hw07.Rmd

Homework 7

Automation Pipeline

First of all lets load all the required libraries.

```
suppressPackageStartupMessages(library(tidyr))
suppressPackageStartupMessages(library(stringr))
suppressPackageStartupMessages(library(ggplot2))
suppressPackageStartupMessages(library(knitr))
suppressPackageStartupMessages(library(kableExtra))
suppressPackageStartupMessages(library(dplyr))
suppressPackageStartupMessages(library(tidyverse))
```

Lets also define a function for formatting the tables.

```
tableFormat<-function(table,title=""){
  table %>%
    kable("html",caption=title, align=c(rep('c', 5))) %>%
    kable_styling(bootstrap_options =
                    c("striped", "hover",  "responsive"),
                  position="center",font_size=14)
}
```

Lets take a look at the gapminder data downloaded from online.

```
input_data<- read.table(file = '03_report_files/gapminder.tsv', sep = '\t', header = TRUE)
head(input_data)%>%
  tableFormat(title = "Downloaded Gapminder data")
```

Downloaded Gapminder data

country

continent

year

lifeExp

pop

gdpPercap

Afghanistan

Asia

1952

28.801

8425333

779.4453

Afghanistan

Asia

1957

30.332

9240934

820.8530

Afghanistan

Asia

1962

31.997

10267083

853.1007

Afghanistan

Asia

1967

34.020

11537966

836.1971

Afghanistan

Asia

1972

36.088

13079460

739.9811

Afghanistan

Asia

1977

38.438

14880372

786.1134

This data has some problem. Lets take a look at that.

```
input_data %>%
  filter(str_detect(country, "Cote"))
```

```
##                                                          country
## 1  Cote dIvoire\tAfrica\t1952\t40.477\t2977019\t1388.594732\nCote dIvoire
## 2   Cote dIvoire\tAfrica\t1962\t44.93\t3832408\t1728.869428\nCote dIvoire
## 3  Cote dIvoire\tAfrica\t1972\t49.801\t6071696\t2378.201111\nCote dIvoire
## 4  Cote dIvoire\tAfrica\t1982\t53.983\t9025951\t2602.710169\nCote dIvoire
## 5 Cote dIvoire\tAfrica\t1992\t52.044\t12772596\t1648.073791\nCote dIvoire
## 6 Cote dIvoire\tAfrica\t2002\t46.832\t16252726\t1648.800823\nCote dIvoire
##   continent year lifeExp      pop gdpPercap
```

```
## 1    Africa 1957  42.469  3300000  1500.896
## 2    Africa 1967  47.350  4744870  2052.050
## 3    Africa 1977  52.374  7459574  2517.737
## 4    Africa 1987  54.655 10761098  2156.956
## 5    Africa 1997  47.991 14625967  1786.265
## 6    Africa 2007  48.328 18013409  1544.750
```

This shows that the data downloaded needs some cleaning up. This is done in the exploratory analysis file. Now lets source this file to check this dataset (gap_clean_data).

```
source('01_exploratory_analysis.R')
```

```
## 'data.frame':    1698 obs. of  6 variables:
##  $ country  : Factor w/ 147 levels "Afghanistan",..: 1 1 1 1 1 1 1 1 1 1 ...
##  $ continent: Factor w/ 5 levels "Africa","Americas",..: 3 3 3 3 3 3 3 3 3 3 ...
##  $ year     : int  1952 1957 1962 1967 1972 1977 1982 1987 1992 1997 ...
##  $ lifeExp  : num  28.8 30.3 32 34 36.1 ...
##  $ pop      : int  8425333 9240934 10267083 11537966 13079460 14880372 12881816 13867957 16317921 22
##  $ gdpPercap: num  779 821 853 836 740 ...
```

```
gap_clean_data %>%
  filter(str_detect(country, "Cote"))%>%
  tableFormat(title = "Cleaned Gapminder data")
```

