**Practice #10: Machine Learning II**

**Objectives:**

* + Get use to numpy array
  + Make our first linear and polynomial regressions

**Steps:**

1. **Getting use to numpy array**

*In this step, you will use and modify some numpy array.*

* Create two numpy arrays from the following lists:

|  |  |
| --- | --- |
| **X1** | **Y** |
| 6 | 130 |
| 10 | 21 |
| 2 | 43 |
| 3 | 76 |
| 4 | 105 |
| 0 | 3 |
| 7 | 167 |
| 8 | 162 |
| 9 | 91 |
| 1 | 15 |

* Transform them into one column arrays with the .reshape() function (final shape should be (10,1))
* Create two other arrays with the same shape:
  + X2: which is the square of every item of X1
  + X3: which is every item of X1 power 3
* Print the four arrays

1. **The linear regression**

*You will now be able to calculate the link between X1 and Y with a linear regression.*

* Create a linear regression model between X1 and Y
* Train the model
* Print the coeff (weight w1), the intercept (b) and the R² (R² is the accuracy of your model, closer of 1, more accurate is your model) of the model (use .intercept\_, coef\_ and score() function).
* Write the equation

1. **The polynomial regression**

*You will now be able to calculate the link between X1 and Y with a polynomial regression.*

* By using X1, X2, X3 (from step 1) make two models (check the np.hstack() function to create the array for training your models):
  + One with a polynomial regression of degree two
  + One with a polynomial regression of degree three
* Print the coeffs (weights w1, w2 and w3 (if exist)), the intercept (b) and the R² of these models.
* Write the equation

1. **The graphics**

*You can now draw a graph with all these data.*

* Make a plot with:
  + The original data (scatter plot)
  + The linear regression (line plot)
  + The two polynomial models (line plots)