Journal (reproducible report)

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Contents

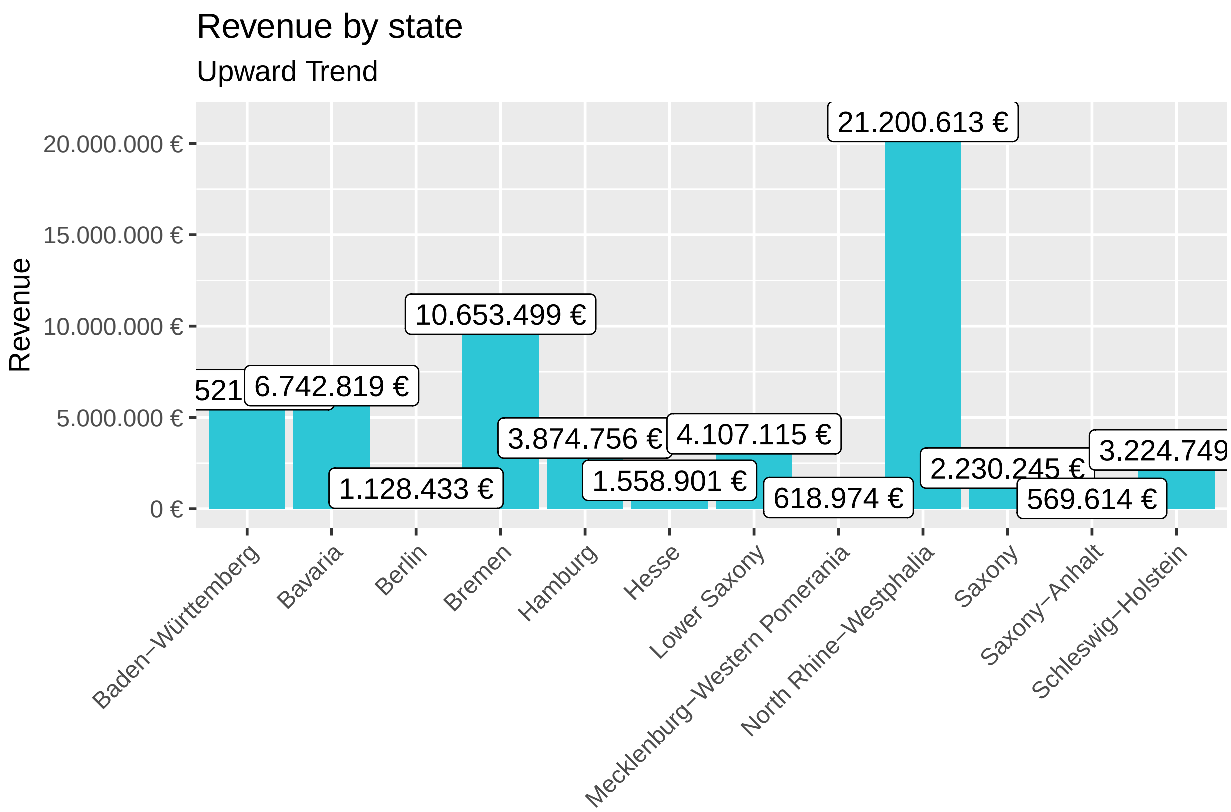
This is an `.Rmd` file. It is plain text with special features. Any time you write just like this, it will be compiled to normal text in the website. If you put a # in front of your text, it will create a top level-header.

