Final Project

Analysis of Internet Use in the World

Jiayi Ge, Yue Liu, Songqi Wang, Kexin Zhang, TUT 0112, L1

Introduction

- The Internet usage is an essential intermedia in globalization and modern society.
- The Internet usage is different around the world.
- How different are the Internet usage in different countries?
- What are the factors that have impact on Internet usage?

Objectives

- How can we define internet use in a country?
- Do different regions of the world have different internet usage?
- According to our definition of internet use, what is the impact of democracy, education, economy, and health on internet use?

Data

- Internet Usage = Internet Users/Population
- Democracy Score
- Education Expenditures
- GDP per capita
- Life Expectancy
- World Region

Data Cleaning

- Select the columns and combine them into one dataframe with proper names
- Change some character data, like GDP with $ sign, into type of double
- Correct one spelling mistake in the data of region
- In some small countries, more users than population. The IntUsage >1 are removed.

Data Summary

```
## Observations: 223
## Variables: 12
## $ Country         <chr> "Afghanistan", "Albania", "Algeria", "American...
## $ IntUsage        <dbl> 0.10349566, 0.66158944, 0.42205756, 0.33007145...
## $ Government_type <chr> "Authoritarian", "Hybrid regime", "Authoritari...
## $ DemocracyScore  <dbl> 2.55, 5.98, 3.56, NA, 3.62, NA, NA, 6.96, 4.11...
## $ Education_GDP   <dbl> NA, 3.3, 4.3, NA, 3.5, 2.8, 2.4, 6.3, 3.3, 6.0...
## $ GDP_Per_Capita  <dbl> 2000, 12500, 15200, 11200, 6800, 12200, 26300,...
## $ Lifetime        <dbl> 51.7, 78.5, 77.0, 73.4, 60.2, 81.5, 76.7, 77.3...
## $ Healthexpend    <dbl> 8.2, 5.9, 7.2, NA, 3.3, NA, 5.5, 4.8, 4.5, NA,...
## $ IntUsers        <dbl> 3531770, 2016516, 17291463, 17000, 2622403, 13...
## $ TeleLines       <dbl> 118769, 247010, 3130090, 10000, 161070, 6000, ...
## $ Population      <dbl> 34124811, 3047987, 40969443, 51504, 29310273, ...
## $ Region          <chr> "Asia & Pacific", "Europe", "Arab States", "As...
```