Cleaned Gapminder data

country

continent

year

lifeExp

pop

gdpPercap

Cote dIvoire

Africa

1952

40.477

2977019

1388.595

Cote dIvoire

Africa

1957

42.469

3300000

1500.896

Cote dIvoire

Africa

1962
44.930
3832408
1728.869
Cote dIvoire
Africa
1967
47.350
4744870
2052.050
Cote dIvoire
Africa
1972
49.801
6071696
2378.201
Cote dIvoire
Africa
1977
52.374
7459574
2517.737
Cote dIvoire
Africa
1982
53.983
9025951
2602.710
Cote dIvoire
Africa
1987
54.655
10761098
2156.956
Cote dIvoire
Africa

1992

52.044

12772596

1648.074

Cote dIvoire

Africa

1997

47.991

14625967

1786.265

Cote dIvoire

Africa

2002

46.832

16252726

1648.801

Cote dIvoire

Africa

2007

48.328

18013409

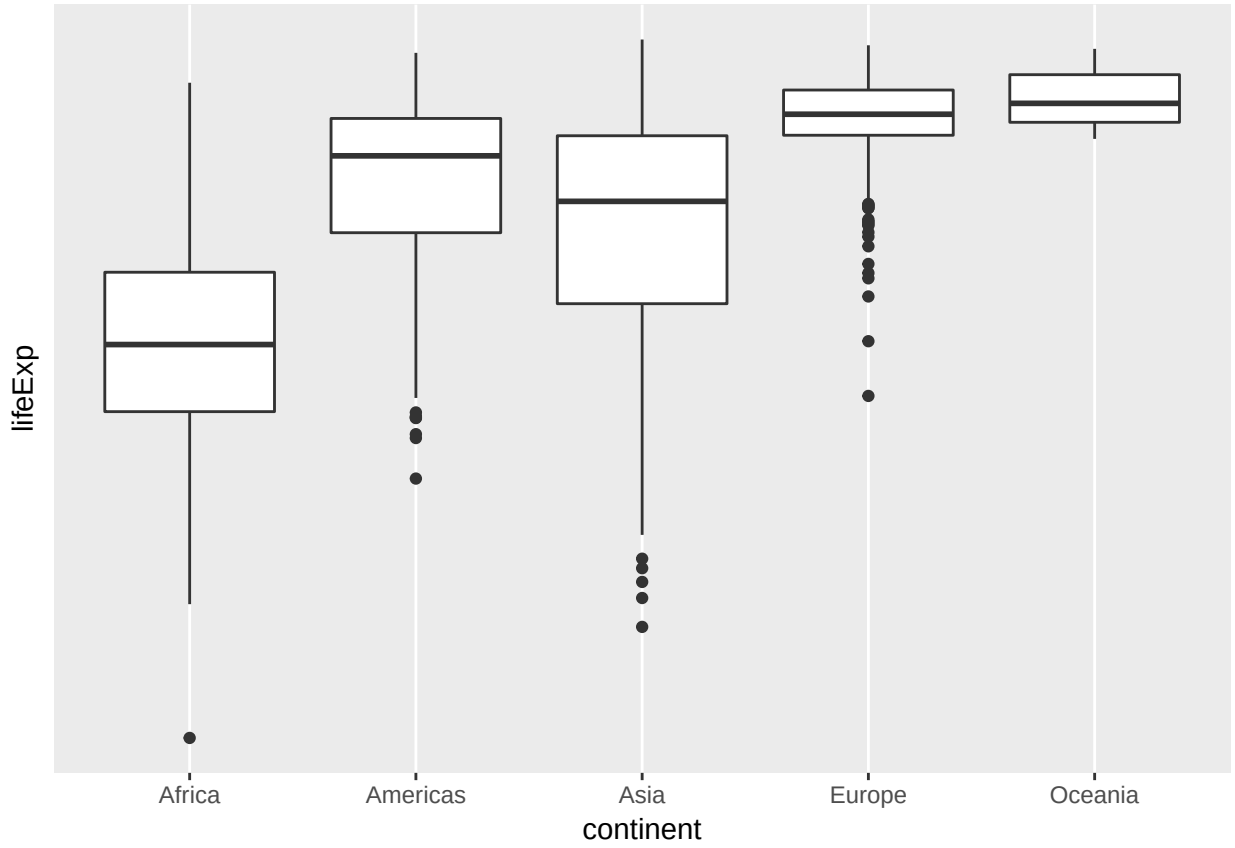
1544.750

```
levels(x$country)
```

```
## [1] "Cote dIvoire"
```