Challenge 1

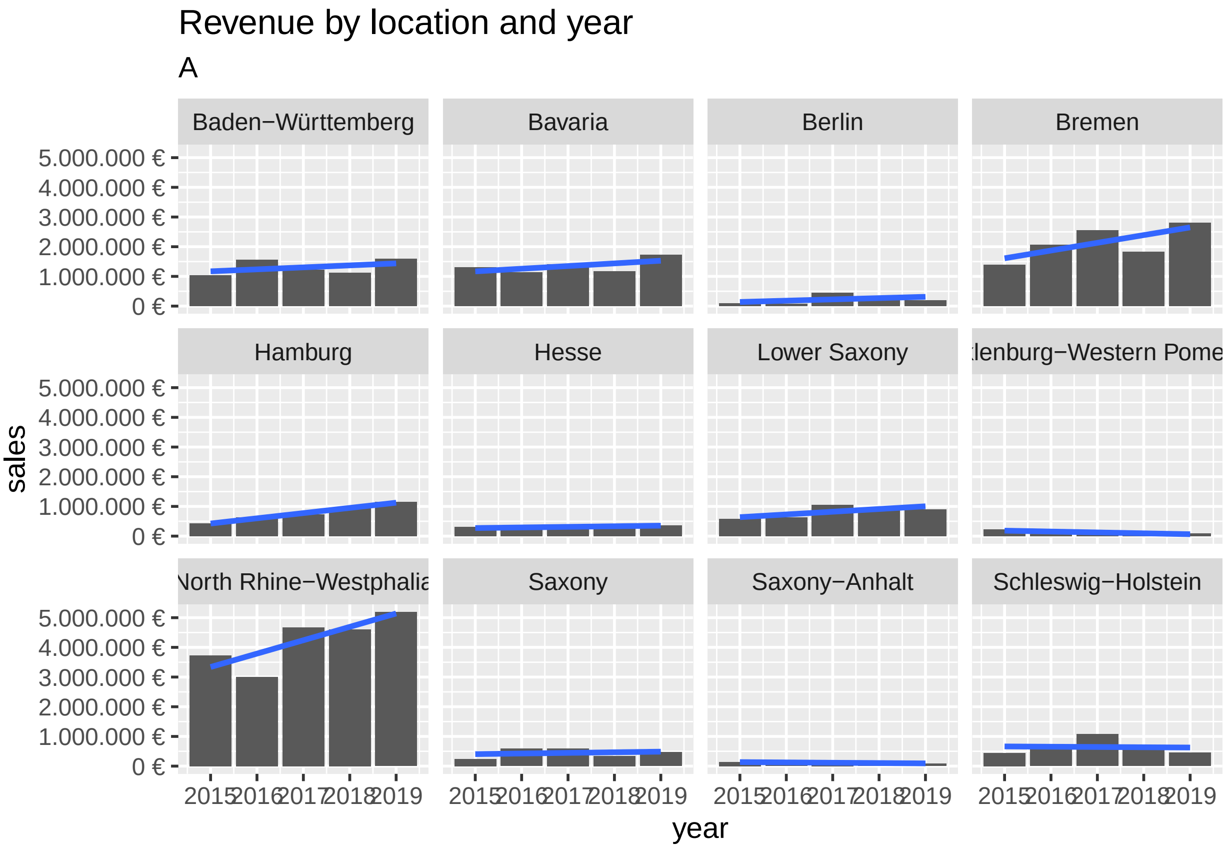
Last compiled: 2020-12-05

```
# Challenge 01 ----

# 1.0 Load libraries ----
library(tidyverse)

#Excel Files
library(readxl)

# 2.0 Importing Files ----
bikes_tbl      <- read_xlsx("docs/00_data/01_bike_sales/01_raw_data/bikes.xlsx")
orderlines_tbl <- read_xlsx("docs/00_data/01_bike_sales/01_raw_data/orderlines.xlsx")
bikeshops_tbl  <- read_xlsx("docs/00_data/01_bike_sales/01_raw_data/bikeshops.xlsx")

# 3.0 Examining Data ----

#oderlines_tbl

#glimpse(orderlines_tbl)
```

```r
#view(orderlines_tbl)

# 4.0 Joining Data ----

bike_orderlines_joined_tbl <- orderlines_tbl %>%
  left_join(bikes_tbl, by = c("product.id" = "bike.id")) %>%
  left_join(bikeshops_tbl, by = c("customer.id" = "bikeshop.id"))

# 5.0 Wrangling Data ----
bike_orderlines_wrangled_tbl <- bike_orderlines_joined_tbl %>%
  select(-...1) %>%
  rename(bikeshop = name) %>%
  set_names(names(.) %>% str_replace_all("\\.", "_")) %>%
  separate(col    = location,
           into   = c("city", "state"),
           sep    = ", ") %>%
  mutate(total_price = price * quantity)


# 6.0 Business Insights ----
# 6.1 Sales by location ----

# Step 1 - Manipulate

sales_by_location_tbl <- bike_orderlines_wrangled_tbl %>%
  select(state, total_price) %>%
  group_by(state) %>%
  summarize(sales = sum(total_price)) %>%
  mutate(sales_text = scales::dollar(sales, big.mark = ".",
                                     decimal.mark = ",",
                                     prefix = "",
                                     suffix = " €"))
# Step 2 - Visualize

sales_by_location_tbl %>%
  ggplot(aes(x = state, y = sales)) +
  geom_col(fill = "#2DC6D6") +
  geom_label(aes(label = sales_text)) +
  geom_smooth(method = "lm", se = FALSE) +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))+
  scale_y_continuous(labels = scales::dollar_format(big.mark = ".",
                                                    decimal.mark = ",",
                                                    prefix = "",
                                                    suffix = " €")) +
  labs(
    title    = "Revenue by state",
    subtitle = "Upward Trend",
    x = "",
    y = "Revenue"
  )
```



```
# 6.2 Sales by location & year ----

# Step 1 - Manipulate
library(lubridate)

sales_by_location_year_tbl <- bike_orderlines_wrangled_tbl %>%


  select(state, total_price, order_date) %>%
  mutate(year = year(order_date)) %>%
  group_by(state, year) %>%
  summarise(sales = sum(total_price)) %>%
  ungroup() %>%

  mutate(sales_text = scales::dollar(sales, big.mark = ".",
                                     decimal.mark = ",",
                                     prefix = "",
                                     suffix = " €"))
# Step 2 - Visualize
sales_by_location_year_tbl %>%

  # Set up x, y, fill
  ggplot(aes(x = year, y = sales)) +

  # Geometries
  geom_col() + # Run up to here to get a stacked bar plot
  geom_smooth(method = "lm", se = FALSE) +

  # Facet
  facet_wrap(~ state) +

  # Formatting
  scale_y_continuous(labels = scales::dollar_format(big.mark = ".",
                                                    decimal.mark = ",",
                                                    prefix = "",
                                                    suffix = " €")) +
  labs(
    title = "Revenue by location and year",
    subtitle = "A"
  )
```