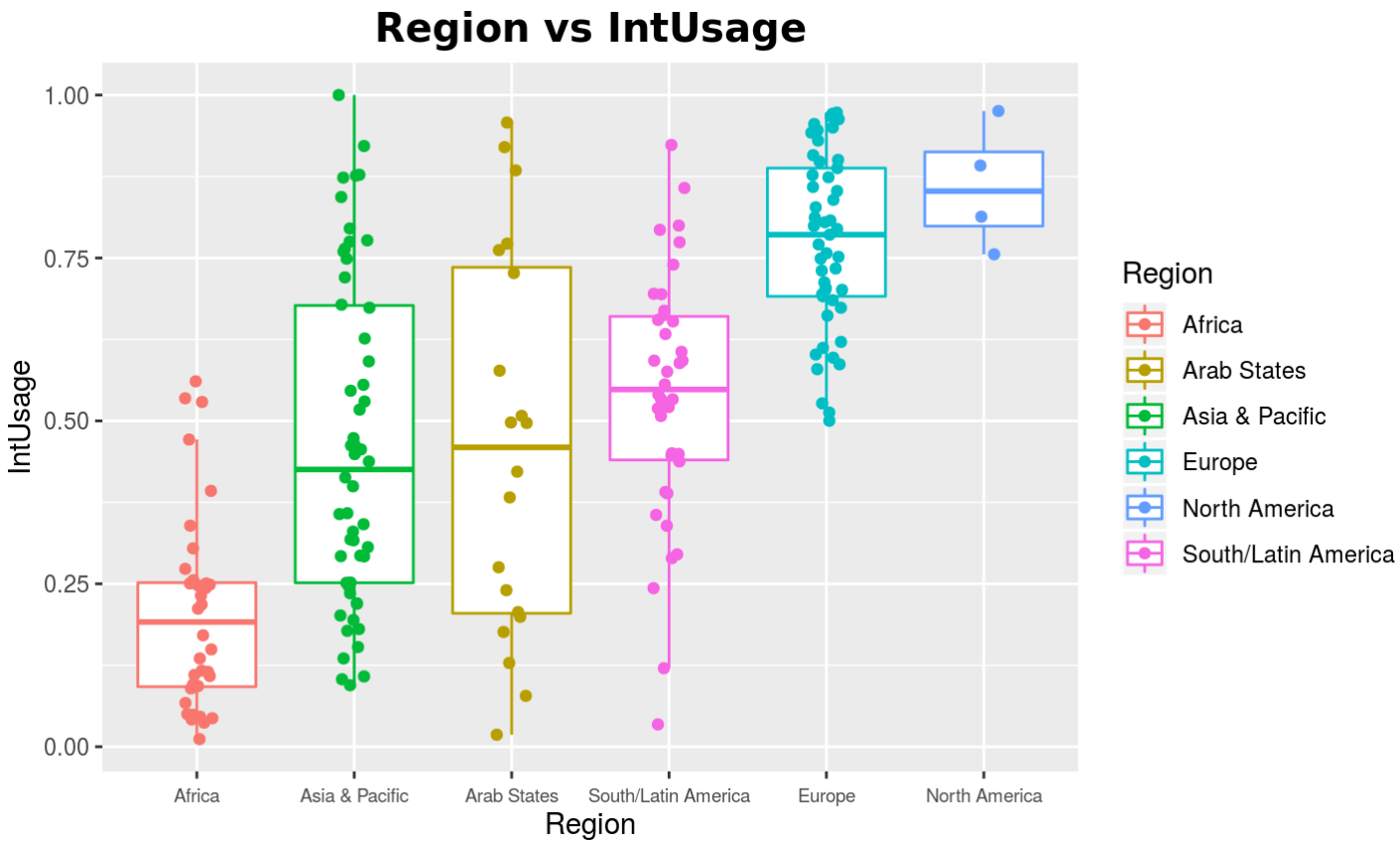
Statistic method 1:Boxplot

- We create boxplot by using geom_boxplot() fuction in R language which belongs to library(ggplot2) package to describe the relationship between the Region and IntUsage.
- We create boxplot by using geom_boxplot() fuction in R language which belongs to library(ggplot2) package to describe the relationship between the Government_type and IntUsage.

Statistic method 2: linear regression

- We create the linear regression by using lm() fuction to describe the relationship between IntUsage and Region.
- We create the linear regression by using lm() fuction to describe the relationship between IntUsage and DemocracyScore.
- We create the linear regression by using lm() fuction to describe the relationship between IntUsage and Education_GDP.
- We create the linear regression by using lm() fuction to describe the relationship between IntUsage and GDP_Per_Capita.
- We create the linear regression by using lm() fuction to describe the relationship between IntUsage and Lifetime.

