Exp. No : 7

Implementing Linear and Logistic Regression

a) Linear Regression

```
# Sample data
heights <- c(150, 160, 165, 170, 175, 180, 185)
weights <- c(55, 60, 62, 68, 70, 75, 80)

# Create a data frame
data <- data.frame(heights, weights)

# Fit a linear regression model
linear_model <- lm(weights ~ heights, data = data)

# Print the summary of the model
print(summary(linear_model))

# Plotting the data and regression line
plot(data$heights, data$weights,
    main = "Linear Regression: Weight vs. Height",
    xlab = "Height (cm)",
    ylab = "Weight (kg)",
    pch = 19, col = "blue")

# Add regression line
abline(linear_model, col = "red", lwd = 2)
```

Output:

```
Console   Terminal ×   Background Jobs ×
  R 4.4.1 · ~/
> source("D:/CSE Engg/Sem 7 Notes/GitHub/210701080-CS19P16-DA-Lab/Exp-7/Exp-7.R")

Call:
lm(formula = weights ~ heights, data = data)

Residuals:
     1       2       3       4       5       6       7
 1.7049 -0.4754 -2.0656  0.3443 -1.2459  0.1639  1.5738

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -54.40984    8.74376  -6.223  0.00157 **
heights       0.71803    0.05154  13.932 3.42e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.521 on 5 degrees of freedom
Multiple R-squared:  0.9749,    Adjusted R-squared:  0.9699
F-statistic: 194.1 on 1 and 5 DF,  p-value: 3.424e-05

>
```
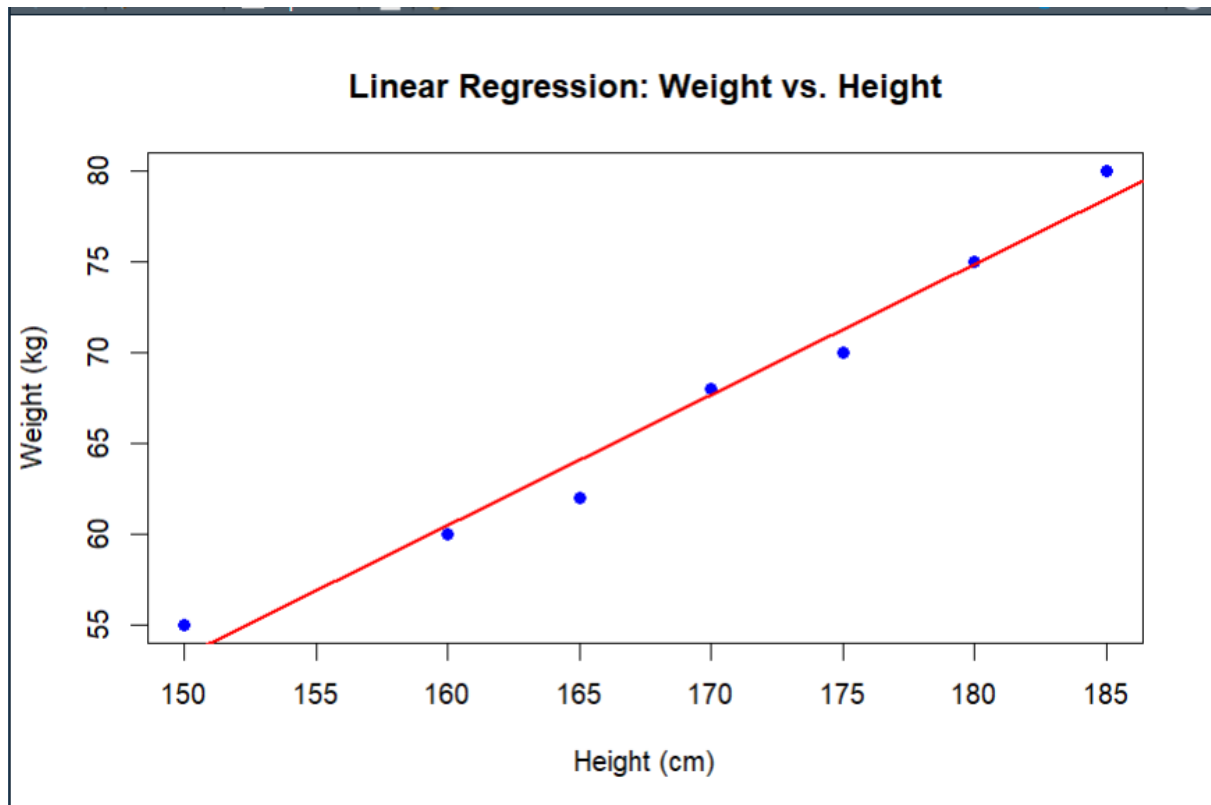

Linear Regression: Weight vs. Height

b) Logistic Regression

```
# Load the dataset
data(mtcars)
# Convert 'am' to a factor (categorical variable)
mtcars$am <- factor(mtcars$am, levels = c(0, 1), labels = c("Automatic", "Manual"))
# Fit a logistic regression model
logistic_model <- glm(am ~ mpg, data = mtcars, family = binomial)
# Print the summary of the model
print(summary(logistic_model))
# Predict probabilities for the logistic model
predicted_probs <- predict(logistic_model, type = "response")
# Display the predicted probabilities
print(predicted_probs)
# Plotting the data and logistic regression curve
plot(mtcars$mpg, as.numeric(mtcars$am) - 1,
main = "Logistic Regression: Transmission vs. MPG",
xlab = "Miles Per Gallon (mpg)",
ylab = "Probability of Manual Transmission",
pch = 19, col = "blue")
# Add the logistic regression curve
curve(predict(logistic_model, data.frame(mpg = x), type = "response"),
add = TRUE, col = "red", lwd = 2)
```

Output:

```
> source("D:/CSE Engg/Sem 7 Notes/GitHub/210701080-CS19P16-DA-Lab/Exp-7/Exp-7b.R")

Call:
glm(formula = am ~ mpg, family = binomial, data = mtcars)

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  -6.6035     2.3514  -2.808  0.00498 **
mpg           0.3070     0.1148   2.673  0.00751 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 43.230  on 31  degrees of freedom
Residual deviance: 29.675  on 30  degrees of freedom
AIC: 33.675

Number of Fisher Scoring iterations: 5

          Mazda RX4         Mazda RX4 Wag         Datsun 710       Hornet 4 Drive
         0.46109512            0.46109512         0.59789839           0.49171990
   Hornet Sportabout               Valiant         Duster 360            Merc 240D
         0.29690087            0.25993307         0.09858705           0.70846924
           Merc 230              Merc 280           Merc 280C            Merc 450SE
         0.59789839            0.32991148         0.24260966           0.17246396
          Merc 450SL            Merc 450SLC  Cadillac Fleetwood Lincoln Continental
         0.21552479            0.12601104         0.03197098           0.03197098
   Chrysler Imperial              Fiat 128         Honda Civic       Toyota Corolla
         0.11005178            0.96591395         0.93878132           0.97821971
       Toyota Corona       Dodge Challenger          AMC Javelin          Camaro Z28
         0.49939484            0.13650937         0.12601104           0.07446438
     Pontiac Firebird             Fiat X1-9        Porsche 914-2         Lotus Europa
         0.32991148            0.85549212         0.79886349           0.93878132
       Ford Pantera L          Ferrari Dino        Maserati Bora           Volvo 142E
         0.14773451            0.36468861         0.11940215           0.49171990
```