Challange 2

Last compiled: 2020-12-05

```
#1. API

library(tidyverse)
library(httr)
library(jsonlite)
library(tibble)
library(keyring)


keyring::key_set("token")

resp <- GET("https://www.ncdc.noaa.gov/cdo-web/api/v2/stations?limit=1000", add_headers(token = key_get

stations_tbl <- resp %>%
  .$content  %>%
  rawToChar() %>%
  fromJSON() %>% .$results

head(stations_tbl,10)
```

```
##    elevation    mindate    maxdate latitude                              name datacoverage
## 1      139.0 1948-01-01 2014-01-01 31.57020                    ABBEVILLE, AL US       0.8813 COOP:0100
## 2      249.3 1938-01-01 2015-11-01 34.25530                      ADDISON, AL US       0.5059 COOP:0100
## 3      302.1 1940-05-01 1962-03-01 34.41667        ADDISON CENTRAL TOWER, AL US       0.9658 COOP:0100
## 4      172.2 1995-04-01 2015-11-01 33.17833 ALABASTER SHELBY CO AIRPORT, AL US       0.8064 COOP:0101
## 5      183.8 1949-01-01 1949-12-01 34.68910                BELLE MINA 2 N, AL US       1.0000 COOP:0101
## 6       34.1 1935-05-01 1936-11-01 31.13333                        ALAGA, AL US       0.2624 COOP:0101
## 7       53.3 1940-11-01 2014-12-01 32.23220                      ALBERTA, AL US       0.9888 COOP:0101
## 8      348.1 1931-01-01 1977-06-01 34.23333                  ALBERTVILLE, AL US       0.9535 COOP:0101
## 9      195.1 1969-10-01 2015-11-01 32.94520               ALEXANDER CITY, AL US       0.9946 COOP:0101
## 10     200.9 1942-11-01 1969-10-01 32.98333          ALEXANDER CITY 6 NE, AL US       0.9629 COOP:0101
##    elevationUnit longitude
## 1         METERS -85.24820
## 2         METERS -87.18140
## 3         METERS -87.31667
## 4         METERS -86.78167
## 5         METERS -86.88190
## 6         METERS -85.06667
## 7         METERS -87.41040
## 8         METERS -86.16667
## 9         METERS -85.94800
## 10        METERS -85.86667
```

```
#2. Web scraping

# LIBRARIES ----

library(tidyverse) # Main Package - Loads dplyr, purrr, etc.
library(rvest)     # HTML Hacking & Web Scraping
library(xopen)     # Quickly opening URLs
library(jsonlite)  # converts JSON files to R objects
library(glue)      # concatenate strings
library(stringi)   # character string/text processing

url  <- "https://www.rosebikes.de/fahrr%C3%A4der/rennrad"
html <- url %>%
  read_html()
```

```
model_name <-  html %>%
  html_nodes(".catalog-category-bikes__title > span") %>%
  html_text() %>%
  stringr::str_extract("(?<=\n).*(?=\n)")

model_price_cent <-  html %>%
  html_nodes(".catalog-category-bikes__price-title") %>%
  html_text() %>%
  stringr::str_extract("(?<=ab\\s).*(?=\\s€)")%>%
  str_replace_all(c("\\." = "",","=""))%>%
  as.numeric()

model_price_EUR = model_price_cent /100

bikes_tbl <- tibble(model_name,model_price_EUR)
head(bikes_tbl,10)
```

```
## # A tibble: 9 x 2
##   model_name       model_price_EUR
##   <chr>                      <dbl>
## 1 PRO SL DISC                 1599
## 2 PRO SL                      1199
## 3 REVEAL FOUR DISC            2499
## 4 REVEAL FOUR                 2099
## 5 REVEAL SIX DISC             3499
## 6 X-LITE FOUR DISC            2699
## 7 X-LITE FOUR                 2199
## 8 X-LITE SIX DISC             3899
## 9 X-LITE SIX                  3499
```

