Untitled

a

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We use the derivative:

$$\begin{pmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \\ y_6 \\ y_7 \\ y_8 \end{pmatrix} = \underbrace{\begin{pmatrix} 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}}_{\text{Design Matrix,}\mathbf{X}} \begin{pmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_4 \end{pmatrix} + \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \\ \varepsilon_7 \\ \varepsilon_8 \end{pmatrix}$$

```r
x1=iris$Petal.Width
x2=iris$Sepal.Width
y=iris$Sepal.Length
b0=4
b1=0.5
b2=0
learning=0.001
for(i in 1:1000000){
  y_predicted=b0+b1*x1+b2*x2
  b0_gradient=-2/length(x1)*sum((y-y_predicted))
  b1_gradient=-2/length(x1)*sum((y-y_predicted)*x1)
  b2_gradient=-2/length(x2)*sum((y-y_predicted)*x2)
  b0=b0-b0_gradient*learning
  b1=b1-b1_gradient*learning
  b2=b2-b2_gradient*learning
}
c(b0,b1,b2)
```

```
## [1] 3.4573334 0.9721296 0.3990708
```

```r
lm(iris$Sepal.Length~iris$Petal.Width+iris$Sepal.Width)
```

```
##
## Call:
## lm(formula = iris$Sepal.Length ~ iris$Petal.Width + iris$Sepal.Width)
##
## Coefficients:
##      (Intercept)  iris$Petal.Width  iris$Sepal.Width
##           3.4573            0.9721            0.3991
```