Lab 2

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Section 1

In Section 1, we will focus on analyzing PISA data we used in class. This dataset has math and reading scores from PISA assessment for 10 countries.

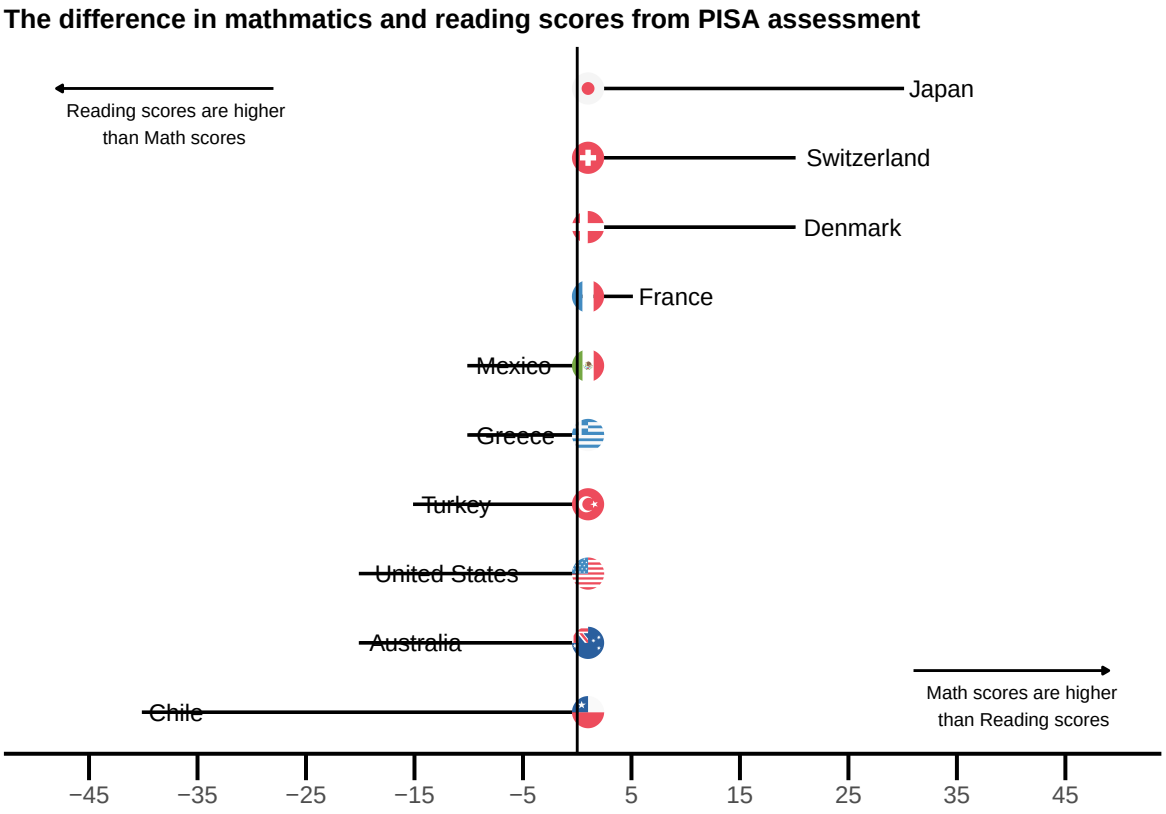
To begin working with this dataset, you are required to import and preprocess the data using the following code snippet provided below:

```
require(countrycode)
library(here)
library(ggplot2)
library(ggtext)

pisa <- read.csv(here('Lab 2/pisa.csv'))
pisa$iso  <- tolower(codelist[codelist$country.name.en %in% pisa$Country,]$iso2c)
pisa$diff <- pisa$Math - pisa$Reading
```

```
#install.packages("ggflags", repos = c(
 # "https://jimjam-slam.r-universe.dev",
  #"https://cloud.r-project.org"))

library(ggflags)

pisa <- read.csv(here('Lab 2/pisa.csv'))
pisa$iso<- tolower(codelist[codelist$country.name.en %in% pisa$Country,]$iso2c)
pisa$diff <- pisa$Math - pisa$Reading
countlabel<-pisa [1:10,1]


ggplot(pisa, aes(x = reorder(Country, diff, decreasing = FALSE), y = diff)) +
  geom_bar(stat = "identity", width = 0.01, color="black")+
  geom_flag(aes(country = iso), size = 5, y = 1, color = "black") + #### Need to determine the local of
  geom_text(aes(label = Country), hjust = -0.1, vjust = 0.5, size = 3, color = "black") + ## need to mo
  coord_flip() +
  scale_y_continuous(breaks = seq(-45, 45, by = 10),
    limits = c(-48, 49)) +
  geom_hline(yintercept = 0, color = "black", linetype = "solid")+
  labs(title = '**The difference in mathmatics and reading scores from PISA assessment**',
    x = '',
    y = '') +
  theme(plot.title= element_markdown(margin = margin(b=5),hjust=0, size = 10),
        axis.text.y = element_blank(),
```

```
    panel.background = element_rect(fill='white',colour='white'),
    axis.ticks= element_blank(),
    plot.caption= element_text(hjust = 0.01,
    size = 9,
    margin=margin(t=0)),
    axis.line.x = element_line(color = "black", linewidth = 0.7),
    axis.ticks.x = element_line(color='black',linewidth = .7),
    axis.ticks.length=unit(.35, "cm"))+
annotate('text',
             x        = 9.2,
             y        = -45,
             hjust    = 0.1,
             vjust    = 0,
             label    = 'Reading scores are higher
      than Math scores',
             size     = 2.5,
             color    = 'black')+
  annotate('text',
             x        = .8,
             y        = 34,
             hjust    = 0.1,
             vjust    = 0,
             label    = 'Math scores are higher
  than Reading scores',
             size     = 2.5,
             color    = 'black')+
   annotate("segment", x = 10, y = -28, xend = 10, yend=-48,
         arrow = arrow(type = "closed", length = unit(0.01, "npc")))+
           annotate("segment", x = 1.6, y = 31, xend = 1.6, yend=49,
         arrow = arrow(type = "closed", length = unit(0.01, "npc")))
```

```
## Warning in geom_flag(aes(country = iso), size = 5, y = 1, color = "black"):
## Ignoring unknown parameters: ‘colour‘
```