Challange 3

```
# 1.0 Libraries----------------------------------------------------------------

library(vroom)
library(tidyverse)
library(data.table)
library(tictoc)
library(lubridate)
# 2.0 10 US Companies with most patents----------------------------------------

col_types <- list(
  id = col_character(),
  type = col_integer(),
  name_first = col_skip(),
  name_last = col_skip(),
  organization = col_character()
)

assignee_tbl <- vroom(
  file       = "docs/02_data_wrangling/assignee.tsv",
  delim      = "\t",
  col_types  = col_types,
  na         = c("", "NA", "NULL")
)

setDT(assignee_tbl)


col_types <- list(
  patent_id = col_character(),
  assignee_id = col_character(),
  location_id = col_skip()
)

patent_assignee_tbl <- vroom(
  file       = "docs/02_data_wrangling/patent_assignee.tsv",
  delim      = "\t",
  col_types  = col_types,
  na         = c("", "NA", "NULL")
)

setDT(patent_assignee_tbl)



combined_data_t1 <- merge(x = patent_assignee_tbl, y = assignee_tbl,
                       by.x    = "assignee_id",
                       by.y    = "id",
                       all.x = FALSE,
                       all.y = FALSE)


top_ten_US <- combined_data_t1[type == 2, .N , by = organization][order(-N)]
head(top_ten_US,10)

# 3.0 US company withe most patents granted in 2019

col_types <- list(
  id = col_character(),
  type = col_skip(),
  number = col_skip(),
  country = col_skip(),
  date = col_date("%Y-%m-%d"),
  abstract = col_skip(),
  title = col_skip(),
  kind = col_skip(),
  num_claims = col_skip(),
  filename = col_skip(),
  withdrawn = col_skip()
)

patent_tbl <- vroom(
  file        = "docs/02_data_wrangling/patent.tsv",
  delim       = "\t",
  col_types   = col_types,
  na          = c("", "NA", "NULL")
)
setDT(patent_tbl)

combined_data_t2 <- merge(x = combined_data_t1, y = patent_tbl,
                          by.x    = "patent_id",
                          by.y    = "id",
                          all.x = FALSE,
                          all.y = FALSE)

patents_granted <- combined_data_t2[lubridate::year(date) == "2019" & type == 2,.N, by=organization][or

head(patents_granted,10)

# 4.0    ------------------------------------------------------------

col_types <- list(
  uuid = col_skip(),
  patent_id = col_character(),
  mainclass_id = col_character(),
  subclass_id = col_skip(),
  sequence = col_skip()
)

uspc_tbl <- vroom(
  file        = "docs/02_data_wrangling/uspc.tsv",
  delim       = "\t",
  col_types   = col_types,
  na          = c("", "NA", "NULL")
)
setDT(uspc_tbl)

combined_data_t3 <- merge(x = combined_data_t1, y = uspc_tbl,
                          by    = "patent_id",
                          all.x = FALSE,
                          all.y = FALSE)

combined_data_t3[,":="(assignee_id = NULL)]

# 4.1 Most innovative tech sector?
#

tic()
most_inno_tech <- combined_data_t3[, unique(patent_id), by=mainclass_id][, .N , by =mainclass_id][order

head(most_inno_tech$mainclass_id,1)
toc()

# 4.2 Top 5 USPTO tech main classes
```

```
tic()
top10_ww <- combined_data_t1[type == 2 | type == 3, .N , by = organization][order(-N)][1:10]
toc()

tic()
most_inno_tech_top10 <- combined_data_t3[organization %in% top10_ww$organization , unique(patent_id), b
head(most_inno_tech$mainclass_id,5)
toc()
```

```
read_rds("docs/top_ten_US")
```

```
##                                      organization      N
##  1: International Business Machines Corporation 139091
##  2:                     General Electric Company  47121
##  3:                            Intel Corporation  42156
##  4:   Hewlett-Packard Development Company, L.P.  35572
##  5:                        Microsoft Corporation  30085
##  6:                      Micron Technology, Inc.  28000
##  7:                        QUALCOMM Incorporated  24702
##  8:                 Texas Instruments Incorporated  24181
##  9:                            Xerox Corporation  23173
## 10:                                  Apple Inc.  21820
```

```
read_rds("docs/patents_granted")
```

```
##                                      organization    N
##  1: International Business Machines Corporation 9265
##  2:                            Intel Corporation 3526
##  3:         Microsoft Technology Licensing, LLC 3106
##  4:                                  Apple Inc. 2817
##  5:                Ford Global Technologies, LLC 2624
##  6:                    Amazon Technologies, Inc. 2533
##  7:                        QUALCOMM Incorporated 2359
##  8:                                 Google Inc. 2290
##  9:                     General Electric Company 1860
## 10:   Hewlett-Packard Development Company, L.P. 1589
```

```
read_rds("docs/most_inno_tech")
```

