SAVEETHA SCHOOL OF ENGINEERING

SAVEETHA INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES

ITA 0443 - STATISTICS WITH R PROGRAMMING FOR REAL TIME PROBLEM

DAY 4– LAB MANUAL

Reg No:192110529

Name:N M S N V ARUN

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.

  programm:

```
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)
```

  output:

```
       1
76.22869
```

  > programm:

```
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)

> png(file = "linearregression.png")

> 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")

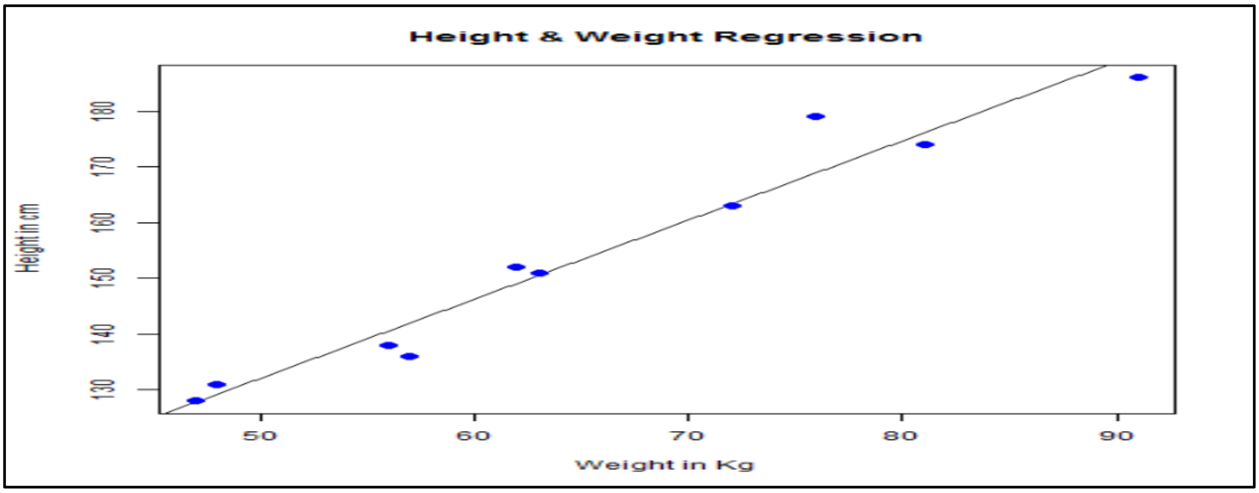
>

> 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:



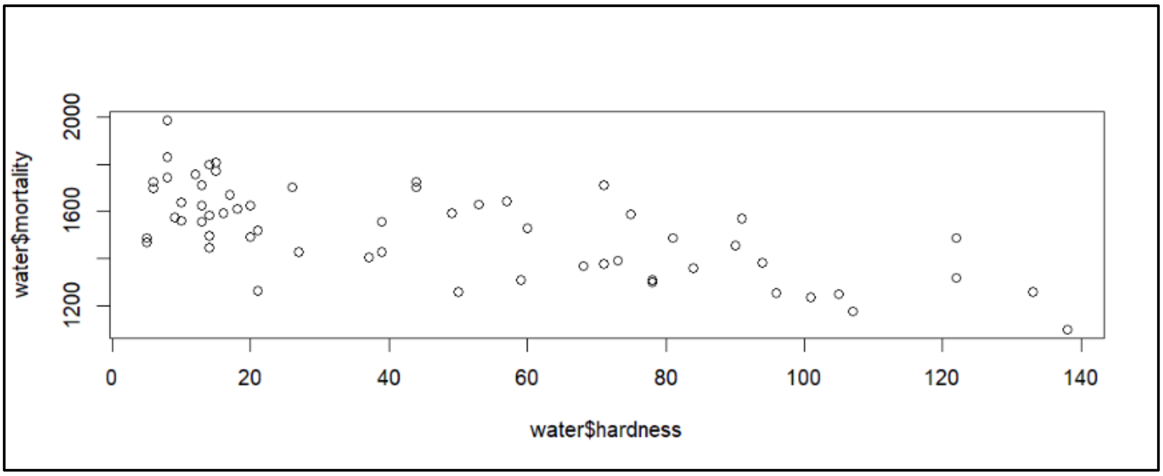
- Download the Dataset "water" From Rdataset Link.Find out whether there is a linear relation between attributes"mortality" and"hardness" by plot function.Fit the Data into the Linear Regression model.Predict the mortality for the hardness=88

programm:

data("water")

plot(water$hardness, water$mortality)

output:



programm:

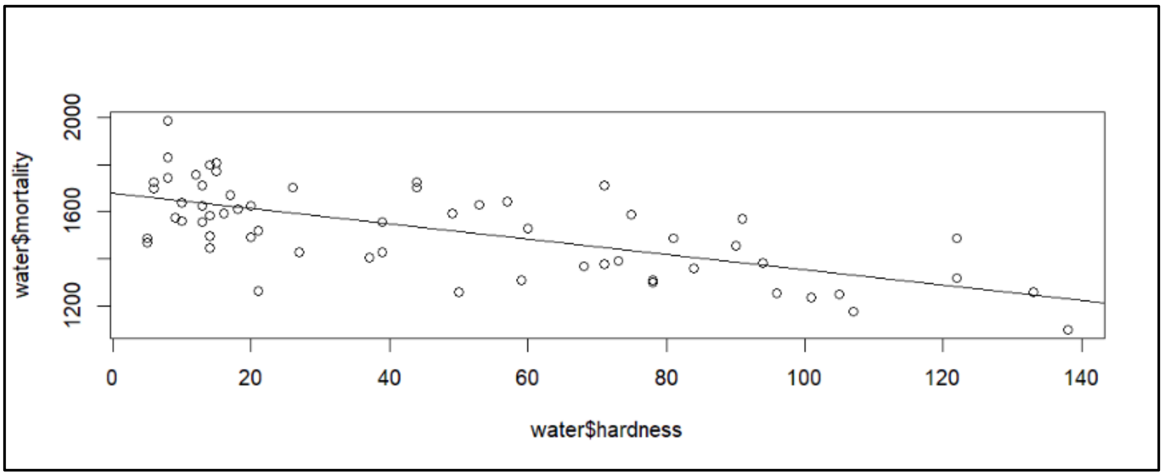
```
model <- lm(mortality ~ hardness, data = water)

