

# Big Data Analytics

Gradient de l'erreur

---

# Gradient et mise à jour

$$y = a.x + b$$

$$E_{\Omega} = \frac{1}{2n} \sum_{i=[1..n]} (\hat{y}_i - y_i)^2$$

$$E_{\Omega} = \frac{1}{2n} \sum_{i=[1..n]} (\hat{y}_i - (a.x_i + b))^2$$

...

$$\frac{\partial E_{\Omega}}{\partial a} = \frac{1}{n} \sum_{i=[1..n]} (a.x_i + b - \hat{y}_i).x_i$$

$$\frac{\partial E_{\Omega}}{\partial b} = \frac{1}{n} \sum_{i=[1..n]} (a.x_i + b - \hat{y}_i)$$

$$U^2' = 2U' * U$$

**M.A.J :**

$$a \leftarrow a - \gamma \cdot \frac{\partial E_{\Omega}}{\partial a}$$

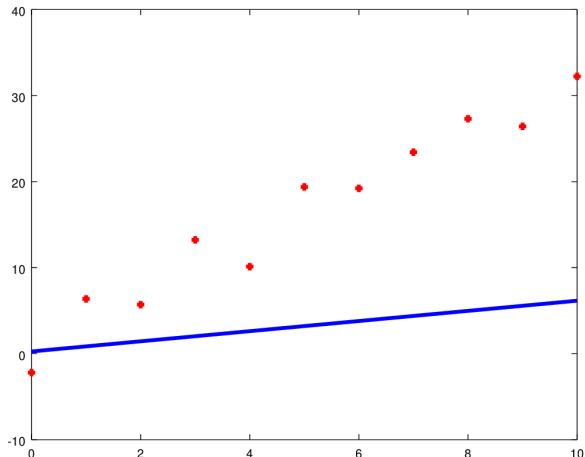
$$b \leftarrow b - \gamma \cdot \frac{\partial E_{\Omega}}{\partial b}$$

où  $1 > \gamma > 0$  (learning rate)

# Gradient et mise à jour

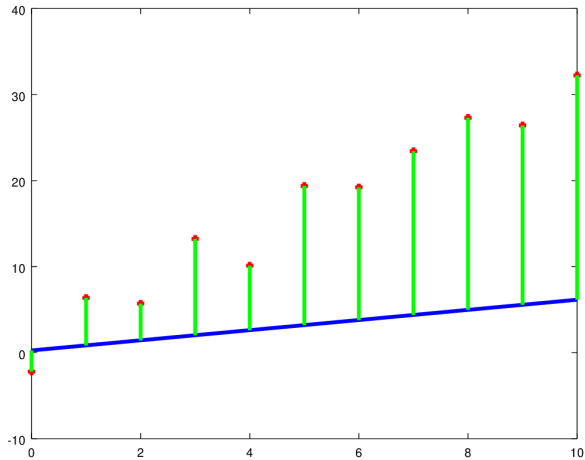
initialisation au hasard (  $\gamma = 0.01$  )

- $a = 0.58$  ( $\hat{a} = 3.0$ )
- $b = 0.25$  ( $\hat{b} = 0.5$ )



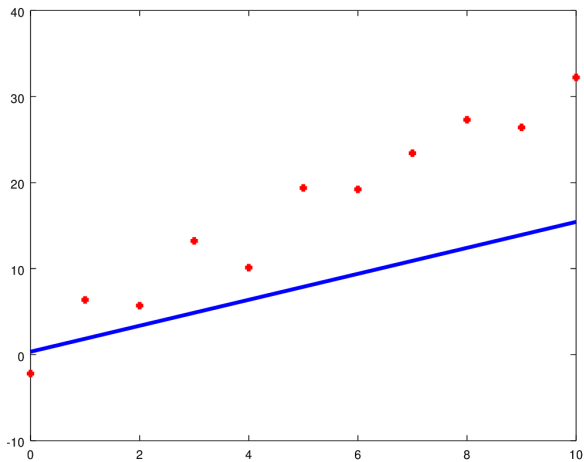
# Gradient et mise à jour

- $a = 0.58$  ( $\hat{a} = 3.0$ )
- $b = 0.25$  ( $\hat{b} = 0.5$ )



