Premier modèle IA

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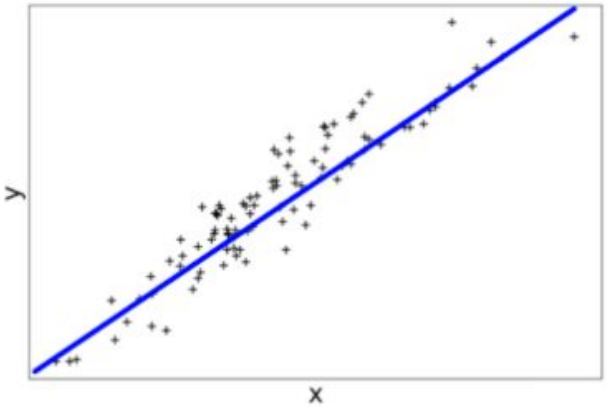
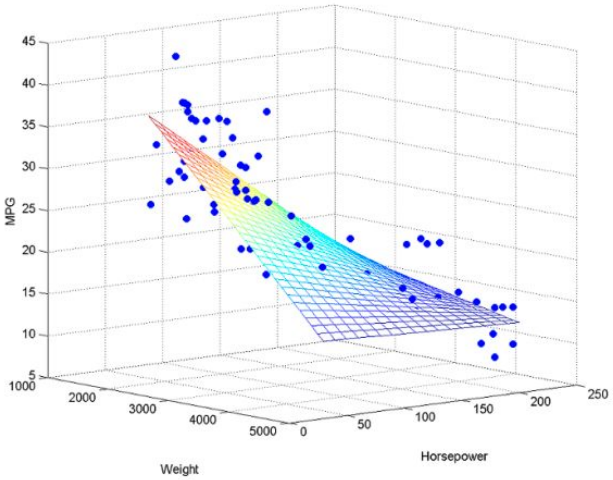
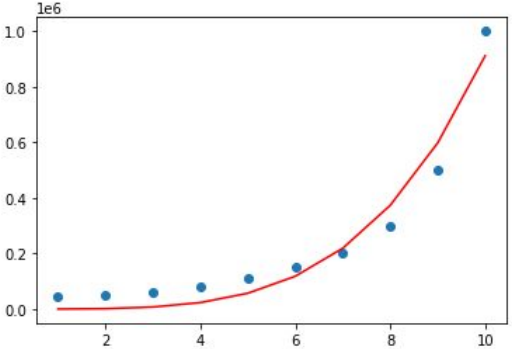
Rappel régression linéaire simple, multiple et polynomiale


y
x


MPG
45
40
35
30
25
20
15
10
5
1000
2000
3000
4000
5000
Weight
0
50
100
150
200
250
Horsepower


1e6
1.0
0.8
0.6
0.4
0.2
0.0
2
4
6
8
10

Les diverses fonctions

Model

$$f(x) = a\,x + b$$

$$F = X \cdot \Theta$$

$$\underset{m \times 1}{\begin{bmatrix} f(x^{(1)}) \\ f(x^{(2)}) \\ \vdots \\ f(x^{(m)}) \end{bmatrix}} = \underset{m \times 2}{\begin{bmatrix} x^{(1)} & 1 \\ \vdots & \vdots \\ x^{(m)} & 1 \end{bmatrix}} \cdot \underset{2 \times 1}{\begin{bmatrix} a \\ b \end{bmatrix}}$$

```python
def model(X, theta):
    return X.dot(theta)
```

Fonction coût

$$J(\theta) = \frac{1}{2m} \sum (X\theta - Y)^2$$

```
def fonction_cout(X, y, theta):
    m = len(y)
    return 1/(2*m) * np.sum((model(X, theta) - y)**2)
```

Gradient

$$\frac{\partial J(\theta)}{\partial \theta} = \frac{1}{m} X^T (X\theta - Y)$$

```
def gradient(X,y,theta):
    m = len(y)
    return 1/m * X.T.dot(model(X, theta) - y)
```