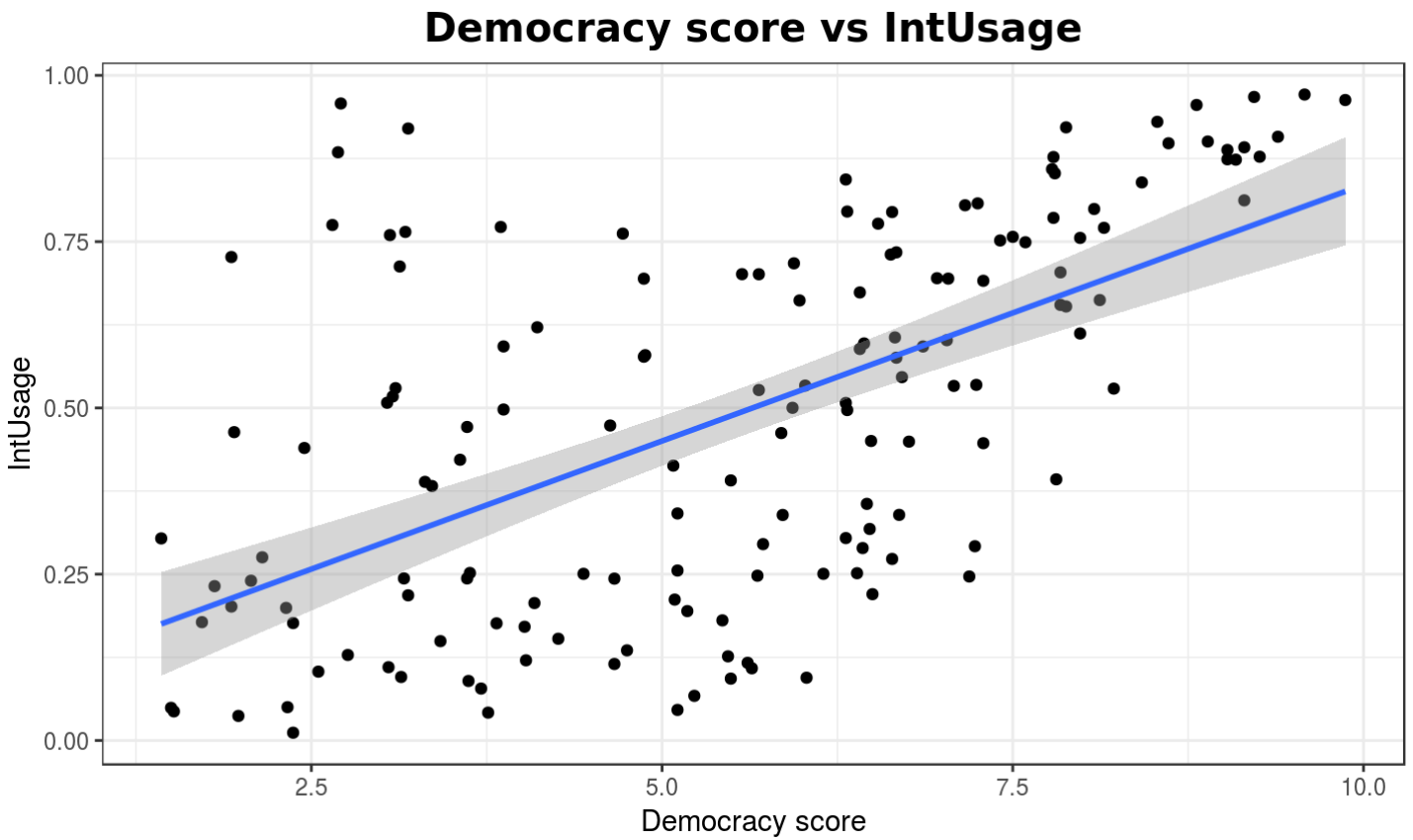
Region


Region vs IntUsage
1.00
0.75
0.50
0.25
0.00
IntUsage
Africa
Asia & Pacific
Arab States
South/Latin America
Europe
North America
Region
Region
Africa
Arab States
Asia & Pacific
Europe
North America
South/Latin America

Region

```
##                            Estimate Std. Error  t value  Pr(>|t|)
## (Intercept)                0.462700    0.02775 16.67000 2.264e-39
## RegionAfrica              -0.258900    0.04388 -5.89900 1.591e-08
## RegionArab States         -0.001206    0.05338 -0.02259 9.820e-01
## RegionEurope               0.312500    0.04024  7.76600 4.500e-13
## RegionNorth America        0.396400    0.10570  3.75100 2.325e-04
## RegionSouth/Latin America  0.075650    0.04318  1.75200 8.136e-02
```