Section 2

In Section 2, our analysis will focus on world population. This dataset has the population for 266 countries from 1960 to 2022.

To begin, you should import the dataset using the following code snippet. This code will first filter the countries and include only European Union countries with at least 10 million people. It will also compute a % change in population from 1960 to 2022.

```
library(pacman)
p_load(ggtext)
library(tidyr)
library(ggplot2)
library(ggtext)
pop     <- read.csv(here('Lab 2/population.csv'))

EU <- c("Austria", "Belgium", "Bulgaria", "Croatia", "Cyprus",
        "Czechia", "Denmark", "Estonia", "Finland", "France",
        "Germany", "Greece", "Hungary", "Ireland", "Italy", "Latvia",
        "Lithuania", "Luxembourg", "Malta", "Netherlands", "Poland",
        "Portugal", "Romania", "Slovak Republic", "Slovenia", "Spain","Sweden")

pop <- pop[pop$Country.Name %in% EU,]
pop <- pop[which(pop$X2022>10000000),]
pop$per_change <- ((pop$X2022 - pop$X1960)/pop$X2022)*100
```

```r
colnames(pop) <- gsub('X', '', colnames(pop))

pop_full <- pop %>%
  pivot_longer(cols      = starts_with(c('1','2')),
                  names_to  = 'Year',
                  values_to = 'Population')

pop_full$Year <- as.numeric(pop_full$Year)


my_color        <- rep('gray',length(unique(pop_full$Country.Name))) #creates everything grey
    names(my_color) <- unique(pop_full$Country.Name)
    my_color["Spain"] <- 'blue'
    my_color["Netherlands"] <- 'orange'
```

```r
plot<- ggplot(pop_full,
           aes(x = Year, y = Population, colour = Country.Name)) +
      geom_line(stat = 'identity')+
  scale_color_manual(values=my_color)+
 guides(color='none', size = 'none') +   # Hide the legends for color and size
      labs(title="Spain and Netherlands are the two countries with largest population growth in Europea
           subtitle = '(Among countries with at least 10 million people)',
           x     = '',
           y     = ' Population (in millions)',
           caption = "Source: OECD Stats \nhttps://stats.oecd.org/") +
  theme(plot.title= element_markdown(margin = margin(b=5),hjust=0, size = 15, face ='bold'),
    panel.background = element_rect(fill='white',colour='white'),
    axis.ticks= element_blank(),
    panel.grid.major.y = element_line(color      = "grey80",
                                      linewidth  = 0.5,
                                      linetype   = "dashed"),
    plot.caption= element_text(hjust = 0.01,
                               size = 9,
                               margin=margin(t=0)),
    axis.line.x = element_line(color = "black", linewidth = 0.7),
    axis.ticks.x = element_line(color='black',linewidth = .7),
    axis.ticks.length=unit(.35, "cm"))
print(plot)
```

