

Weighted Linear Regression

```
> Fluo.Matrix = matrix( c(
4,22,44,60,75,104,
3,20,46,63,81,109,
4,21,45,60,79,107,
5,22,44,63,78,101,
4,21,44,63,77,105), byrow=T,ncol=6)
> Fluo.Matrix
      [,1] [,2] [,3] [,4] [,5] [,6]
[1,]    4   22   44   60   75  104
[2,]    3   20   46   63   81  109
[3,]    4   21   45   60   79  107
[4,]    5   22   44   63   78  101
[5,]    4   21   44   63   77  105
>
```

Compute the mean and standard deviation for each column.

```
> apply(Fluo.Matrix,2,mean)
[1] 4.0 21.2 44.6 61.8 78.0 105.2
> apply(Fluo.Matrix,2,sd)
[1] 0.7071068 0.8366600 0.8944272 1.6431677 2.2360680 3.0331502
```

Fitting a linear model based on the full data

```
> Fit2 = lm(Fluo.M ~ Conc.M)
> summary(Fit2)

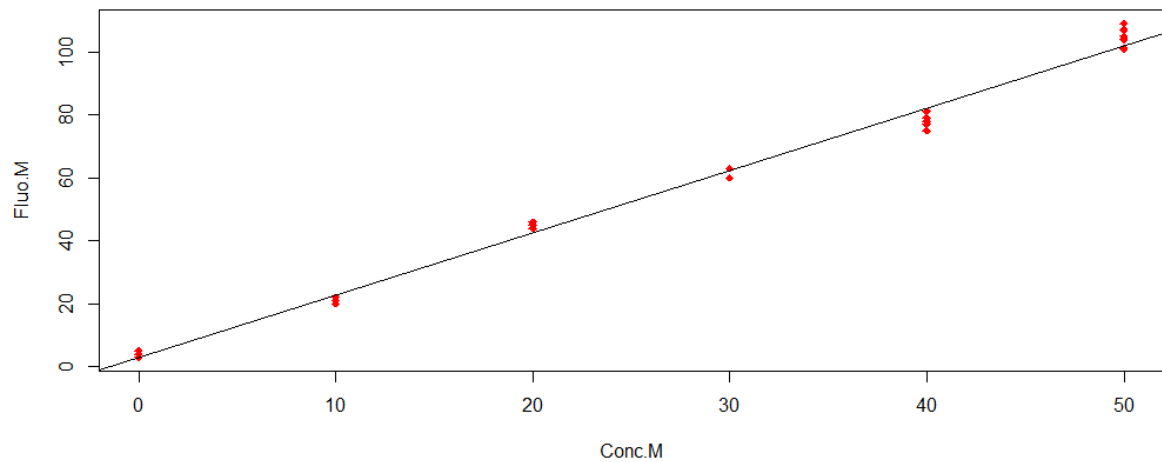
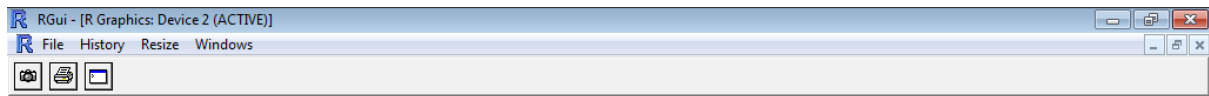
Call:
lm(formula = Fluo.M ~ Conc.M)

Residuals:
    Min       1Q   Median       3Q      Max
-7.1924 -1.7410  0.6248  1.4419  6.9905

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.92381    0.97589   2.996  0.00567 **
Conc.M       1.98171    0.03223  61.482 < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.015 on 28 degrees of freedom
Multiple R-squared:  0.9926,    Adjusted R-squared:  0.9924
F-statistic: 3780 on 1 and 28 DF,  p-value: < 2.2e-16

> plot(Conc.M,Fluo.M,pch=18,col="red")
> abline(coef(Fit2))
```



```
> summary(Fit3)

Call:
lm(formula = Fluo.mean ~ Conc, weights = weights)

Residuals:
    1      2      3      4      5      6 
0.7772 -2.4187  2.1963 -0.3705 -1.8963  1.2426 

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  3.48066    1.15736   3.007  0.0397 *
Conc         1.96315    0.06765  29.018  8.4e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.034 on 4 degrees of freedom
Multiple R-squared:  0.9953,    Adjusted R-squared:  0.9941 
F-statistic: 842 on 1 and 4 DF,  p-value: 8.396e-06
```

The Regression Equation for the Weighted Regression Model is

$$\text{Abso.fitted} = 3.48 + 1.96 \text{ Conc}$$

Both terms are significant (*) and (***) respectively.