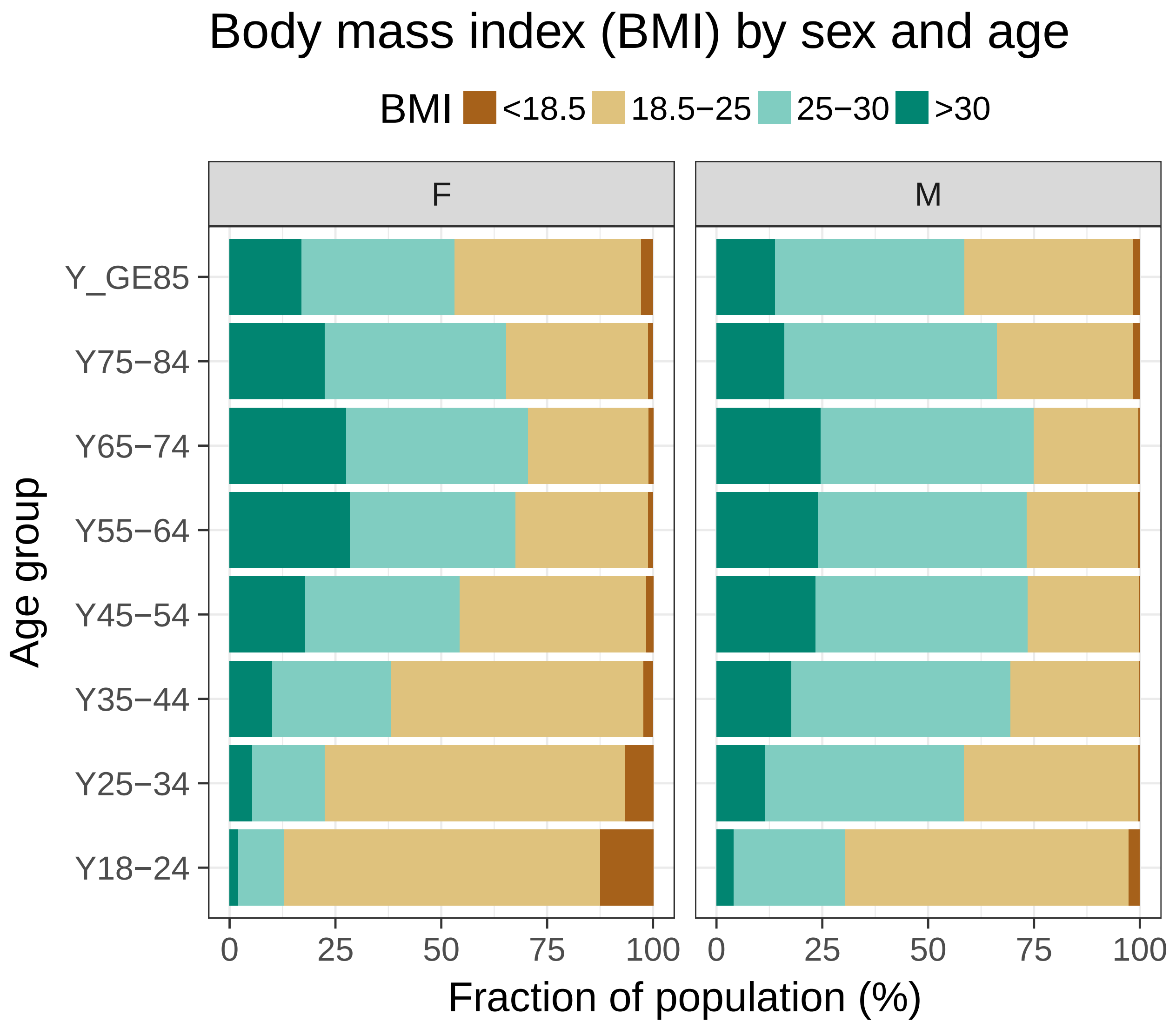
The original and more detailed treatment of this example is provided in a blog post.

```r
t1 <- get_eurostat("tsdtr420",
  filters = list(geo = c("UK", "SK", "FR", "PL", "ES", "PT")))

ggplot(t1, aes(x = time, y = values, color=geo, group=geo, shape=geo)) +
  geom_point(size=4) +
  geom_line() + theme_bw() + ggtitle("Road accidents")+
  xlab("Year") + ylab("Victims (n)") +
  # labels
  theme(legend.position="none",
        title = element_text(size = 16),
        axis.text.x = element_text(size = 16),
        axis.text.y = element_text(size = 16)
    ) +
  ggrepel::geom_label_repel(data=t1 %>%
                     group_by(geo) %>%
                     na.omit() %>%
                     filter(time %in% c(min(time),max(time))),
                   aes(fill=geo,label=geo),color="white")
```



