DAY 4 LAB MANNUAL

ITA0443-STATISTICS WITH R PROGRAMMING

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GITHUB LINK:- https://github.com/Vamsim29/ITA0443-STATISTICS-WITH-R-PROGRAMMING

LINEAR REGRESSION ANALYSIS IN R

Exercise

Using linear regression analysis establish a relationship between height and weight of a person using the input vector given below.

 # Values of height

151, 174, 138, 186, 128, 136, 179, 163, 152, 131

 # Values of weight.

63, 81, 56, 91, 47, 57, 76, 72, 62, 48

Predict the weight of a person with height 170. Visualize the regression graphically.

CODE:-

```
x <- c(151, 174, 138, 186, 128, 136, 179, 163, 152, 131)

y <- c(63, 81, 56, 91, 47, 57, 76, 72, 62, 48)

relation <- lm(y~x)

a <- data.frame(x = 170)

result <-    predict(relation,a)

print(result)

plot(y,x,col = "blue",main = "Height & Weight Regression",

       abline(lm(x~y)),cex = 1.3,pch = 16,xlab = "Weight in Kg",ylab = "Height in cm")
```

```
dev.off()
```

OUTPUT:-

1

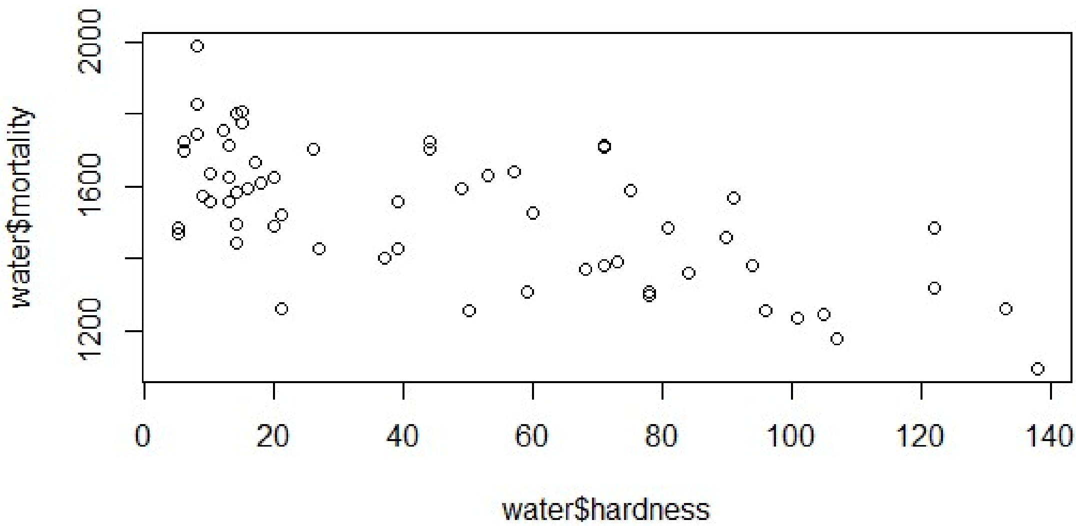
76.22869

Download the Dataset "water" From Rdataset Link.Find out whether there is a linear relation between attributes"mortality" and"hardness" by plot function.Fit the Data into the Linear Regression model.Predict the mortality for the hardness=88

CODE:-

```
plot(water$hardness, water$mortality)
  model <- lm(mortality ~ hardness, data = water)
```

