R Lab 13. Nonlinear Regression

Here we fit a nonlinear regression model predicting miles per gallon of a car as a nonlinear function of the weight and the number of cylinders

$$Mpg = b_0 + b_1 e^{b2(wt) + cyl} + \varepsilon$$

```
> attach(mtcars)
> NL = nls( log(mpg) ~ b0+b1*exp(b2*wt+cyl), data=mtcars, start=list(b0=1,b1=1,b2=1) )
> NL

Nonlinear regression model
  model: log(mpg) ~ b0 + b1 * exp(b2 * wt + cyl)
   data: mtcars
       b0        b1        b2
3.1877790 -0.0000512  0.2889503
 residual sum-of-squares: 0.7844

Number of iterations to convergence: 9
Achieved convergence tolerance: 3.577e-07
```

 # Parameter estimates are b_0=3.2, b_1=-0.00005, b_2=0.29.
 # SSErr = 0.7844; the algorithm converged after 9 iterations; the distance between
 # successive parameter estimates in this algorithm achieved 0.0000003577.
 # Summary below tests significance of slopes. Predicted values, as always, by "predict"

```
> summary(NL)

Formula: log(mpg) ~ b0 + b1 * exp(b2 * wt + cyl)

Parameters:
    Estimate Std. Error t value Pr(>|t|)
b0  3.188e+00  4.136e-02  77.069   <2e-16 ***
b1 -5.120e-05  2.545e-05  -2.012   0.0536 .
b2  2.890e-01  1.053e-01   2.744   0.0103 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1645 on 29 degrees of freedom
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```
> Yhat = predict(NL)
```