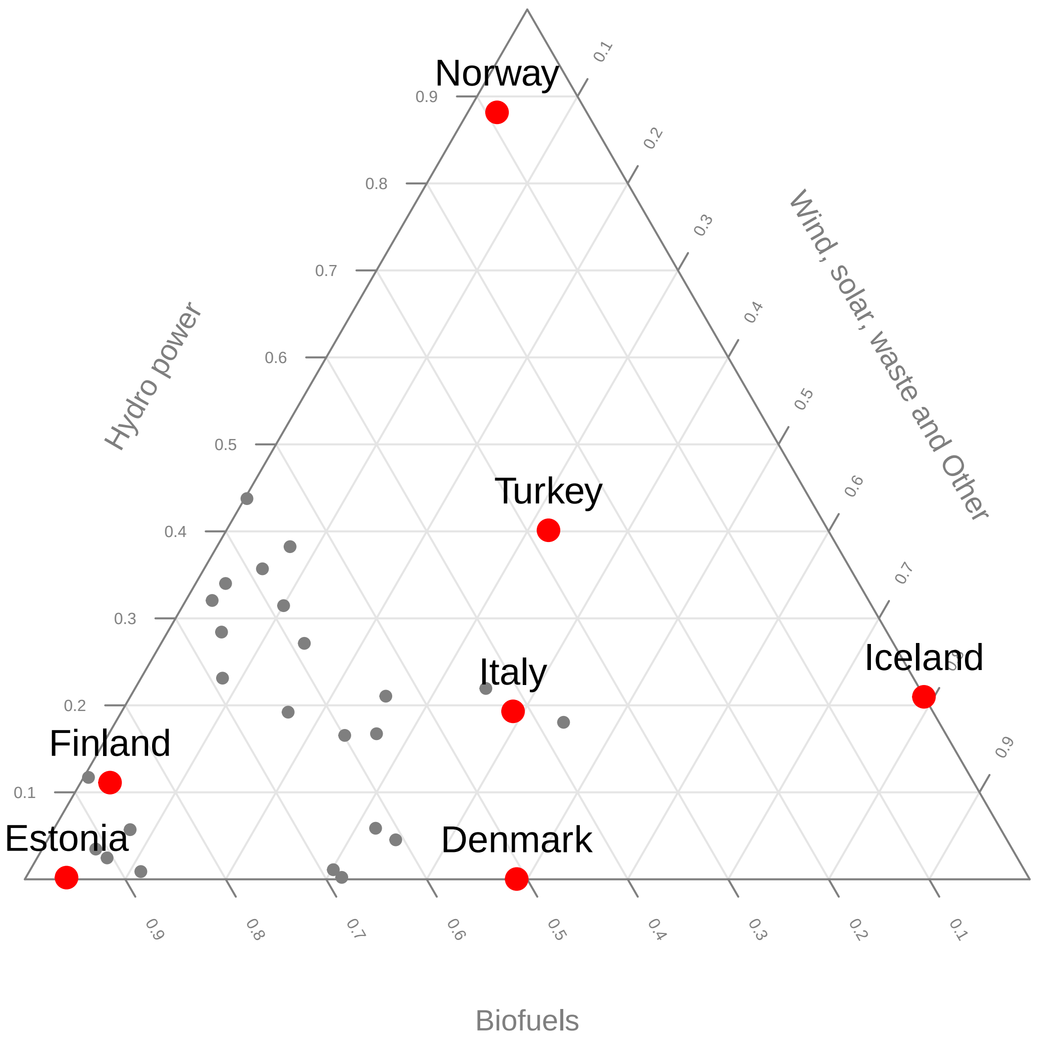
Body-mass index

```
library(dplyr)
tmp1 <- get_eurostat("hlth_ehis_de1", time_format = "raw")
tmp1 %>%
  dplyr::filter( isced97 == "TOTAL" ,
          sex != "T",
          age != "TOTAL", geo == "PL") %>%
  mutate(BMI = factor(bmi,
                      levels=c("LT18P5","18P5-25","25-30","GE30"),
                          labels=c("<18.5", "18.5-25", "25-30",">30"))) %>%
  arrange(BMI) %>%
  ggplot(aes(y=values, x=age, fill=BMI)) +
  geom_bar(stat="identity") +
  facet_wrap(~sex) + coord_flip() +
  theme(legend.position="top") +
  ggtitle("Body mass index (BMI) by sex and age") +
  xlab("Age group") +
  ylab("Fraction of population (%)") +
  scale_fill_brewer(type = "div")
```