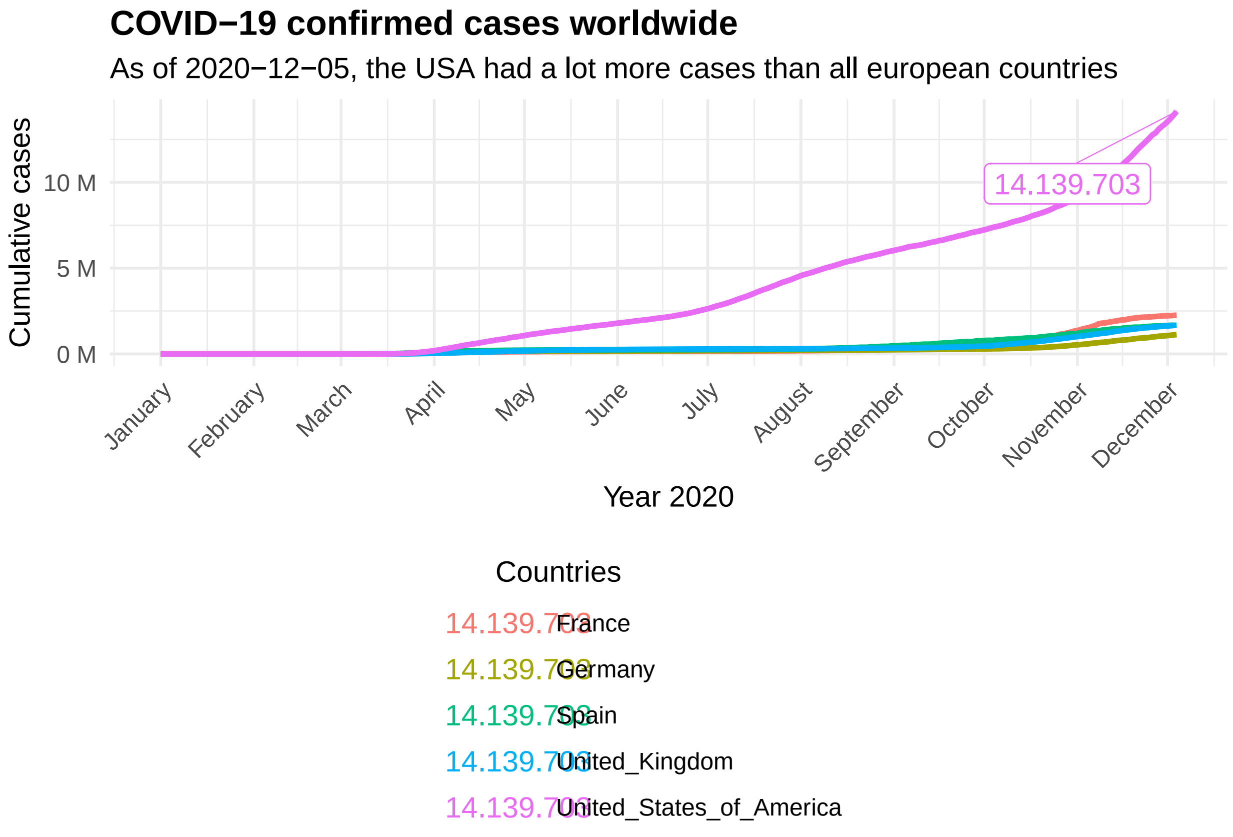
```
## [1] "257"
```

```
read_rds("docs/most_inno_main_class")
```

```
## [1] "257" "438" "370" "709" "365"
```

