Temperature and Seoul Bike

Aim:

- To demonstrate how to do a machine learning in R for beginners (no prerequisite knowledge)
- To use a linear regression model to predict Seoul bike rent demand from temperature
- Only necessary codes are included and codes such as making plot neat are excluded

Code written by: Ggodburi AI (Youtuber)

- URL for the youtube: https://www.youtube.com/channel/UCUdyx4YZ_bkBmBS3aq_7Xag

Data set source:

- Sathishkumar V E, Jangwoo Park, and Yongyun Cho. 'Using data mining techniques for bike sharing demand prediction in metropolitan city.' Computer Communications, Vol.153, pp.353-366, March, 2020
- Sathishkumar V E and Yongyun Cho. 'A rule-based model for Seoul Bike sharing demand prediction using weather data' European Journal of Remote Sensing, pp. 1-18, Feb, 2020
- Dua, D. and Graff, C. (2019). UCI Machine Learning Repository [http://archive.ics.uci.edu/ml]. Irvine, CA: University of California, School of Information and Computer Science.
- URL: https://archive.ics.uci.edu/ml/datasets/Seoul+Bike+Sharing+Demand

Load Data

```
# Before loading data, the two column names need to be changed for the encoding issue.
# Temperature(?C) -> Temperature
# Dew point temperature(?C) -> Dew point temperature

data_frame = read.csv('SeoulBikeData.csv')
summary(data_frame)
```

```
##      Date           Rented.Bike.Count      Hour        Temperature
##  Length:8760        Min.   :   0.0    Min.   : 0.00   Min.   :-17.80
##  Class :character   1st Qu.: 191.0    1st Qu.: 5.75   1st Qu.:  3.50
##  Mode  :character   Median : 504.5    Median :11.50   Median : 13.70
##                     Mean   : 704.6    Mean   :11.50   Mean   : 12.88
##                     3rd Qu.:1065.2    3rd Qu.:17.25   3rd Qu.: 22.50
##                     Max.   :3556.0    Max.   :23.00   Max.   : 39.40
##   Humidity...    Wind.speed..m.s. Visibility..10m. Dew.point.temperature
##  Min.   : 0.00   Min.   :0.000    Min.   :  27     Min.   :-30.600
##  1st Qu.:42.00   1st Qu.:0.900    1st Qu.: 940     1st Qu.: -4.700
##  Median :57.00   Median :1.500    Median :1698     Median :  5.100
##  Mean   :58.23   Mean   :1.725    Mean   :1437     Mean   :  4.074
##  3rd Qu.:74.00   3rd Qu.:2.300    3rd Qu.:2000     3rd Qu.: 14.800
##  Max.   :98.00   Max.   :7.400    Max.   :2000     Max.   : 27.200
##  Solar.Radiation..MJ.m2.  Rainfall.mm.     Snowfall..cm.       Seasons
##  Min.   :0.0000           Min.   : 0.0000   Min.   :0.00000   Length:8760
```