Renewable energy production

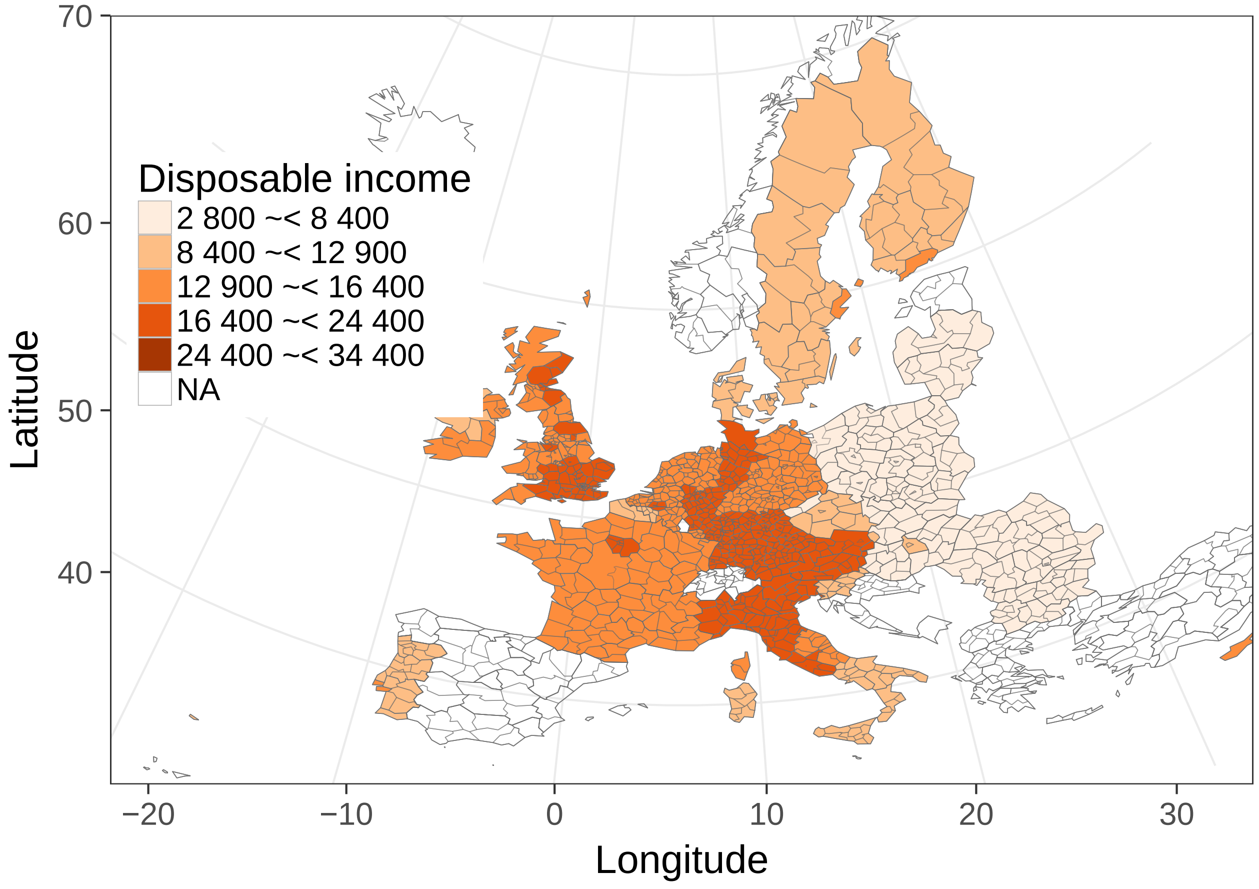
```
dict <- c("Solid biofuels (excluding charcoal)" = "Biofuels",
          "Biogasoline" = "Biofuels",
          "Other liquid biofuels" = "Biofuels",
          "Biodiesels" = "Biofuels",
          "Biogas" = "Biofuels",
          "Hydro power" = "Hydro power",
          "Tide, Wave and Ocean" = "Hydro power",
          "Solar thermal" = "Wind, solar, waste and Other",
          "Geothermal Energy" = "Wind, solar, waste and Other",
          "Solar photovoltaic" = "Wind, solar, waste and Other",
          "Municipal waste (renewable)" = "Wind, solar, waste and Other",
          "Wind power" = "Wind, solar, waste and Other",
          "Bio jet kerosene" = "Wind, solar, waste and Other")

energy3 <- get_eurostat("ten00081") %>%
  label_eurostat(dat) %>%
  filter(time == "2013-01-01",
         product != "Renewable energies") %>%
  mutate(nproduct = dict[as.character(product)], # just three categories
         geo = gsub(geo, pattern=" \\(.*", replacement="")) %>%
  select(nproduct, geo, values) %>%
  group_by(nproduct, geo) %>%
  summarise(svalue = sum(values)) %>%
  group_by(geo) %>%
  mutate(tvalue = sum(svalue),
         svalue = svalue/sum(svalue)) %>%
 filter(tvalue > 1000) %>%
 spread(nproduct, svalue)

# Triangle plot
 par(cex=0.75, mar=c(0,0,0,0))
 positions <- plotrix::triax.plot(as.matrix(energy3[, c(3,5,4)]),
                     show.grid = TRUE,
                     label.points= FALSE, point.labels = energy3$geo,
                     col.axis="gray50", col.grid="gray90",
                     pch = 19, cex.axis=1.2, cex.ticks=0.7, col="grey50")

 # Larger labels
 ind <- which(energy3$geo %in%  c("Norway", "Iceland","Denmark","Estonia", "Turkey", "Italy", "Finland"
 df <- data.frame(positions$xypos, geo = energy3$geo)
 points(df$x[ind], df$y[ind], cex=2, col="red", pch=19)
 text(df$x[ind], df$y[ind], df$geo[ind], adj = c(0.5,-1), cex=1.5)
```