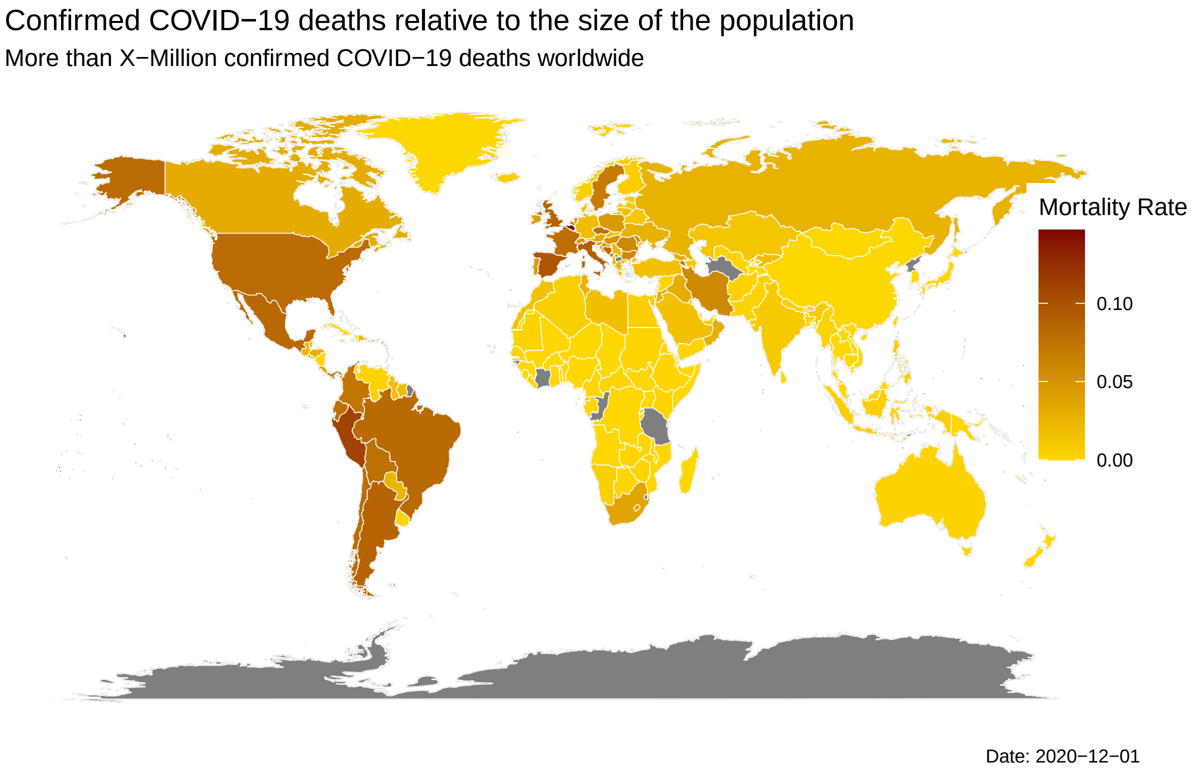
Challange 4

```r
# 1.0 Libraries

library(tidyverse)
library(lubridate)
library(ggrepel)
library(maps)
library(ggthemes)
library(viridis)

# 2.0 Map the time course of the cumulative Covid-19 cases!

# 2.1 Import Data

covid_data_tbl  <- read_csv("https://opendata.ecdc.europa.eu/covid19/casedistribution/csv")

# 2.2 Data wrangling

cum_c19_cases_tbl <- covid_data_tbl %>%

          mutate(date := lubridate::dmy(dateRep)) %>%
          select(date, countriesAndTerritories, cases) %>%
          filter(countriesAndTerritories %in% c("Germany",
                                                "France",
                                                "Spain",
                                                "United_Kingdom",
                                                "United_States_of_America")
                                                , year(date) == "2020") %>%
          group_by(countriesAndTerritories) %>%
          arrange(date, .by_group = TRUE) %>%
          mutate(cum_cases = cumsum(cases)) %>%
          ungroup()


# 2.3. Data visualization
cum_c19_cases_tbl %>%
  ggplot(aes(date, cum_cases, color = countriesAndTerritories)) +
  geom_line(aes(color = countriesAndTerritories),size = 1) +
  geom_label_repel(
    data = cum_c19_cases_tbl %>%
      filter(date %in% max(date),
             countriesAndTerritories == "United_States_of_America"),
    label = scales::dollar(max(cum_c19_cases_tbl$cum_cases),
                           big.mark     = ".",
                           decimal.mark = ",",
                           prefix       = ""),
    segment.size       = 0.2,
    min.segment.length = 1,
    box.padding        = 1.5
  ) +


  scale_y_continuous(labels = scales::dollar_format(scale = 1e-6,
                                                    prefix = "",
                                                    suffix = " M")) +
  scale_x_date(date_labels = "%B", date_breaks = "1 month") +


  labs(
    title = "COVID-19 confirmed cases worldwide",
    subtitle = str_glue("As of {Sys.Date()}, the USA had a lot more cases than all european countries")
    x = "Year 2020",
    y = "Cumulative cases",
    color = "Countries"
  ) +

  theme_minimal() +
  theme(
    axis.text.x = element_text(angle = 45, hjust = 1),
    legend.position = "bottom",
    plot.title = element_text(face = "bold"),
    legend.margin = margin(0.2, 0.2, 0.2, 0.2, "cm"),
    legend.direction = "vertical"
  )
```



```
# 3.0 Mortality rate -----------------------------------------------------------

# 3.1 Import Data
```

```r
covid_data_tbl  <- read_csv("https://opendata.ecdc.europa.eu/covid19/casedistribution/csv")

world <- map_data("world")

# 3.2 Data wrangling

covid_deaths_tbl <- covid_data_tbl %>%
  mutate(date := lubridate::dmy(dateRep)) %>%
  select(date, countriesAndTerritories, deaths, popData2019) %>%
  filter( year(date) == "2020") %>%

  group_by(countriesAndTerritories) %>%
  arrange(date, .by_group = TRUE) %>%
  mutate(total_deaths = cumsum(deaths)) %>%
  ungroup() %>%

  filter(date == as.Date(date("2020-12-01"))) %>%
  mutate(mortality_pct := 100 * total_deaths / popData2019) %>%
  select(date, countriesAndTerritories, mortality_pct) %>%
  mutate(across(countriesAndTerritories, str_replace_all, "_", " ")) %>%
  mutate(countriesAndTerritories = case_when(
    countriesAndTerritories == "United Kingdom" ~ "UK",
    countriesAndTerritories == "United States of America" ~ "USA",
    countriesAndTerritories == "Czechia" ~ "Czech Republic",
    TRUE ~ countriesAndTerritories
  ))


covid_mortality_tbl <- covid_deaths_tbl %>%
  full_join(world %>% select(region,long,lat), by = c("countriesAndTerritories" = "region"))


# 3.3. Data visualization

covid_mortality_tbl %>% ggplot()+
  geom_map(map = world,
           aes(long, lat, map_id = countriesAndTerritories),
           color="#2b2b2b", fill=NA, size=0.15) +
  geom_map(map = world,
           aes(fill=mortality_pct,
               map_id = countriesAndTerritories),
           color="white", size=0.15) +

   scale_fill_continuous(
       name = "Mortality Rate",
       low   = "#FFD700",
       high  = "#800000")+

  labs(title = "Confirmed COVID-19 deaths relative to the size of the population",
       subtitle = "More than X-Million confirmed COVID-19 deaths worldwide",
       caption = "Date: 2020-12-01") +

  theme_map() +
  theme(
        plot.margin=margin(20,20,20,20),
        legend.position = c(0.9, 0.4))
```

