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**19BCE1311**

**CSE3506 – ESSENTIALS OF DATA ANALYTICS LAB-9**

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**Tasks for Week-9: Gradient Descent**

**Aim:** To obtain the value of a and b for y= ax + b using gradient descent method.

**Algorithm:**

**Step 1:** Initialize the weights (a & b) with random values and calculate the loss function.

**Step 2:** Calculate the gradient. This helps us move the values of a & b in the direction in which loss function is minimized.

**Step 3:** Adjust the weights with the gradients to reach the optimal values where loss function is minimized.

**Step 4:** Use the new weights for prediction and to calculate the new loss function.

**Step 5:** Repeat steps 2 and 3 till further adjustments to weights don’t significantly reduce the Error.

**STATISTICS:**

**Values using Gradient Descent:**

|  |  |
| --- | --- |
| FIELD | VALUE |
| Optimum Slope | -5.33401243341807 |
| Optimum Intercept | 37.2487084651956 |
| Number of iterations | 580 |
| Loss function | 0.00411973531571587 |

**Values using Linear Regression:**

|  |  |
| --- | --- |
| FIELD | VALUE |
| Intercept | 37.285 |
| Slope | -5.344 |

**RESULT:**

We can observe that slope and intercept obtained using gradient descent method is almost equal to the values obtained using Linear Regression. Therefore, we have successfully calculated the values of m and c for y= mx + c.

**INFERENCE:**

Hence, we have obtained the optimal value of the weights m and c.

**Program:**

rm(list=ls())

gd<-function(x,y,m,c,alpha,conv\_thr,iter){

iterations=0

Lf=0

while(iterations<=iter){

y\_pred=m\*x+c

Lf\_new=0.5\*(sum(y\_pred-y)^2)

m=m-alpha\*sum((y\_pred-y)\*x)

c=c-alpha\*sum(y\_pred-y)

if(abs(Lf-Lf\_new)<conv\_thr){

break;

}

Lf=Lf\_new

iterations=iterations+1

}

return(paste('Optimum Slope',m,"Optimum Intercept",c,"Number of iterations",iterations,"Loss function",Lf))

}

data<-mtcars

gd(data$wt,data$mpg,32,-0.2,0.005,0.0001,10000)

reg<-lm(data$mpg~data$wt)

reg