OUTPUT:-



CODE:-

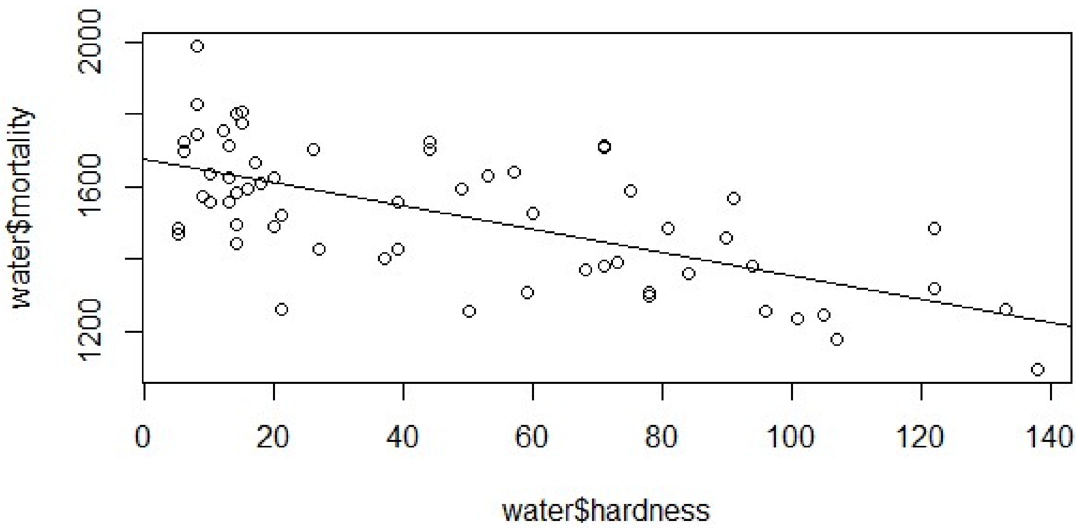
```
model <- lm(mortality ~ hardness, data = water)

prediction <- predict(model, newdata = data.frame(hardness = 88))

plot(water$hardness, water$mortality)

abline(model)
```

OUTPUT:-



MULTIPLE REGRESSION ANALYSIS IN R

Exercise:

1.Generate a multiple regression model using the built in dataset mtcars.It gives a comparison between different car models in terms of mileage per gallon (mpg), cylinder displacement("disp"), horse power("hp"), weight of the car("wt") and some more parameters.

Establish the relationship between "mpg" as a response variable with "disp","hp" and "wt" as predictor variables. Predict the mileage of the car with dsp=221,hp=102 and wt=2.91.

CODE:-

```
input <- mtcars[,c("mpg","disp","hp","wt")

model <- lm(mpg~disp+hp+wt, data = input)

print(model)]

cat("# # # # The Coefficient Values # # # ","\n")
```

a <- coef(model)[1]

print(a)

Xdisp <- coef(model)[2]

Xhp <- coef(model)[3]

Xwt <- coef(model)[4]

print(Xdisp)

print(Xhp)

print(Xwt)

Y = 37.15+(-0.000937)*221+(-0.0311)*102+(-3.8008)*2.91 = 22.7104

OUTPUT:-

Exercise:-

	mpg	disp	hp	wt
Mazda RX4	21.0	160	110	2.620
Mazda RX4 Wag	21.0	160	110	2.875
Datsun 710	22.8	108	93	2.320
Hornet 4 Drive	21.4	258	110	3.215
Hornet Sportabout	18.7	360	175	3.440
Valiant	18.1	225	105	3.460Call:

lm(formula = mpg ~ disp + hp + wt, data = input)

Coefficients:

(Intercept)	disp	hp	wt
37.105505	-0.000937	-0.031157	-3.800891

The Coefficient Values # #

(Intercept)

37.10551

disp

-0.0009370091

hp

-0.03115655

wt

-3.800891

2. Consider the data set "delivery" available in the R environment. It gives a deliverytime ("delTime")of production materials(number of productions "n.prod") with the given distance("distance") to reach the destination place.

a)Create the model to establish the relationship between "delTime" as a response variable with "n.prod" and "distance" as predictor variables.

CODE:-

```
# Load the delivery data set
data("delivery")

# Fit the linear regression model
model <- lm(delTime ~ n.prod + distance, data = delivery)

# Summary of the model
summary(model)
```

OUTPUT:-

```
Call:
lm(formula = delTime ~ n.prod + distance, data = delivery)
```

```
Residuals:
    Min      1Q  Median      3Q     Max
-5.7880 -0.6629  0.4364  1.1566  7.4197

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 2.341231   1.096730   2.135 0.044170 *
n.prod      1.615907   0.170735   9.464 3.25e-09 ***
distance    0.014385   0.003613   3.981 0.000631 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.259 on 22 degrees of freedom
Multiple R-squared:  0.9596,  Adjusted R-squared:  0.9559
F-statistic: 261.2 on 2 and 22 DF,  p-value: 4.687e-16
```

b)Predict the delTime for the given number of production("n.prod")=9 and distance("distance")=450