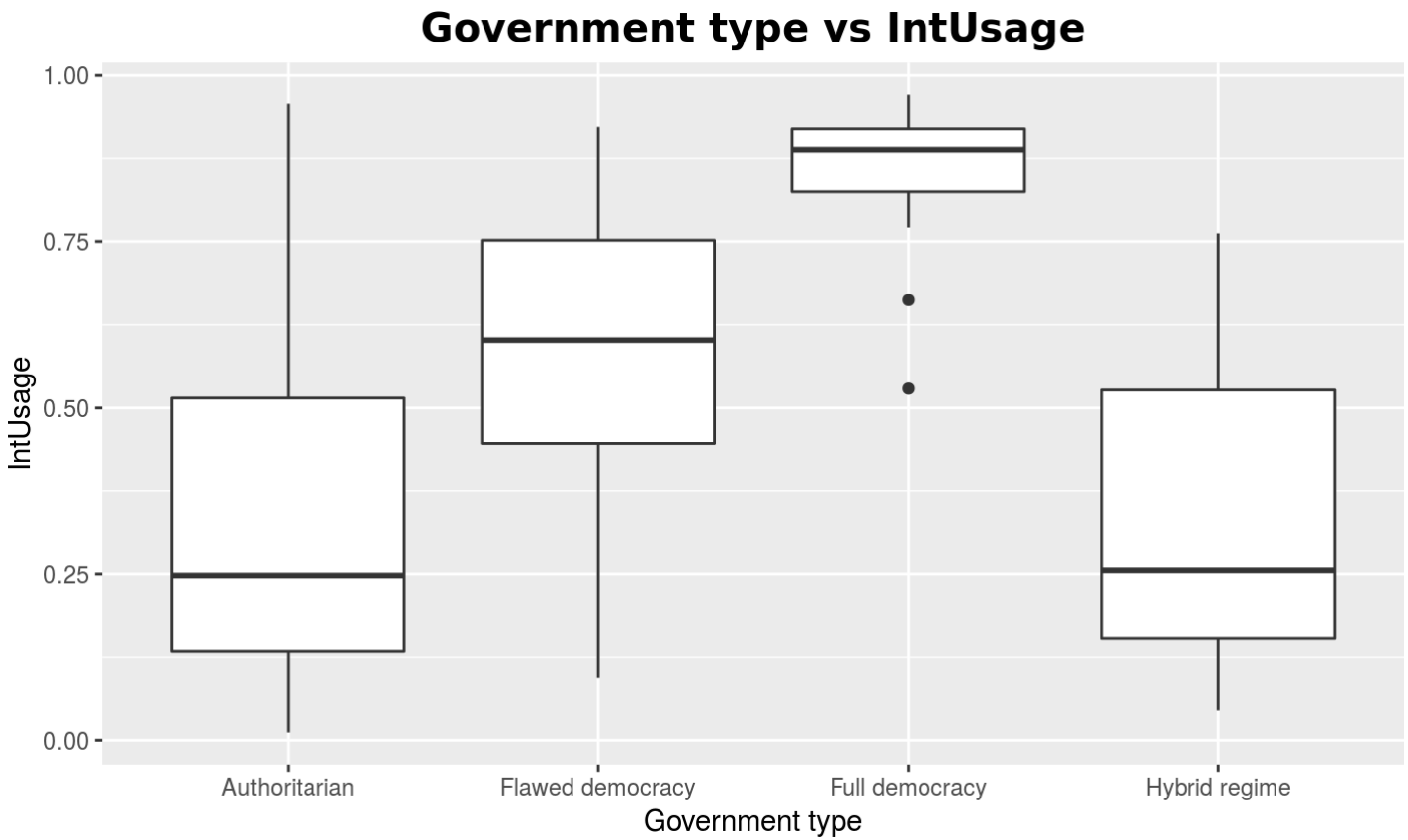
Democracy


Democracy score vs IntUsage
1.00
0.75
0.50
0.25
0.00
IntUsage
2.5
5.0
7.5
10.0
Democracy score