Descente de Gradient

$$\theta = \theta - \alpha \frac{\partial J}{\partial \theta}$$

```python
def descente_gradient(X,y,theta,alpha,n_iterations):
    cost = np.zeros(n_iterations)
    for i in range(n_iterations):
        theta = theta - alpha * gradient(X, y, theta)
        cost[i] = fonction_cout(X, y, theta)
    return theta, cost
```

Coefficient de détermination

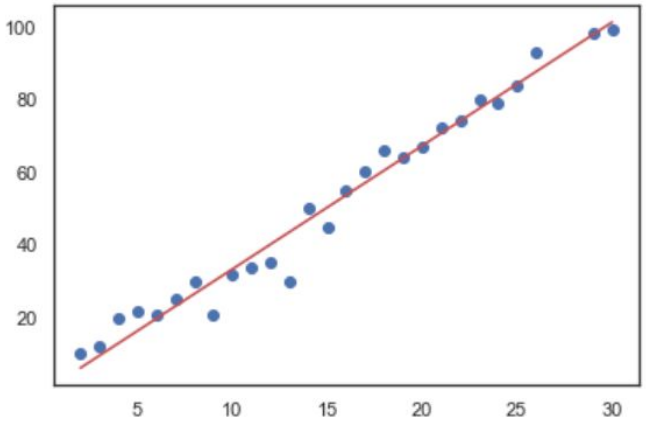
$$R^2 = 1 - \frac{\sum(y - f(x))^2}{\sum(y - \bar{y})^2}$$

```python
def coef_determination(X, y, theta):
    return 1 - ((y - model(X, theta))**2).sum() / ((y - y.mean())**2).sum()
```

