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Essential of Data Analytics
Tasks for Week-9: Gradient Descent algorithm

Aim: Understand the following operations/functions on 'Mtcars' data.

Algorithm:

- removing all the values from the global environment.
- Create a function named gd with the parameters of x, y, m, c, alpha, com_thr, iter.
- Create and initialize the variable iterations with 0.
- Create and initialize the variable Lf with 0.
- Start the while loop with condition that if the iterations value should be less than iter.
- Create a variable name y_p and assignee value as m*x-c.
- Create a new variable named Lf_new and assignee value of 0.5*(sum(y_p-y)^2).
- Create a new variable called m and assignee the value with m-alpha*sum((y_p-y)*x). it can be n number of m's because if the system has one independent variable then we will have one m value or else we have m's values according to the no of independent variable we use.
- Create a new variable called c and assignee the value with c-alpha*sum(y_p-y).
- There will be use of an condition now if the absolute difference of Lf and Lf_new is less or equal to conv_thr then we break the while loop and return optimal intercept and optimal slop values.
- Store the dataset of mtcars in data variable.
- Call the function gd and give the input variables in this way (data$wt, data$mpg, -0.2,32, 0.001, 0.0001, 1000).
- Plot the data$wt and data$mpg and later find the lm values using lm function or these 2 variables.

Result:

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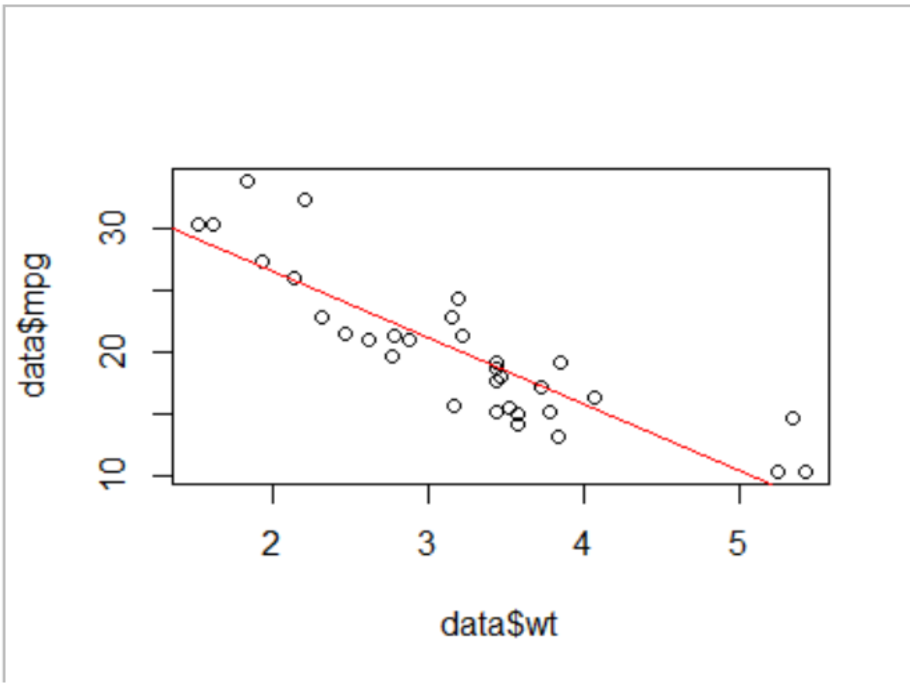
Dataset: mtcars:

One independent and one dependent variable:



Inference:

Dataset: mtcars:

One independent and one dependent variable:

The values of the gradient decent are almost similar to Linear Regression model so the gradient decent can be acceptable.

Two independent and one dependent variable:

The values of the gradient decent are almost similar to Linear Regression model so the gradient decent can be acceptable.

Statistics:

Dataset: mtcars:

One independent and one dependent variable:

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Gradient decent:

Optimal Intercept 36.7393256646, Optimal slop -5.187718039126

Linear Regression:

(Intercept)	data$wt
37.285	-5.344

Two independent and one dependent variable:

Gradient decent:

Optimal Intercept 31.7905329118 Optimal slop one -4.92233682447 Optimal slop two 1.15226031532

Linear Regression:

(Intercept)	data$wt	data$drat
30.290	-4.783	1.442

Code:

One independent and one dependent variable:

```
rm(list=ls())


gd<- function(x,y,m,c,alpha,conv_thr,iter){
  iterations<-0
  Lf<-0
  while(iterations<=iter){
    y_p=m*x+c
    Lf_new<-0.5*sum(y_p-y)^2
    m=m-alpha*sum((y_p-y)*x)
    c=c-alpha*sum(y_p-y)
    if(abs(Lf-Lf_new)<=conv_thr){
```

```
    break
   }
   Lf=Lf_new
   iterations=iterations+1
  }
  return(paste("Optimal Intercept ",c,"Optimal slop ",m))
}

data<-mtcars
gd(data$wt,data$mpg,-0.2,32,0.001,0.0001,1000)
plot(data$wt,data$mpg)
reg<-lm(data$mpg~data$wt)
reg
abline(reg,col='red')
```

Two independent and one dependent variable:

```
rm(list=ls())

gd1<- function(x1,x2,y,m1,m2,c,alpha,conv_thr,iter){
  iterations<-0
  Lf<-0
  while(iterations<=iter){
   y_p=m1*x1+m2*x2+c
   Lf_new<-0.5*sum(y_p-y)^2
   m1=m1-alpha*sum((y_p-y)*x1)
   m2=m2-alpha*sum((y_p-y)*x2)
```

```
    c=c-alpha*sum(y_p-y)
    if(abs(Lf-Lf_new)<=conv_thr){
      break
    }
    Lf=Lf_new
    iterations=iterations+1
  }
  return(paste("Optimal Intercept ",c,"Optimal slop one ",m1,"Optimal slop two ",m2))
}

data<-mtcars
view(data)
gd1(data$wt,data$drat,data$mpg,-0.2,-0.4,32,0.001,0.00001,10000)
reg1<-lm(data$mpg~(data$wt+data$drat))
reg1
```