STAT545 Homework 03 The use of dplyr/ggplot2

Overview

This Rmarkdown file aims to explore the gapminder dataset with **dplyr** package, and to plot figures using **ggplot2** package. It will be used as a cheatsheet for future data manipulation and figure plotting.

Import data frame and tidyverse pacakge

Gapminder data will be used in this homework, and the dataset will be explored using "dplyr" package.

```
library(gapminder)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(ggplot2)
library(reshape2)
# use suppressMessages(library(tidyverse)) to generate a pdf file
```

Task 1 Get the maximum and minimum of GDP per capita for all continents.

To get the maximum and minimum value of GDP per capita for all continents, the data need to be group by continent, and then get the min and max value by calling **summarize** function.

```
min_max <- gapminder %>%
  group_by(continent) %>%
  summarize(min = min(gdpPercap),
            max = max(gdpPercap))
```

The following chunk makes the table looks better.

```
knitr::kable(min_max)
```

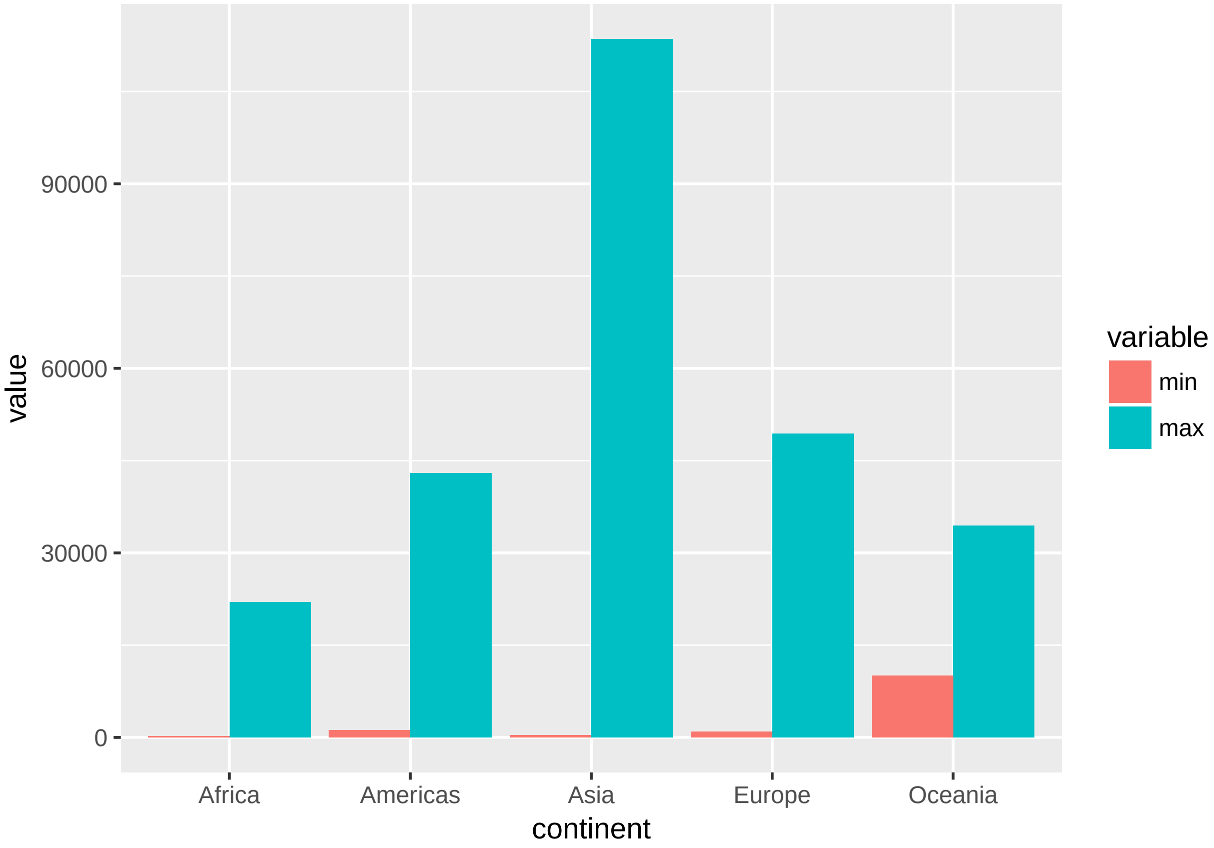
continent	min	max
Africa	241.1659	21951.21
Americas	1201.6372	42951.65
Asia	331.0000	113523.13
Europe	973.5332	49357.19
Oceania	10039.5956	34435.37

In order to plot the min and max value, the data.frame needs to be reshaped. The following chunk will put the value of max and min in one column and lable the value in another column named variable. I found this webpage helpful.

```
min_max <- melt(min_max, id.vars = "continent")
```

The following chunk will produce a barplot. To plot the value of min and max side by side, I used position = position_dodge(.9), which is learned from here.

```
min_max %>%
  ggplot(aes(continent, value)) +
  geom_bar(stat = "identity", position = position_dodge(.9), aes(fill = variable))
```



The first part of this task is not hard, but I spent a lot of time on the second part. I cannot get the correct barplot before I learned how to reshape the data.frame. I found the **reshape2** package very helpful here.