Résultats des modèles

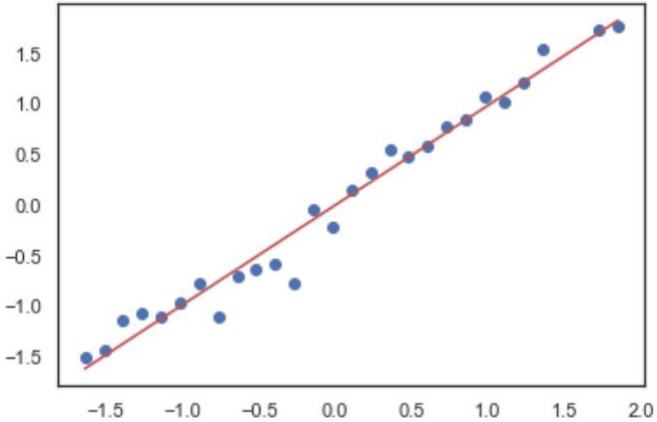
Régression linéaire

Sans Scikit-Learn



Score: 0.9729

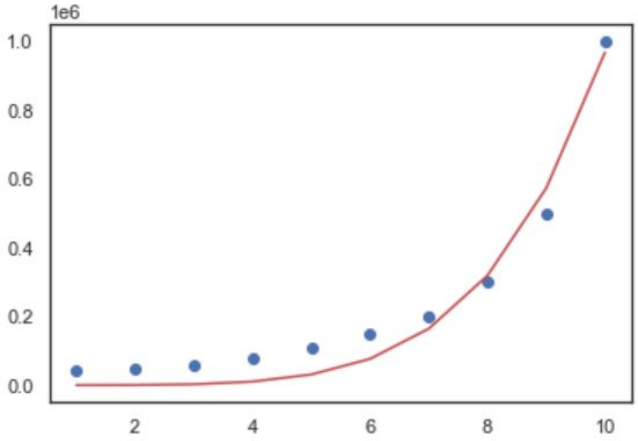
Avec Scikit-Learn



Score: 0.9733

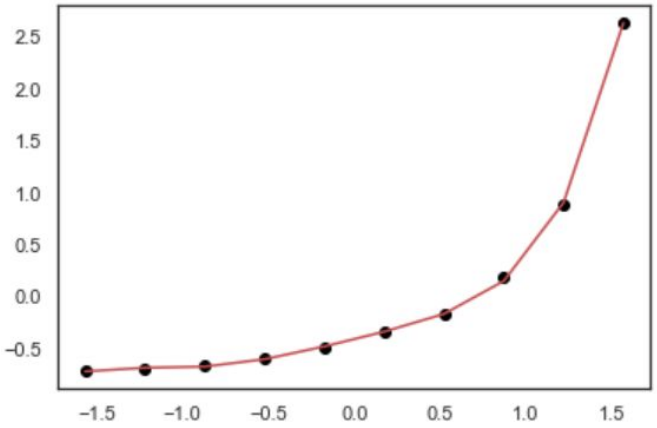
Régression polynomiale

Sans Scikit-Learn



Score: 0.9598

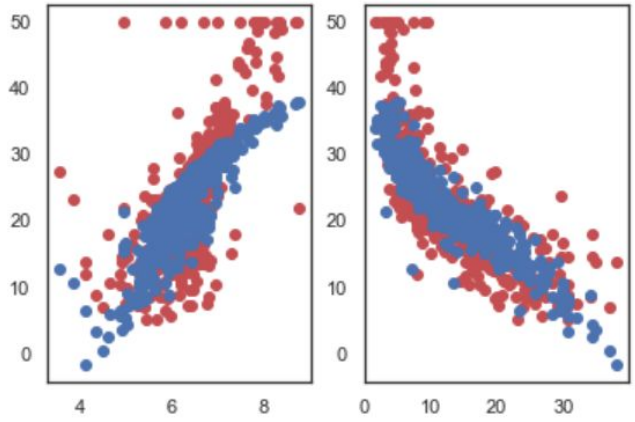
Avec Scikit-Learn



Score: 0.9997

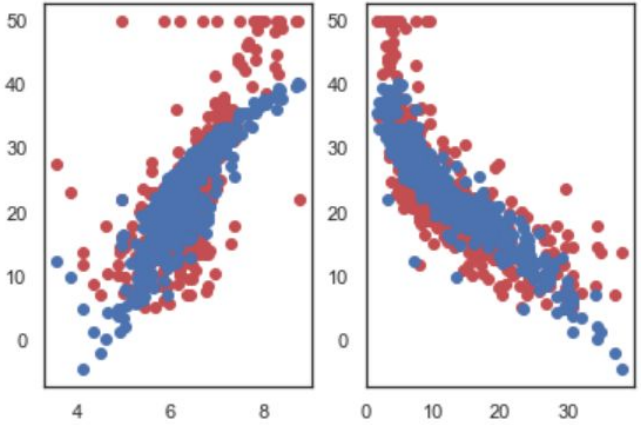
Régression multiple

Sans Scikit-Learn



Score: 0.6282

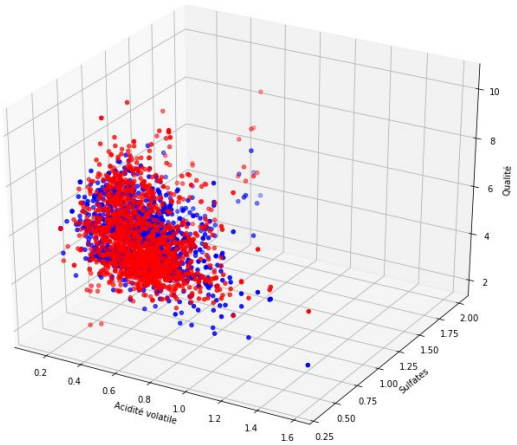
Avec Scikit-Learn



Score: 0.6385

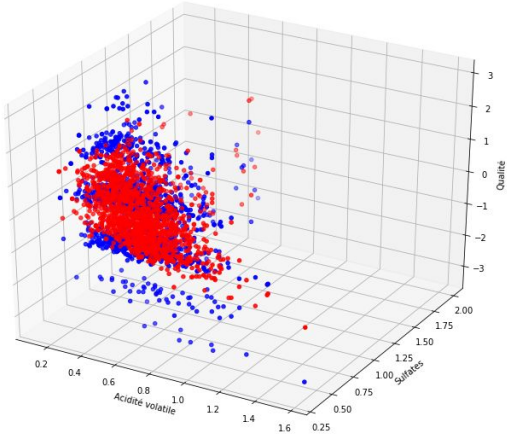
Régression multiple (vins)

Sans Scikit-Learn



Score: -0.65(?)

Avec Scikit-Learn



Score: 0.36

Conclusion