CODE:-

```
# Predict delivery time for n.prod = 9 and distance = 450

newdata <- data.frame(n.prod = 9, distance = 450)

delTime_pred <- predict(model, newdata)

delTime_pred
```

OUTPUT:

```
1
23.35757
```

LOGISTIC REGRESSION ANALYSIS IN R

Exercise

1. Create a logistic regression model using the "mtcars" data set with the information given below.

The in-built data set "mtcars" describes different models of a car with their various engine specifications. In "mtcars" data set, the transmission mode (automatic or manual) is described by the column am which is a binary value (0 or 1). Create a logistic regression model between the columns

"am" and 3 other columns - hp, wt and cyl.

CODE:-

```
data("mtcars")

model <- glm(am ~ hp + wt + cyl, data = mtcars, family = binomial)

summary(model)
```

OUTPUT:-

```
Call:

glm(formula = am ~ hp + wt + cyl, family = binomial, data = mtcars)


Deviance Residuals:

      Min          1Q      Median          3Q         Max

-2.17272   -0.14907   -0.01464    0.14116    1.27641


Coefficients:

            Estimate Std. Error z value Pr(>|z|)

(Intercept) 19.70288    8.11637   2.428   0.0152 *

hp           0.03259    0.01886   1.728   0.0840 .

wt          -9.14947    4.15332  -2.203   0.0276 *

cyl          0.48760    1.07162   0.455   0.6491

---

Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1


(Dispersion parameter for binomial family taken to be 1)


    Null deviance: 43.2297  on 31  degrees of freedom
```

Residual deviance: 9.8415 on 28 degrees of freedom

AIC: 17.841

Number of Fisher Scoring iterations: 8

POISSON REGRESSION ANALYSIS IN R

Exercise :

1. Create a Poisson regression model using the in-built data set “warpbreaks” with information given below.

In-built data set "warpbreaks” describes the effect of wool type (A or B) and tension (low, medium or high) on the number of warp breaks per loom. Consider "breaks" as the response variable which is a count of number of breaks. The wool "type" and "tension" are taken as predictor variables.

CODE:-

```
require(stats); require(graphics)

summary(warpbreaks)

opar <- par(mfrow = c(1, 2), oma = c(0, 0, 1.1, 0))

plot(breaks ~ tension, data = warpbreaks, col = "lightgray",

     varwidth = TRUE, subset = wool == "A", main = "Wool A")

plot(breaks ~ tension, data = warpbreaks, col = "lightgray",

     varwidth = TRUE, subset = wool == "B", main = "Wool B")

mtext("warpbreaks data", side = 3, outer = TRUE)

par(opar)

summary(fm1 <- lm(breaks ~ wool*tension, data = warpbreaks))

anova(fm1)
```

OUTPUT:-

```
  breaks        wool    tension
```

```
 Min.   :10.00   A:27   L:18
 1st Qu.:18.25   B:27   M:18
 Median :26.00          H:18
 Mean   :28.15
 3rd Qu.:34.00
 Max.   :70.00
Call:
lm(formula = breaks ~ wool * tension, data = warpbreaks)


Residuals:
     Min       1Q   Median       3Q      Max
-19.5556  -6.8889  -0.6667   7.1944  25.4444


Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)        44.556      3.647  12.218 2.43e-16 ***
woolB             -16.333      5.157  -3.167 0.002677 **
tensionM          -20.556      5.157  -3.986 0.000228 ***
tensionH          -20.000      5.157  -3.878 0.000320 ***
woolB:tensionM     21.111      7.294   2.895 0.005698 **
woolB:tensionH     10.556      7.294   1.447 0.154327
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Residual standard error: 10.94 on 48 degrees of freedom

Multiple R-squared: 0.3778, Adjusted R-squared: 0.3129

F-statistic: 5.828 on 5 and 48 DF, p-value: 0.0002772

Analysis of Variance Table

Response: breaks

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
wool	1	450.7	450.67	3.7653	0.0582130	.
tension	2	2034.3	1017.13	8.4980	0.0006926	***
wool:tension	2	1002.8	501.39	4.1891	0.0210442	*
Residuals	48	5745.1	119.69			

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1