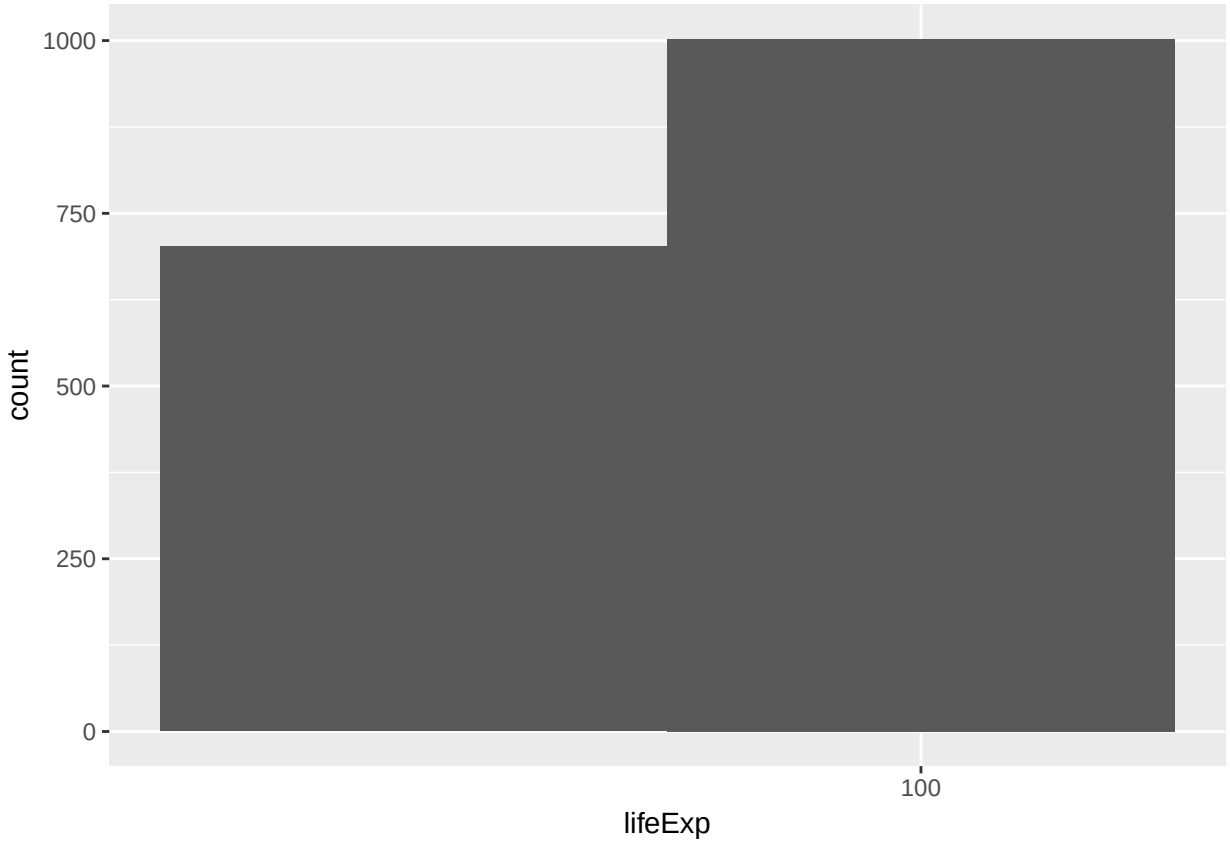
It looks the data is cleaned and the problem is solved. Now, lets look at the boxplot of lifeExp vs year.

```
boxplot
```