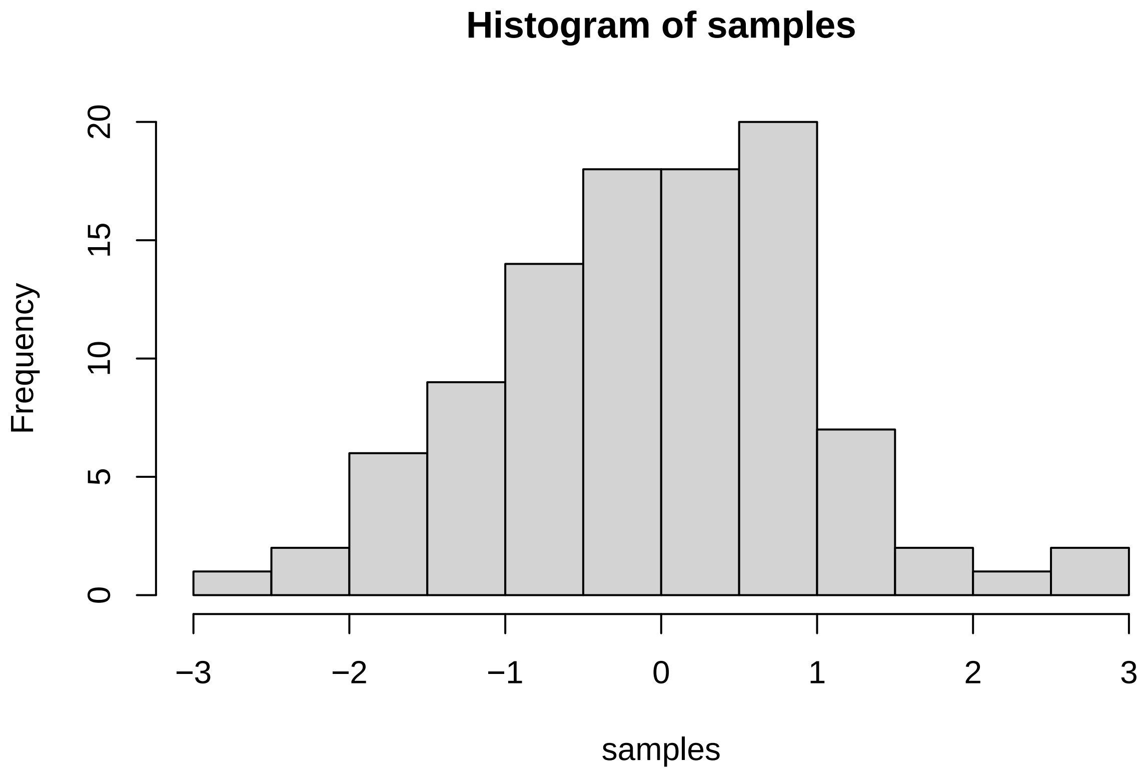

Confirmed COVID−19 deaths relative to the size of the population
More than X−Million confirmed COVID−19 deaths worldwide
Mortality Rate
0.10
0.05
0.00
Date: 2020−12−01