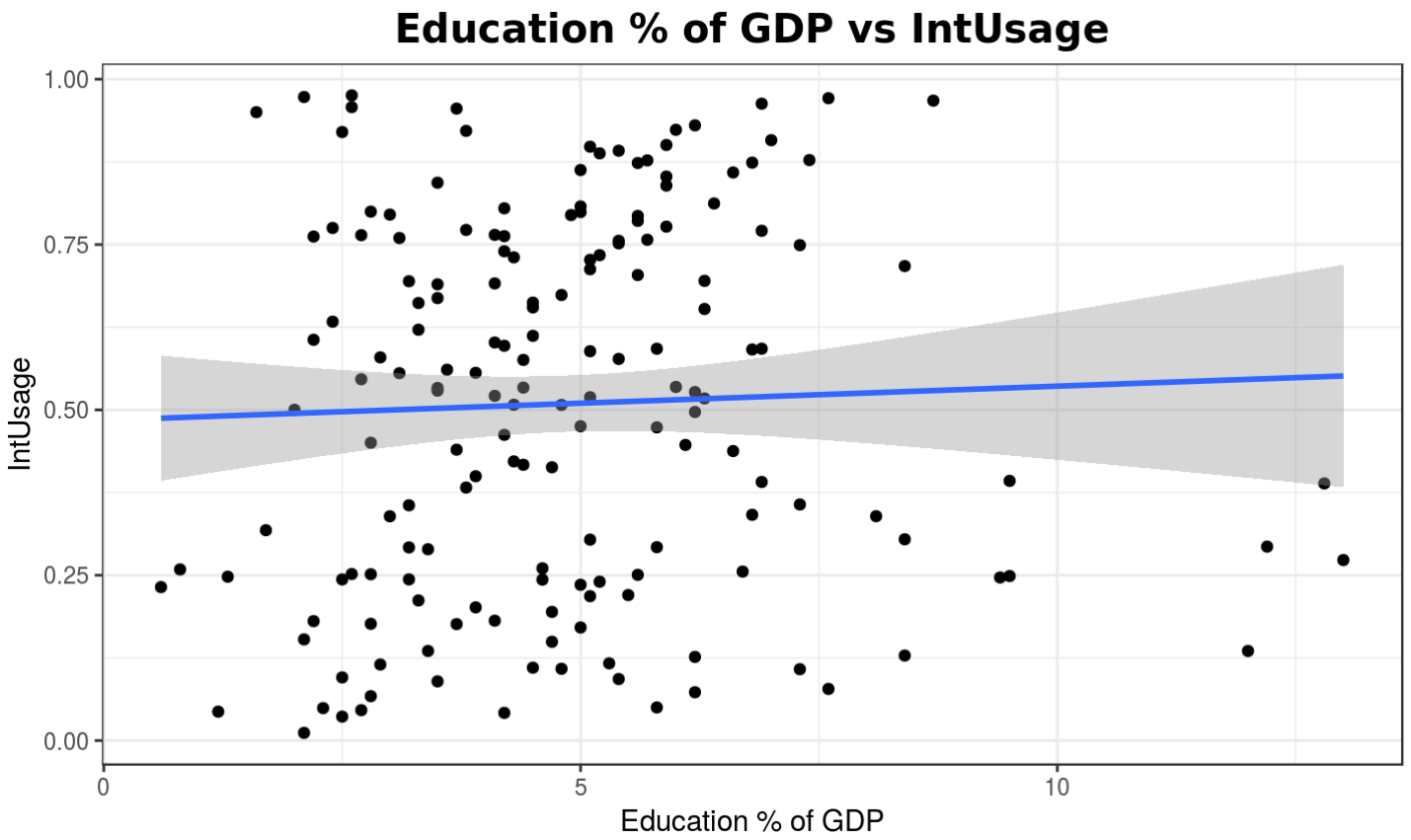
Democracy

```
##
## Call:
## lm(formula = IntUsage ~ DemocracyScore, data = compare_Dem_usage)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.43530 -0.18077  0.00475  0.14439  0.68386
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.065091   0.050490   1.289    0.199
## DemocracyScore 0.077045   0.008501   9.063 5.68e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.228 on 153 degrees of freedom
## Multiple R-squared:  0.3493, Adjusted R-squared:  0.3451
## F-statistic: 82.14 on 1 and 153 DF,  p-value: 5.676e-16
```