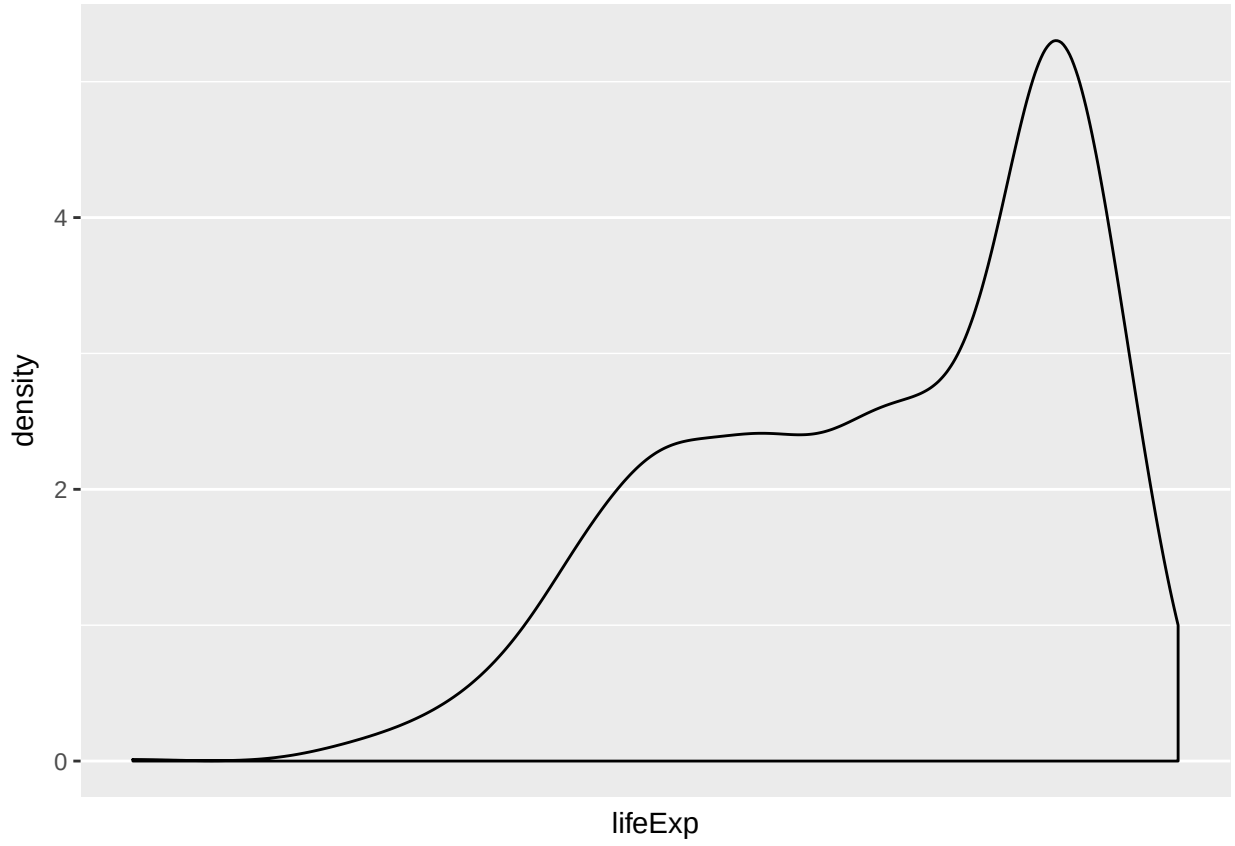


Now,lets look at few other plots of lifeExp such as histogram, density plot and frequency plot.