Map visualization

The source code for the detailed map visualization is hidden but available. For a detailed treatment of this example, see our related blog post.

```
library(eurostat)
library(dplyr)
library(ggplot2)
# Downloading and manipulating the tabular data
get_eurostat("tgs00026", time_format = "raw") %>%
  # subsetting to year 2005 and NUTS-3 level
  dplyr::filter(time == 2005, nchar(as.character(geo)) == 4) %>%
  # classifying the values the variable
  dplyr::mutate(`Disposable income` = cut_to_classes(values)) %>%
  # merge Eurostat data with geodata from Cisco
  merge_eurostat_geodata(data=.,geocolumn="geo",resolution = "60", output_class ="df", all_regions=TRUE
  # plot map
  ggplot(data=., aes(long,lat,group=group)) +
  geom_polygon(aes(fill = `Disposable income`), colour=alpha("dim grey", 1/2),size=.2) +
  scale_fill_manual(values=RColorBrewer::brewer.pal(n = 5, name = "Oranges")) + theme(legend.position=c
  coord_map(project="orthographic", xlim=c(-22,34), ylim=c(35,70)) +
  xlab("Longitude") + ylab("Latitude")
```



Country code tables

```
# Load EFTA country listing
data(efta_countries)
kable(efta_countries)
```

code	name
IS	Iceland
LI	Liechtenstein
NO	Norway
CH	Switzerland

Contact

For contact information, see the README.

Version info

This tutorial was created with

```r
sessionInfo()
```

```
## R version 3.3.1 (2016-06-21)
## Platform: x86_64-pc-linux-gnu (64-bit)
## Running under: Ubuntu 16.10
##
## locale:
##  [1] LC_CTYPE=en_US.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_US.UTF-8        LC_COLLATE=en_US.UTF-8
##  [5] LC_MONETARY=en_US.UTF-8    LC_MESSAGES=en_US.UTF-8
##  [7] LC_PAPER=en_US.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_US.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
## [1] ggplot2_2.2.1      plotrix_3.6-4      dplyr_0.5.0
## [4] tidyr_0.6.1        xtable_1.8-2       knitr_1.15.1
## [7] eurostat_3.1.1     rmarkdown_1.3.9004
##
## loaded via a namespace (and not attached):
##  [1] Rcpp_0.12.9        RColorBrewer_1.1-2 plyr_1.8.4
##  [4] highr_0.6          class_7.3-14       tools_3.3.1
##  [7] digest_0.6.12      jsonlite_1.3       evaluate_0.10
## [10] tibble_1.2         gtable_0.2.0       lattice_0.20-34
## [13] DBI_0.6            mapproj_1.2-4      ggrepel_0.6.5
## [16] curl_2.3           yaml_2.1.14        e1071_1.6-8
## [19] httr_1.2.1         stringr_1.2.0      maps_3.1.1
## [22] classInt_0.1-23    rprojroot_1.2      grid_3.3.1
## [25] R6_2.2.0           sp_1.2-4           readr_1.0.0
## [28] magrittr_1.5       backports_1.0.5    scales_0.4.1
## [31] htmltools_0.3.5    assertthat_0.1     colorspace_1.3-2
## [34] labeling_0.3       stringi_1.1.2      lazyeval_0.2.0
## [37] munsell_0.4.3
```