Task 2 Compute a trimmed mean of life expectancy of different continent for different years

To get the trimmed mean value of the lifeExp, the value of trim needs to be specified in the mead() funtion.

```
t_mean <- gapminder %>%
  group_by(year, continent) %>%
  summarize(trim_mean = mean(lifeExp, trim = 0.1))
```

```
knitr::kable(t_mean)
```

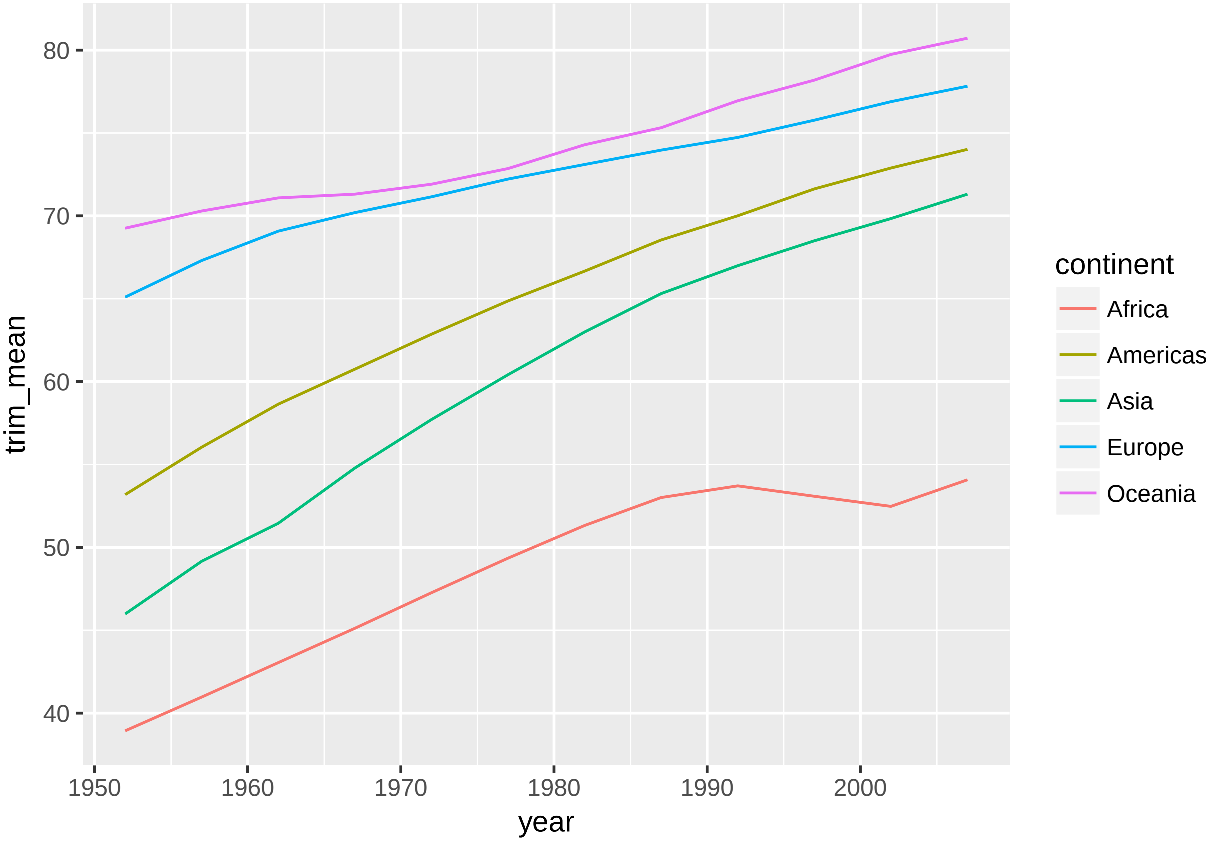
year	continent	trim_mean
1952	Africa	38.93298
1952	Americas	53.18157