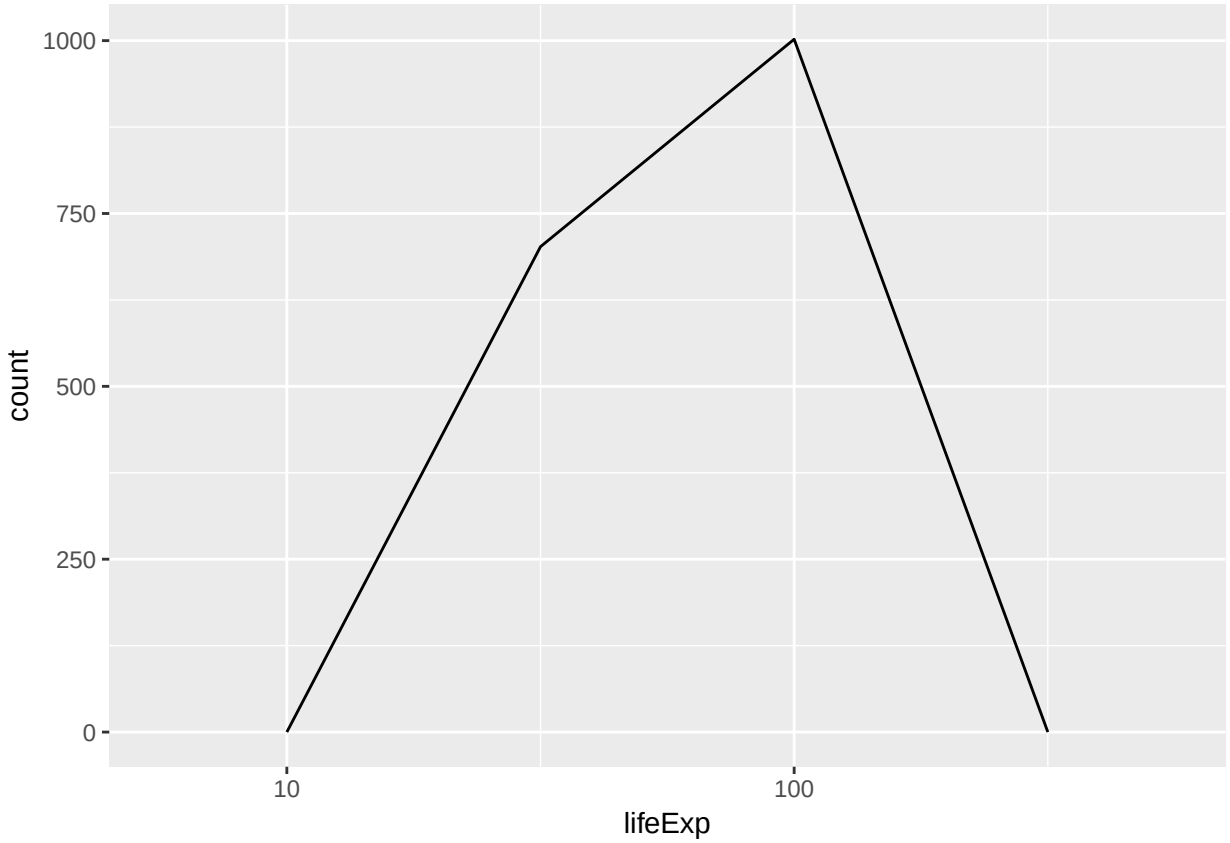
```
hist_plot
```




```
density_plot
```




```
freq_plot
```



Now lets take a look at the levels of continent factor variable before and after reordering.

```
#Before
gap_clean_data$continent%>%
  levels()
```

```
## [1] "Africa"   "Americas" "Asia"     "Europe"   "Oceania"
```

```
#After
gap_reordered$continent%>%
  levels()
```

```
## [1] "Oceania"  "Europe"   "Americas" "Asia"     "Africa"
```

Now, lets source the statistical analysis file.

```
source('02_statistical_analysis.R')
```

```
## Saving 6.5 x 4.5 in image
## Saving 6.5 x 4.5 in image
## Saving 6.5 x 4.5 in image
## Saving 6.5 x 4.5 in image
## Saving 6.5 x 4.5 in image
```