Democracy


Government type vs IntUsage
1.00
0.75
0.50
0.25
0.00
IntUsage
Authoritarian
Flawed democracy
Full democracy
Hybrid regime
Government type

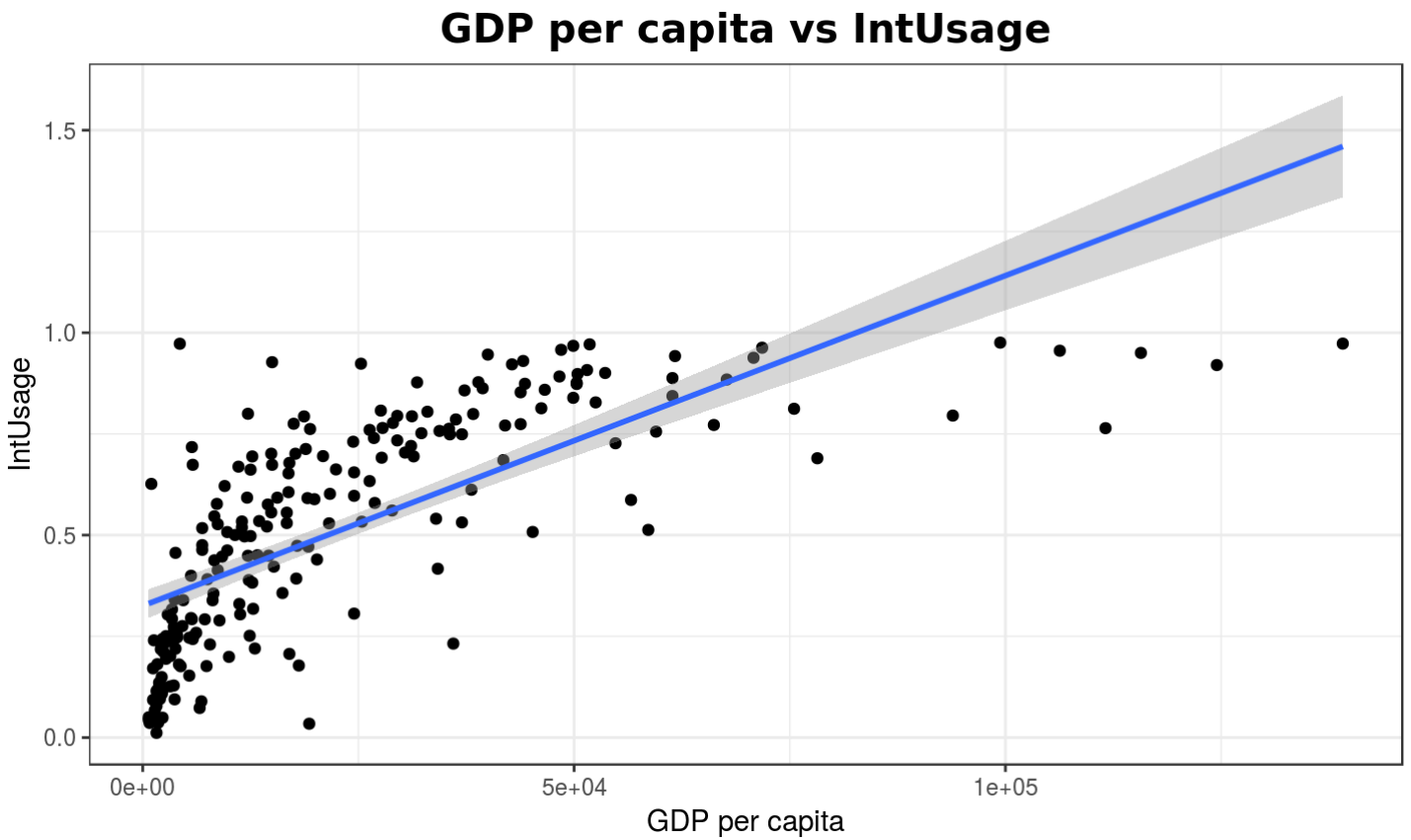
Education


Education % of GDP vs IntUsage
IntUsage
1.00
0.75
0.50
0.25
0.00
0
5
10
Education % of GDP

Education

```
##
## Call:
## lm(formula = IntUsage ~ Education_GDP, data = compare_edu_usage)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.48350 -0.25630  0.01942  0.25379  0.47790
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.48436    0.05341   9.068 2.98e-16 ***
## Education_GDP  0.00515    0.01010   0.510    0.611
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2817 on 169 degrees of freedom
## Multiple R-squared:  0.001535,   Adjusted R-squared:  -0.004373
## F-statistic: 0.2598 on 1 and 169 DF,  p-value: 0.6109
```