year	continent	trim_mean
1952	Asia	45.98107
1952	Europe	65.09708
1952	Oceania	69.25500
1957	Africa	40.96993
1957	Americas	56.04624
1957	Asia	49.16422
1957	Europe	67.30763
1957	Oceania	70.29500
1962	Africa	43.04819
1962	Americas	58.64005
1962	Asia	51.45357
1962	Europe	69.07921
1962	Oceania	71.08500
1967	Africa	45.11750
1967	Americas	60.75086
1967	Asia	54.78682
1967	Europe	70.19675
1967	Oceania	71.31000
1972	Africa	47.26495
1972	Americas	62.86081
1972	Asia	57.71233
1972	Europe	71.14942
1972	Oceania	71.91000
1977	Africa	49.34983
1977	Americas	64.86633
1977	Asia	60.41761
1977	Europe	72.22067
1977	Oceania	72.85500
1982	Africa	51.31998
1982	Americas	66.66624
1982	Asia	62.99337
1982	Europe	73.09983
1982	Oceania	74.29000
1987	Africa	53.00740
1987	Americas	68.54767
1987	Asia	65.31263
1987	Europe	73.96738
1987	Oceania	75.32000
1992	Africa	53.71045
1992	Americas	70.00586
1992	Asia	66.99396
1992	Europe	74.73196
1992	Oceania	76.94500
1997	Africa	53.08371
1997	Americas	71.62719
1997	Asia	68.49633
1997	Europe	75.77375
1997	Oceania	78.19000
2002	Africa	52.47467
2002	Americas	72.88752
2002	Asia	69.83704
2002	Europe	76.88962

year	continent	trim_mean
2002	Oceania	79.74000
2007	Africa	54.07752
2007	Americas	74.01419
2007	Asia	71.31067
2007	Europe	77.82504
2007	Oceania	80.71950

The following chunk will a line plot of the change.

```
t_mean %>%
  ggplot(aes(year, trim_mean, col = continent)) +
  geom_line()
```



This task is quite straight forwards, and the pattern in clearly shown by the plot.

Task 3 Report countries that has relative low life expectancy over time by continent.

The reletive low life expectancy is defined as life expectancy lower than the mean of the worldwide life expectancy. First, the mean of the worldwide life expectancy (life expectancy benchmark) needs to be computed.

```
gm_worldmean_lifeExp <- gapminder %>%
  group_by(year) %>%
  mutate(lifeExp_benchmark = mean(lifeExp))
```

Then count the number of countries of each continent that has a small life expectancy value than the worldwide one for each year.

```r
num_lowExp_country <- gm_worldmean_lifeExp %>%
  mutate(rel_low = lifeExp < lifeExp_benchmark) %>%
  group_by(year, continent) %>%
  summarize(n_country = sum(rel_low == "TRUE"))
```

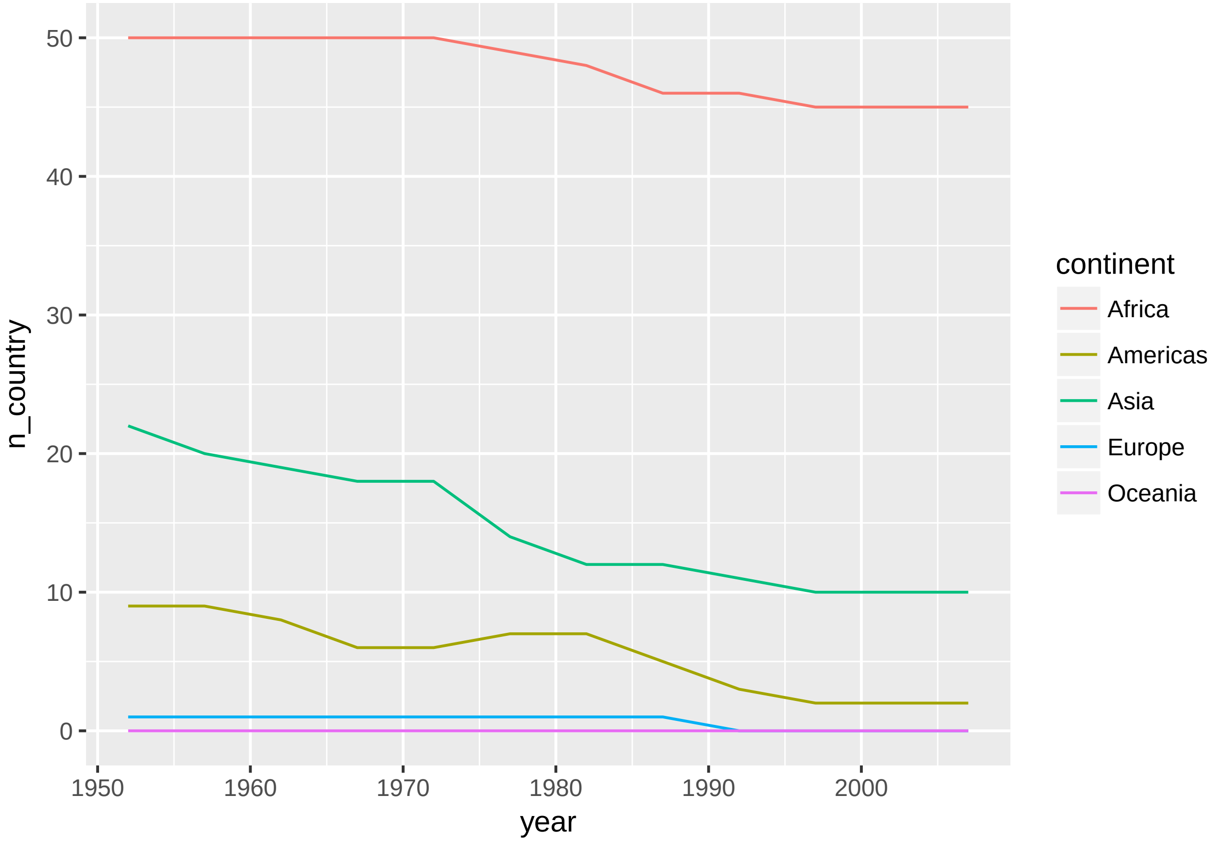
```r
knitr::kable(num_lowExp_country)
```