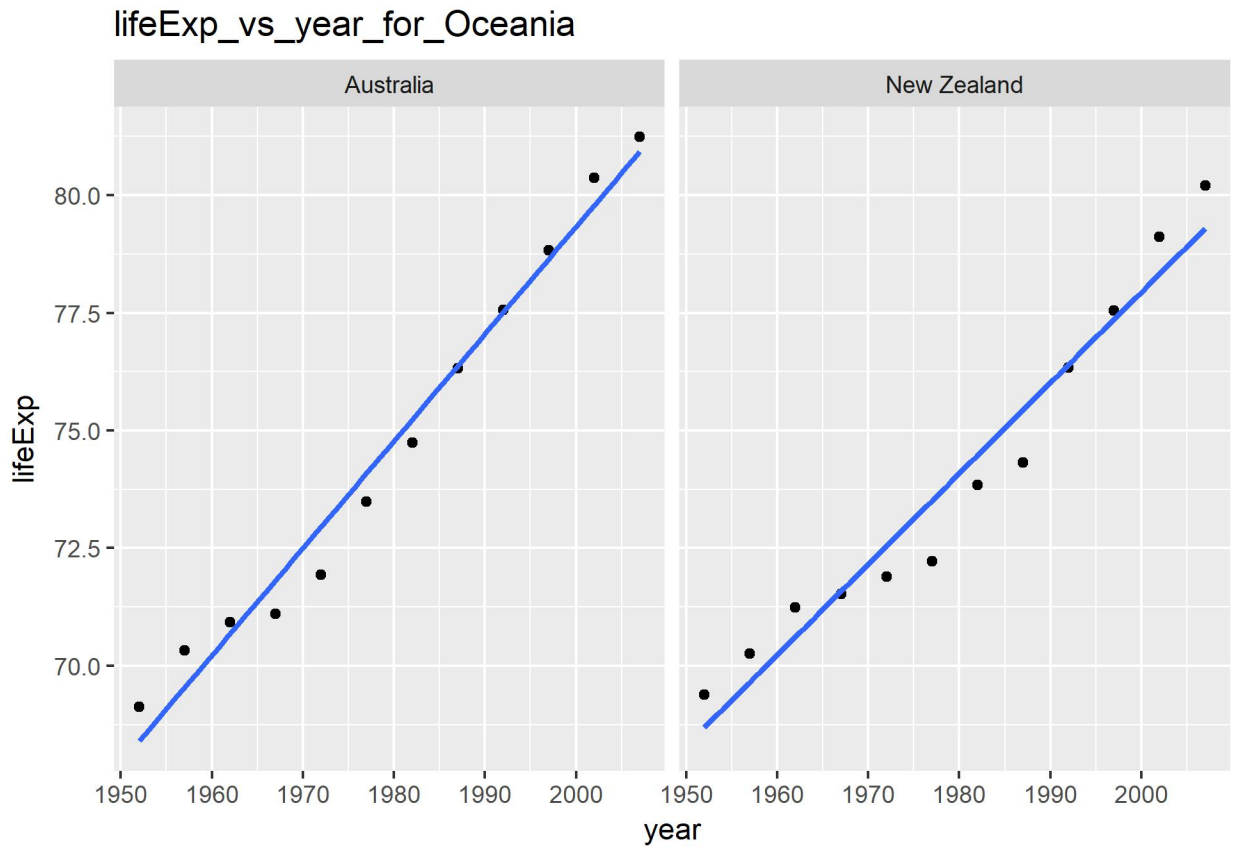
Now, lets look at the fitted result table.

```
fitted_result
```

```
## # A tibble: 140 x 7
## # Groups:   country, continent [140]
##        country continent  intercept     slope Res_Err_Std Res_Err_Variance
```

```
##         <fctr>    <fctr>      <dbl>     <dbl>       <dbl>           <dbl>
##  1 Afghanistan      Asia  -507.5343 0.2753287   1.2227880      1.49521045
##  2     Albania    Europe  -594.0725 0.3346832   1.9830615      3.93253302
##  3     Algeria    Africa -1067.8590 0.5692797   1.3230064      1.75034589
##  4      Angola    Africa  -376.5048 0.2093399   1.4070091      1.97967471
##  5   Argentina  Americas  -389.6063 0.2317084   0.2923072      0.08544349
##  6     Austria    Europe  -405.9205 0.2419923   0.4074094      0.16598240
##  7     Bahrain      Asia  -859.8258 0.4675077   1.6395865      2.68824402
##  8  Bangladesh      Asia  -936.2158 0.4981308   0.9766908      0.95392498
##  9     Belgium    Europe  -340.2412 0.2090846   0.2929025      0.08579187
## 10       Benin    Africa  -612.8340 0.3342329   1.1746910      1.37989891
## # ... with 130 more rows, and 1 more variables: R_squared <dbl>
```