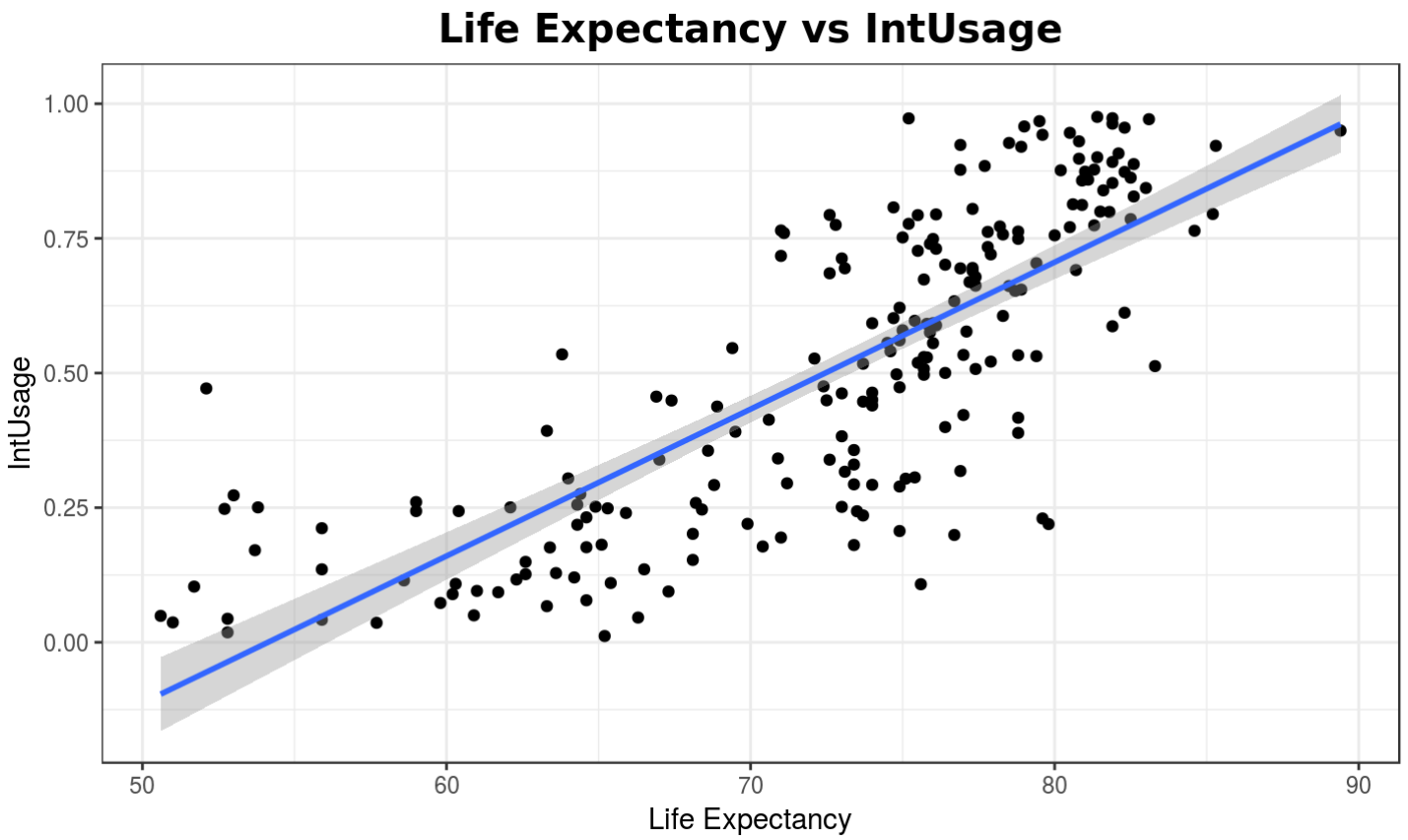
Economy


GDP per capita vs IntUsage
IntUsage
1.5
1.0
0.5
0.0
0e+00
5e+04
1e+05
GDP per capita

Economy

```
##
## Call:
## lm(formula = IntUsage ~ GDP_Per_Capita, data = compare_gdp_usage)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.48686 -0.15150  0.01641  0.14950  0.61226
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)    3.254e-01  1.820e-02   17.88   <2e-16 ***
## GDP_Per_Capita 8.156e-06  5.396e-07   15.12   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1961 on 217 degrees of freedom
## Multiple R-squared:  0.5129, Adjusted R-squared:  0.5106
## F-statistic: 228.5 on 1 and 217 DF,  p-value: < 2.2e-16
```

Health


Life Expectancy vs IntUsage
IntUsage
1.00
0.75
0.50
0.25
0.00
50
60
70
80
90
Life Expectancy

Health

```
##
## Call:
## lm(formula = IntUsage ~ Lifetime, data = compare_life_usage)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.48082 -0.10786 -0.00331  0.12509  0.52664
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) -1.476503   0.107994  -13.67   <2e-16 ***
## Lifetime     0.027279   0.001474   18.50   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1744 on 213 degrees of freedom
## Multiple R-squared:  0.6165, Adjusted R-squared:  0.6147
## F-statistic: 342.4 on 1 and 213 DF,  p-value: < 2.2e-16
```

Final Model

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-1.002896e+00	1.274508e-01	-7.868886e+00	1.179632e-12
DemocracyScore	1.704953e-02	6.626141e-03	2.573071e+00	1.119362e-02
GDP_Per_Capita	4.794072e-06	6.680423e-07	7.176300e+00	4.763440e-11
Lifetime	1.750179e-02	2.005383e-03	8.727403e+00	1.038720e-14
Education_GDP	8.229308e-03	5.733634e-03	1.435269e+00	1.535937e-01

R-squared:

```
## [1] 0.8078404
```

Conclusion

- We do have a difference between the internet usages of different countries. Generally, developed countries or developed regions have a higher Internet usage.
- Economy and health have a strong positive impact on internet usage.
- Democracy level have a week positive impact on internet usage.
- Education has no impact on internet usage.

Acknowledgment

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