year	continent	n_country
1952	Africa	50
1952	Americas	9
1952	Asia	22
1952	Europe	1
1952	Oceania	0
1957	Africa	50
1957	Americas	9
1957	Asia	20
1957	Europe	1
1957	Oceania	0
1962	Africa	50
1962	Americas	8
1962	Asia	19
1962	Europe	1
1962	Oceania	0
1967	Africa	50
1967	Americas	6
1967	Asia	18
1967	Europe	1
1967	Oceania	0
1972	Africa	50
1972	Americas	6
1972	Asia	18
1972	Europe	1
1972	Oceania	0
1977	Africa	49
1977	Americas	7
1977	Asia	14
1977	Europe	1
1977	Oceania	0
1982	Africa	48
1982	Americas	7
1982	Asia	12
1982	Europe	1
1982	Oceania	0
1987	Africa	46
1987	Americas	5
1987	Asia	12
1987	Europe	1
1987	Oceania	0
1992	Africa	46
1992	Americas	3
1992	Asia	11

year	continent	n_country
1992	Europe	0
1992	Oceania	0
1997	Africa	45
1997	Americas	2
1997	Asia	10
1997	Europe	0
1997	Oceania	0
2002	Africa	45
2002	Americas	2
2002	Asia	10
2002	Europe	0
2002	Oceania	0
2007	Africa	45
2007	Americas	2
2007	Asia	10
2007	Europe	0
2007	Oceania	0

The following chunk plot a figure showing the number of low life expectancy countries of each continent over time.

```
num_lowExp_country %>%
  ggplot(aes(year, n_country, col = continent)) +
  geom_line()
```



I found the first part of this task very difficult. It was hard for me to count the number of countries that has a relatively low life expectancy until I got some help from here.

But I want to explore more

The following chunks will put the table and plot side by side, but only when the output is a html_document. Please look at the gapminder.html to see how it works. I was inspired by this webpage.