Here is a look at one of the saved figures containing lifeExp vs year for each country in Oceania continent with regression line laid.



For plots of other continents, check out here.

Now, lets check the best 5 countries that fit our model perfectly in each continent except Oceania.

```
best_countries%>%
  select(country,continent,intercept,slope,R2_norm,std_norm)%>%
  tableFormat(title = "Best countries in Each Continent")
```

Best countries in Each Continent

country

continent

intercept

slope

R2_norm

std_norm

France

Europe

-397.7646

0.2385014

1.0000000

0.0799057

Sweden

Europe

-252.9239

0.1662545

0.9978525

0.0768994

Switzerland

Europe

-364.3421

0.2222315

0.9997657

0.0780409

Argentina

Americas

-389.6063

0.2317084

0.9975158

0.1421767

Brazil

Americas

-709.9427

0.3900895

1.0000000

0.1586794

Canada

Americas

-358.3489

0.2188692

0.9983348

0.1212330

Indonesia

Asia

-1201.9366

0.6346413

0.9998642

0.1146592

Iran

Asia

-924.4620

0.4966399

0.9977595

0.1180490

Israel

Asia

-455.0911

0.2671063

0.9975264

0.0649611

Pakistan

Asia

-748.3836

0.4057923

1.0000000

0.0715672

Comoros

Africa

-839.1671

0.4503909

0.9991745

0.0664286

Equatorial Guinea

Africa

-571.0228

0.3101706

0.9991925

0.0456170

Mali

Africa

-702.4815

0.3768098

0.9977719

0.0668388

Mauritania

Africa

-831.3813

0.4464175

1.0000000

0.0565590

Now, lets check the worst 5 countries that didn't fit our model in each continent except Oceania.

```
worst_countries%>%
  select(country,continent,intercept,slope,R2_norm,std_norm)%>%
  tableFormat(title = "Worst countries in Each Continent")
```

Worst countries in Each Continent

country

continent

intercept

slope

R2_norm

std_norm

Bulgaria

Europe

-218.64725

0.1456888

0.5478435

0.9111365

Montenegro

Europe

-509.69710

0.2930014

0.8037745

1.0000000

Poland

Europe

-318.23836

0.1962189

0.8416624

0.5887156

Romania

Europe

-243.28540

0.1574014

0.8074848

0.5309380

Jamaica

Americas

-369.50089

0.2213944

0.8072352

1.0000000

Trinidad and Tobago

Americas

-276.93502

0.1736615

0.7995687

0.8035163

Cambodia

Asia

-735.78684

0.3959028

0.6404537

1.0000000

Iraq

Asia

-409.01741

0.2352105

0.5472894

0.7206027

Korea, Dem. Rep.

Asia

-562.75907

0.3164266

0.7050021

0.6905999

Botswana

Africa

-65.49586

0.0606685

0.0341027

0.8482737

Rwanda

Africa

132.20498

-0.0458315

0.0171996

0.9101842

Zambia

Africa

165.60797

-0.0604252

0.0599759

0.6285138

Zimbabwe

Africa

236.79819

-0.0930210

0.0563630

1.0000000