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.

programm:

```
> data("mtcars")

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

> summary(model)


Call:

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


Residuals:

   Min     1Q Median     3Q    Max

-3.891 -1.640 -0.172  1.061  5.861


Coefficients:

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

(Intercept) 37.105505   2.110815  17.579  < 2e-16 ***

disp        -0.000937   0.010350  -0.091  0.92851

hp          -0.031157   0.011436  -2.724  0.01097 *

wt          -3.800891   1.066191  -3.565  0.00133 **

---

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


Residual standard error: 2.639 on 28 degrees of freedom

Multiple R-squared:  0.8268,   Adjusted R-squared:  0.8083

F-statistic: 44.57 on 3 and 28 DF,  p-value: 8.65e-11


>

> new_car <- data.frame(disp = 221, hp = 102, wt = 2.91)

> predict(model, newdata = new_car)
```

output:

```
       1
```

22.65987

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.

programm:

```
data("delivery")

model <- lm(delTime ~ n.prod + distance, data = delivery)

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

programm:

```
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.

programm:

```
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.

programm:

```
data("warpbreaks")

> model <- glm(breaks ~ wool + tension, data = warpbreaks, family = poisson)

> summary(model)
```

output:

```
Call:
glm(formula = breaks ~ wool + tension, family = poisson, data = warpbreaks)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-3.6871  -1.6503  -0.4269   1.1902   4.2616

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  3.69196    0.04541  81.302  < 2e-16 ***
woolB       -0.20599    0.05157  -3.994 6.49e-05 ***
tensionM    -0.32132    0.06027  -5.332 9.73e-08 ***
tensionH    -0.51849    0.06396  -8.107 5.21e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for poisson family taken to be 1)

    Null deviance: 297.37  on 53  degrees of freedom
Residual deviance: 210.39  on 50  degrees of freedom
AIC: 493.06
```

```
Number of Fisher Scoring iterations: 4
```