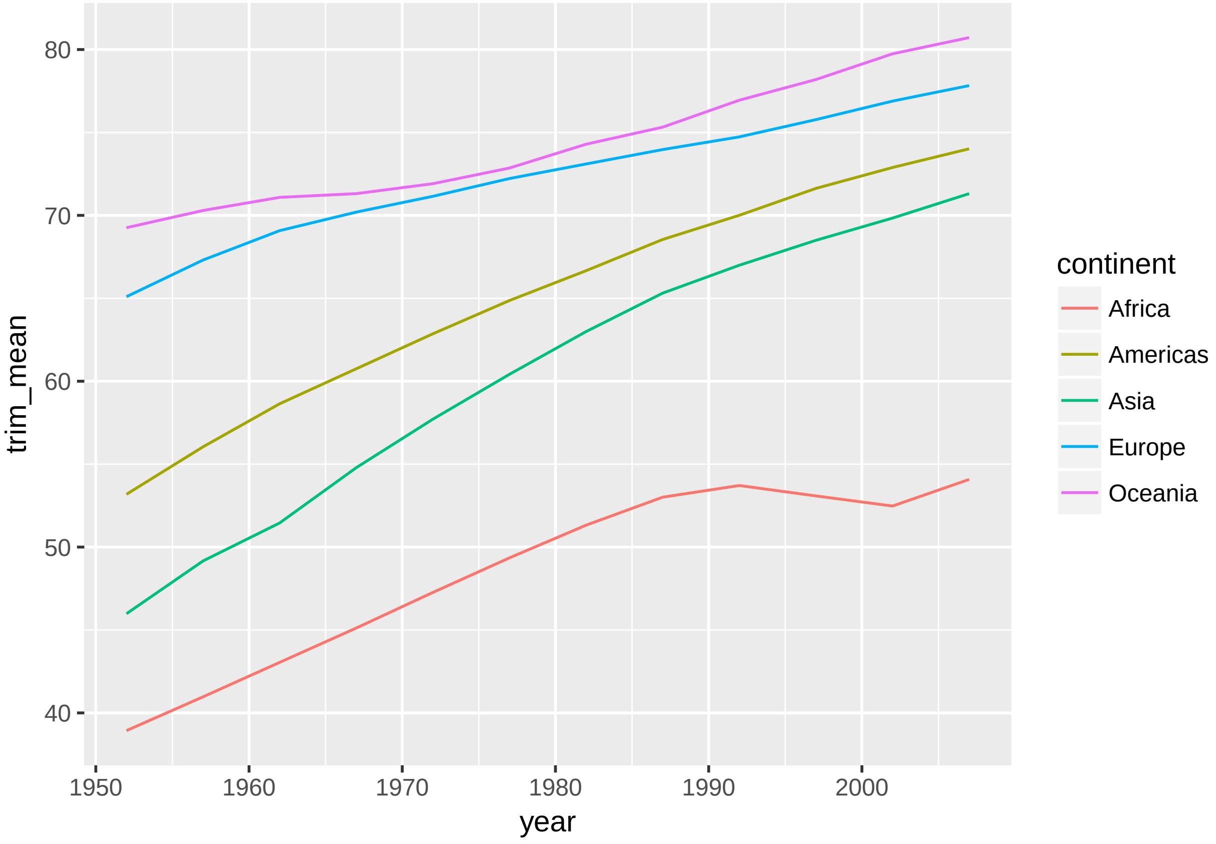
```
t_mean <- gapminder %>%
  group_by(year, continent) %>%
  summarize(trim_mean = mean(lifeExp, trim = 0.1))
```

```
knitr::kable(t_mean)
```

year	continent	trim_mean
1952	Africa	38.93298
1952	Americas	53.18157
1952	Asia	45.98107
1952	Europe	65.09708
1952	Oceania	69.25500
1957	Africa	40.96993
1957	Americas	56.04624
1957	Asia	49.16422
1957	Europe	67.30763
1957	Oceania	70.29500
1962	Africa	43.04819
1962	Americas	58.64005
1962	Asia	51.45357
1962	Europe	69.07921
1962	Oceania	71.08500
1967	Africa	45.11750
1967	Americas	60.75086
1967	Asia	54.78682
1967	Europe	70.19675
1967	Oceania	71.31000
1972	Africa	47.26495
1972	Americas	62.86081
1972	Asia	57.71233
1972	Europe	71.14942
1972	Oceania	71.91000
1977	Africa	49.34983
1977	Americas	64.86633
1977	Asia	60.41761
1977	Europe	72.22067
1977	Oceania	72.85500
1982	Africa	51.31998
1982	Americas	66.66624
1982	Asia	62.99337
1982	Europe	73.09983
1982	Oceania	74.29000
1987	Africa	53.00740
1987	Americas	68.54767
1987	Asia	65.31263
1987	Europe	73.96738

year	continent	trim_mean
1987	Oceania	75.32000
1992	Africa	53.71045
1992	Americas	70.00586
1992	Asia	66.99396
1992	Europe	74.73196
1992	Oceania	76.94500
1997	Africa	53.08371
1997	Americas	71.62719
1997	Asia	68.49633
1997	Europe	75.77375
1997	Oceania	78.19000
2002	Africa	52.47467
2002	Americas	72.88752
2002	Asia	69.83704
2002	Europe	76.88962
2002	Oceania	79.74000
2007	Africa	54.07752
2007	Americas	74.01419
2007	Asia	71.31067
2007	Europe	77.82504
2007	Oceania	80.71950

```r
t_mean %>%
  ggplot(aes(year, trim_mean, col = continent)) +
  geom_line()
```


trim_mean
year
continent
Africa
Americas
Asia
Europe
Oceania