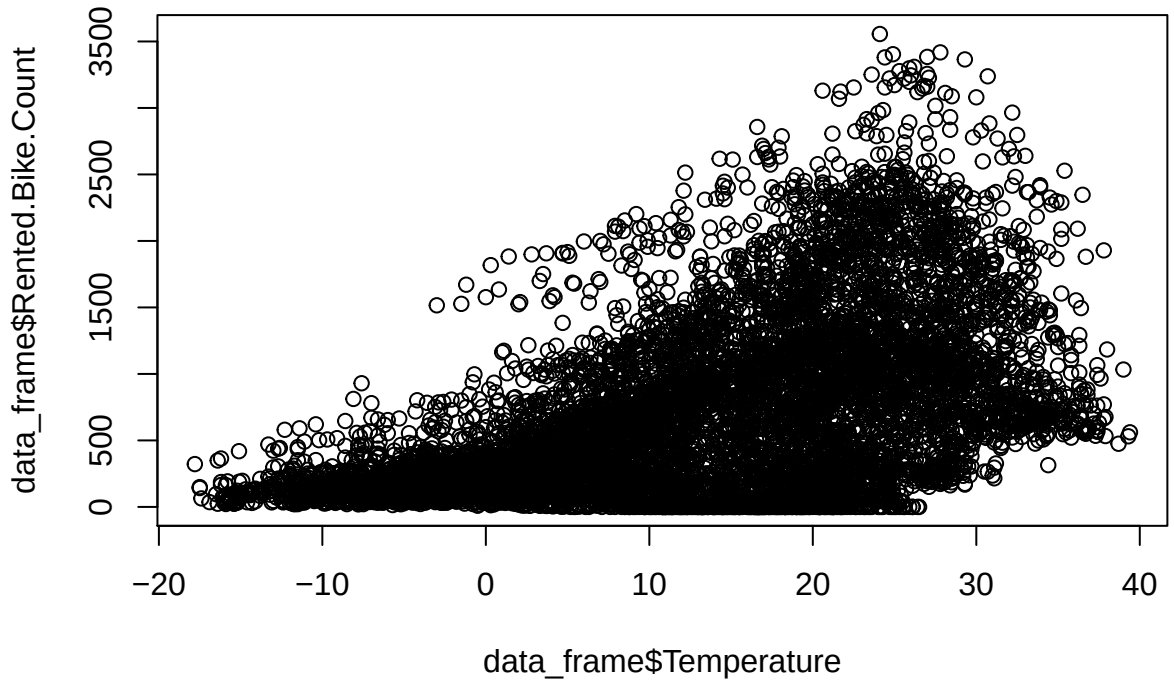
```
##  1st Qu.:0.0000          1st Qu.: 0.0000   1st Qu.:0.00000   Class :character
##  Median :0.0100          Median : 0.0000   Median :0.00000   Mode  :character
##  Mean   :0.5691          Mean   : 0.1487   Mean   :0.07507
##  3rd Qu.:0.9300          3rd Qu.: 0.0000   3rd Qu.:0.00000
##  Max.   :3.5200          Max.   :35.0000   Max.   :8.80000
##    Holiday          Functioning.Day
##  Length:8760        Length:8760
##  Class :character   Class :character
##  Mode  :character   Mode  :character
##
##
##
```

```
head(data_frame)
```

```
##         Date Rented.Bike.Count Hour Temperature Humidity... Wind.speed..m.s.
## 1 01/12/2017               254    0        -5.2          37              2.2
## 2 01/12/2017               204    1        -5.5          38              0.8
## 3 01/12/2017               173    2        -6.0          39              1.0
## 4 01/12/2017               107    3        -6.2          40              0.9
## 5 01/12/2017                78    4        -6.0          36              2.3
## 6 01/12/2017               100    5        -6.4          37              1.5
##   Visibility..10m. Dew.point.temperature Solar.Radiation..MJ.m2. Rainfall.mm.
## 1             2000                 -17.6                       0            0
## 2             2000                 -17.6                       0            0
## 3             2000                 -17.7                       0            0
## 4             2000                 -17.6                       0            0
## 5             2000                 -18.6                       0            0
## 6             2000                 -18.7                       0            0
##   Snowfall..cm. Seasons    Holiday Functioning.Day
## 1             0  Winter No Holiday             Yes
## 2             0  Winter No Holiday             Yes
## 3             0  Winter No Holiday             Yes
## 4             0  Winter No Holiday             Yes
## 5             0  Winter No Holiday             Yes
## 6             0  Winter No Holiday             Yes
```

Scatter plot between Temperature and Rented bike count

```
plot(x=data_frame$Temperature ,y=data_frame$Rented.Bike.Count)
```



Modeling by using linear regression (a basic form of machine learning)

```
# y(bike rent count) = a (parameter) * x (temperature) + b (parameter)
# by using regression, we can derive parameters a and b which represent the data best
# (minimizing the errors)

# formula argument format = Y ~ X
linear_regression_model = glm(formula = Rented.Bike.Count ~ Temperature, data=data_frame)
summary(linear_regression_model)
```

```
##
## Call:
## glm(formula = Rented.Bike.Count ~ Temperature, data = data_frame)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -1100.60   -336.57    -49.69    233.81   2525.19
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 329.9525     8.5411   38.63   <2e-16 ***
## Temperature  29.0811     0.4862   59.82   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 295390.5)
##
##     Null deviance: 3643934363  on 8759  degrees of freedom
## Residual deviance: 2587029843  on 8758  degrees of freedom
## AIC: 135205
##
```

```
## Number of Fisher Scoring iterations: 2
```

