

TP 3 : Polynomial Regression

The dataset to be used is called “Pressure” and comes as a default dataset in R. Each row is an observation that provides relation of pressure against temperature. It looks like this:

```
##   temperature pressure
## 1           0  0.0002
## 2          20  0.0012
## 3          40  0.0060
## 4          60  0.0300
## 5          80  0.0900
## 6         100  0.2700
```

The input is the temperature and the output is the pressure.

- 1- Visualize the graph relating the pressure to the temperature.
- 2- What can you notice from the graph?
- 3- Use linear regression model to capture the relationship between the inputs and the outputs of the data. Then, return the empirical error $L_S(h_{reg})$.
- 4- Visualize linear model in the constructed graph.
- 5- Comment your result.
- 6- Now, fit the data with polynomial regression model. Try different polynomial orders ($Q = 2, 3, 4$), and in each time compute the empirical error $L_S(h_{poly})$.
- 7- Draw the different polynomial regression models in the same graph. What do you notice?
- 8- Compare the result of the best polynomial regression model with the linear regression model. What is the best model?
- 9- For the best model, let's run it using these learning rates (0.1; 0.2; ... ; 1). For each case give:
 - The number of iterations.
 - The empirical error.
- 10- Comment your results.