Section 3

In Section 3, our analysis will focus on the relationship between online hotel revenue and the number of travel agents over time using a connected scatterplot. To begin, you should import the dataset using the following code snippet.

```r
hotel <- read.csv('hotel.csv',fileEncoding="UTF-8-BOM")
hotel$travel_agents <- hotel$travel_agents/1000

  # number of travel agents are in thousands
  # hotel revenue is in billion dollars
```

```
hotel
```

```
   year travel_agents hotel_revenue
1  2000       123.385         12.95
2  2001       110.583         19.95
3  2002       104.046         28.02
4  2003       103.501         40.12
5  2004        90.428         51.16
6  2005        88.521         64.10
7  2006        87.431         79.81
8  2007        85.252         89.79
9  2008        86.070         94.46
10 2009        76.809         90.00
11 2010        70.272         99.76
12 2011        67.276        116.11
13 2012        64.552        124.60
14 2013        64.280        143.49
15 2014        63.975        155.38
```

```
  library(ggplot2)
library(ggtext)
first   <-   hotel[1:5,1:3]
second<- hotel [5:9, 1:3]
third<-hotel[9:10, 1:3]
forth<-hotel[10:15, 1:3]
label1<-hotel[1:15,1]

  ggplot() +
    geom_point(data=first,aes(x=hotel_revenue,y=travel_agents), size=2, shape=1) +
    geom_path(data=first,aes(x=hotel_revenue,y=travel_agents),color='#b75b37',linewidth=0.75) +
    geom_point(data=second,aes(x=hotel_revenue,y=travel_agents),size=2, shape=1) +
    geom_path(data=second,aes(x=hotel_revenue,y=travel_agents),color='#0e73b0',linewidth=0.75) +
    geom_point(data=third,aes(x=hotel_revenue,y=travel_agents),size=2, shape=1) +
    geom_path(data=third,aes(x=hotel_revenue,y=travel_agents),color='#57a6ac',linewidth=0.75) +
    geom_point(data=forth,aes(x=hotel_revenue,y=travel_agents),size=2, shape = 1) +
    geom_path(data=forth,aes(x=hotel_revenue,y=travel_agents),color='#b75b37',linewidth=0.75) +
    geom_text(data = hotel, aes(x = ifelse(label1 == "2008", hotel_revenue + 2, hotel_revenue), y = tra
            hjust = 0, vjust = -1.5, size = 2, color = "black") +
    scale_x_continuous(
      breaks   = seq(0,180,30),
      limits   = c(0,185),
      expand   = c(0,0),
      labels   = paste0(format(seq(0,180,30),digits = 1),'B')) +
    scale_y_continuous(
      breaks   = seq(0,140,20),
      limits   = c(0,150),
      expand   = c(0,0),
      labels   = paste0(format(seq(0,150,20),digits = 1),'K'))+
    labs(title = "**Online Hotel Revenue vs. Number of Travel Agents**",
         subtitle = '',
         x     = 'Online Hotel Revenue (USD)',
         y     = 'Number of Travel Agents')+
    theme(plot.title         = element_markdown(margin = margin(b=10),
```

```
                                            hjust  = -0.1),
      axis.title.x = element_markdown(size = 8,
                                      vjust = 1.2,
                                      hjust = 0),
        axis.title.y       = element_markdown(size   = 8,
                                              vjust  = 1.075,
                                              margin = margin(r =0,b=0)),
      panel.background   = element_blank(),
      panel.grid.major.y = element_line(color='gray',linetype='dashed',linewidth=0.25),
      panel.grid.major.x = element_line(color='gray',linetype='dashed',linewidth=0.25),
      axis.ticks.x       = element_blank(),
      axis.ticks.y       = element_blank(),
      axis.line.y        = element_line(colour='lightgray'),
      axis.text = element_markdown(size= 7,
                                   vjust = 1))+
annotate('text',
         x        = 30,
         y        = 120,
         hjust    = .1,
         vjust    = 0,
         label    = 'Between 2000 and 2004, online travel revenue increased
         while the number of travel agents decreased',
         size     = 2.5,
         color    = '#b75b37') +
annotate('text',
         x        = 60,
         y        = 95,
         hjust    = 0.1,
         vjust    = 0,
         label    = 'From 2004 to 2008 , online hotel revenues continued to increase
         while the number of travel agents decreased steadily',
         size     = 2.5,
         color    = '#0e73b0')+
annotate('text',
         x        = 35,
         y        = 58,
         hjust    = 0.1,
         vjust    = 0,
         label    = 'From 2008 to 2009 , online hotel revenue
         ecreased a little but for the first time
         ince 2000 along with a sudden decrease
         in the travel of agents',
         size     = 2.5,
         color    = '#57a6ac')+
 annotate('text',
         x        = 102,
         y        = 85,
         hjust    = 0.1,
         vjust    = 0,
         label    = 'Recession',
         size     = 2.5,
         color    = '#57a6ac')+
annotate('text',
```

```
            x        = 120,
            y        = 52,
            hjust    = 0.1,
            label    = 'Online hotel revenue recovered and continued
            to increase while the number of travel agents
            kept decreasing and stablized',
            size     = 2.5,
            color    = '#b75b37')+
annotate("segment", x = 94.5, y = 86.1, xend = 100, yend=86.1,
       arrow = arrow(type = "closed", length = unit(0.01, "npc")))
```