Predict the bike rent count by using the derived a and b for any temperature

```
temp_temperature = 23
a = 29.0811
b = 329.9525

y = a * temp_temperature + b
y
```

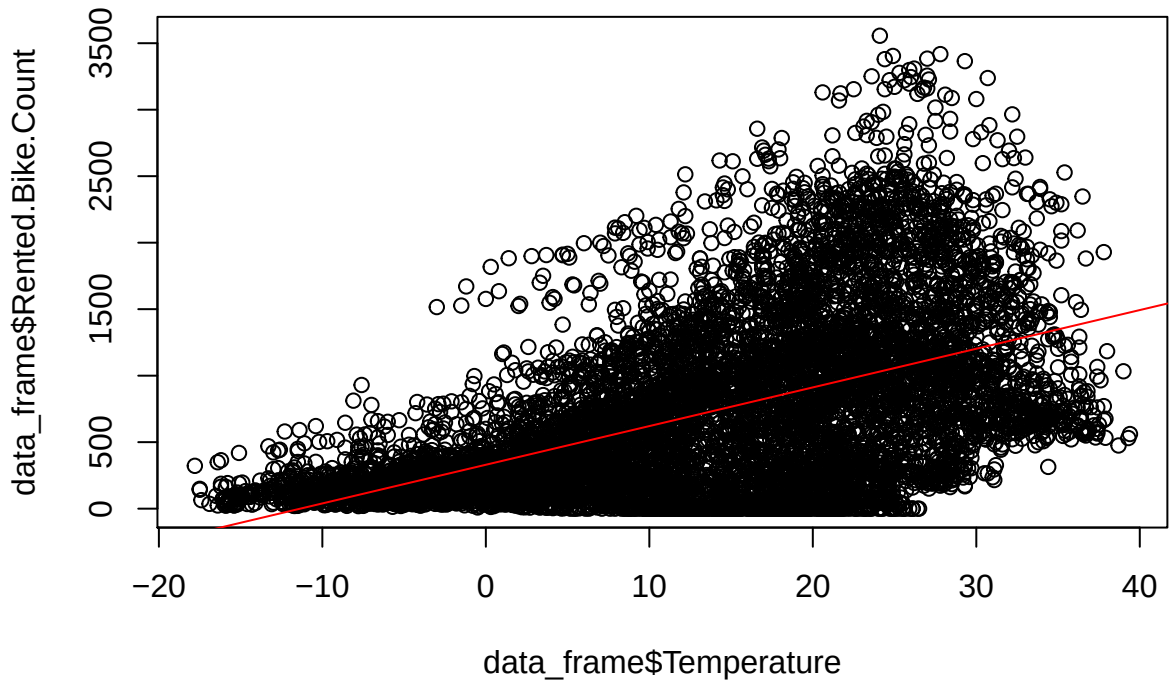
```
## [1] 998.8178
```

```
predict(linear_regression_model, newdata=data.frame(Temperature=c(23)))
```

```
##        1
## 998.8178
```

Plot the best fit line in red using the derived parameters

```
plot(x=data_frame$Temperature ,y=data_frame$Rented.Bike.Count)
abline(a=b,b=a, col='red')
```



Show several predicted bike counts according to given temperatures

```
temperature_list = c(-10,0,10,20,30,40)
pred_list = predict(linear_regression_model, newdata=data.frame(Temperature=temperature_list))

data.frame(Temperature=temperature_list, Pred_bike_count=pred_list)
```

```
##   Temperature Pred_bike_count
## 1         -10        39.14152
## 2           0       329.95251
## 3          10       620.76350
## 4          20       911.57449
## 5          30      1202.38548
## 6          40      1493.19647
```