Adding R stuff

So far this is just a blog where you can write in plain text and serve your writing to a webpage. One of the main purposes of this lab journal is to record your progress learning R. The reason I am asking you to use this process is because you can both make a website, and a lab journal, and learn R all in R-studio. This makes everything really convenient and in the same place.

So, let's say you are learning how to make a histogram in R. For example, maybe you want to sample 100 numbers from a normal distribution with mean = 0, and standard deviation = 1, and then you want to plot a histogram. You can do this right here by using an r code block, like this:

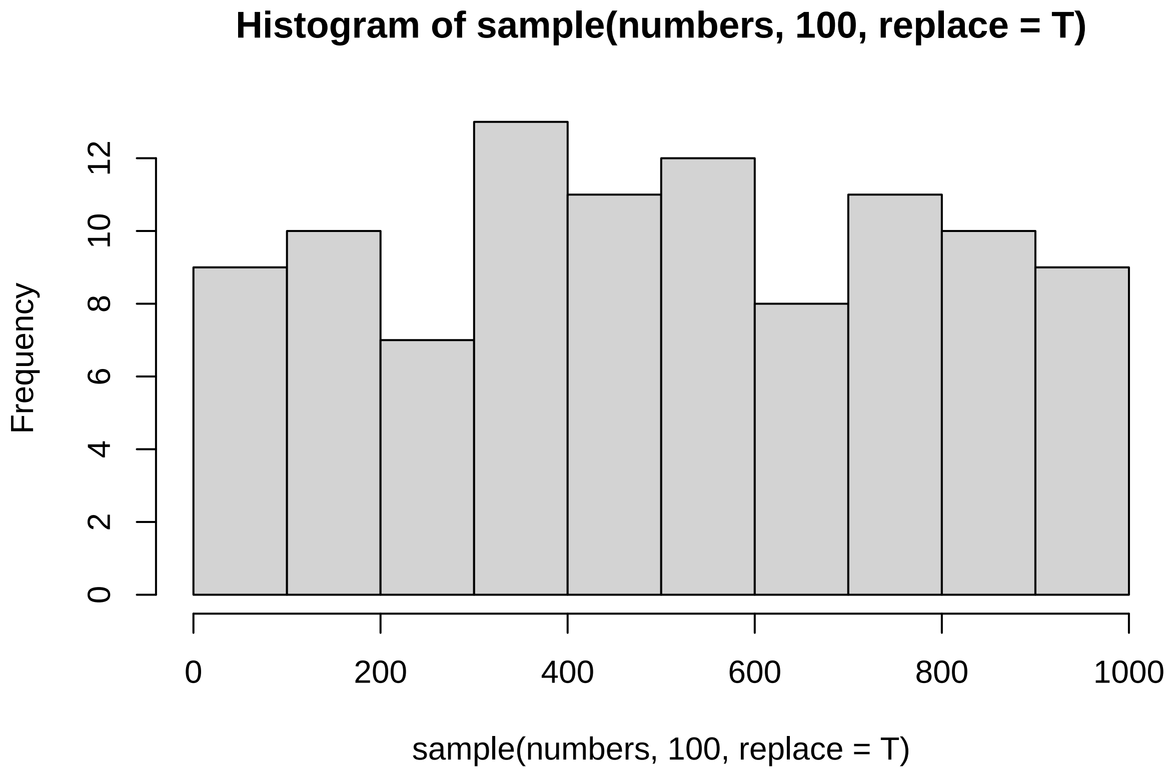
```
samples <- rnorm(100, mean=0, sd=1)
hist(samples)
```



```r
numbers <- 1:1000

# This will print the first 10 elements of the vector numbers
numbers[1:10]
```

```
##  [1]  1  2  3  4  5  6  7  8  9 10
```

```r
# This will plot a histogram of 100 random elements of the vector numbers
hist(sample(numbers, 100, replace = T))
```



When you knit this R Markdown document, you will see that the histogram is printed to the page, along with the R code. This document can be set up to hide the R code in the webpage, just delete the comment (hashtag) from the cold folding option in the yaml header up top. For purposes of letting yourself see the code, and me see the code, best to keep it the way that it is. You'll learn that all of these things and more can be customized in each R code block.