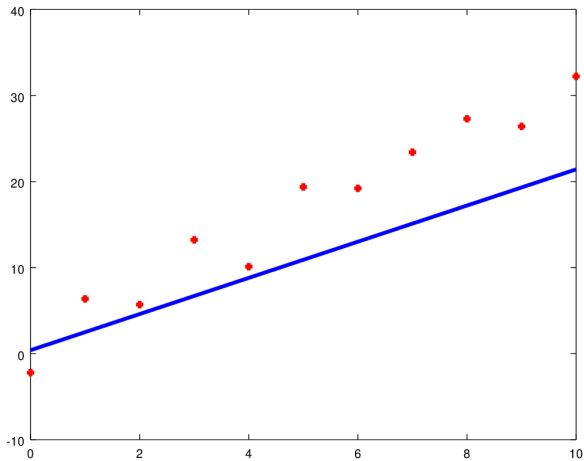
# Gradient et mise à jour

- $a = 1.50$  ( $\hat{a} = 3.0$ )
- $b = 0.35$  ( $\hat{b} = 0.5$ )



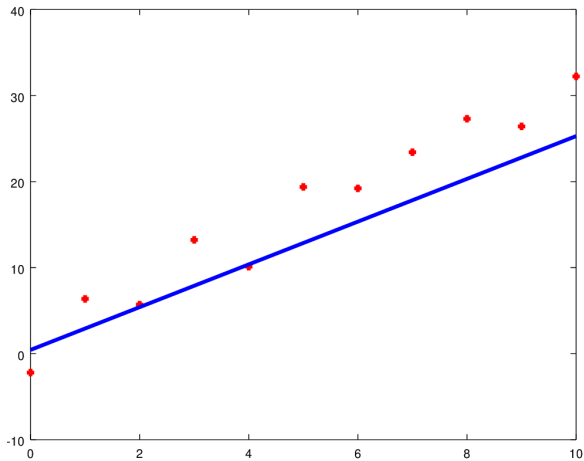
# Gradient et mise à jour

- $a = 2.10$  ( $\hat{a} = 3.0$ )
- $b = 0.40$  ( $\hat{b} = 0.5$ )



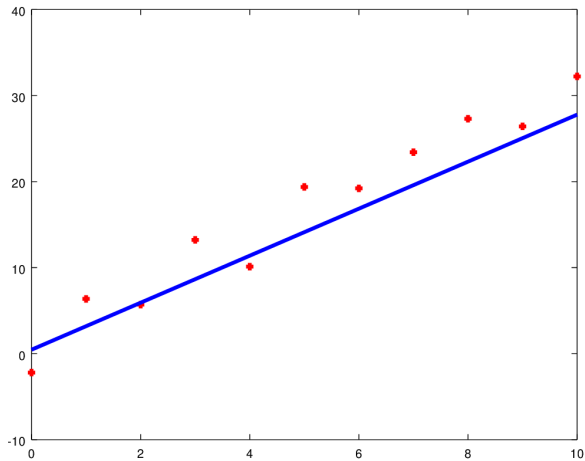
# Gradient et mise à jour

- $a = 2.48$  ( $\hat{a} = 3.0$ )
- $b = 0.43$  ( $\hat{b} = 0.5$ )



# Gradient et mise à jour

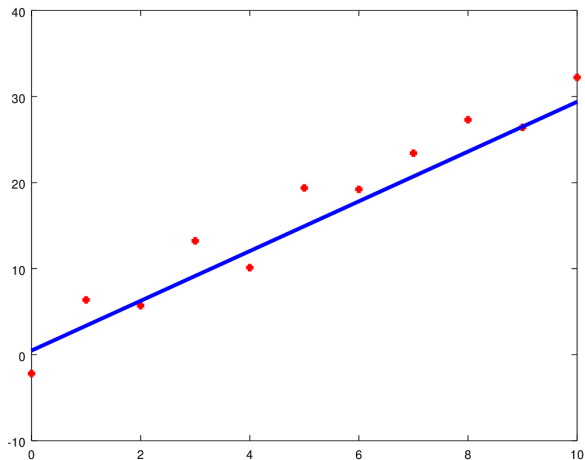
- $a = 2.73$  ( $\hat{a} = 3.0$ )
- $b = 0.46$  ( $\hat{b} = 0.5$ )





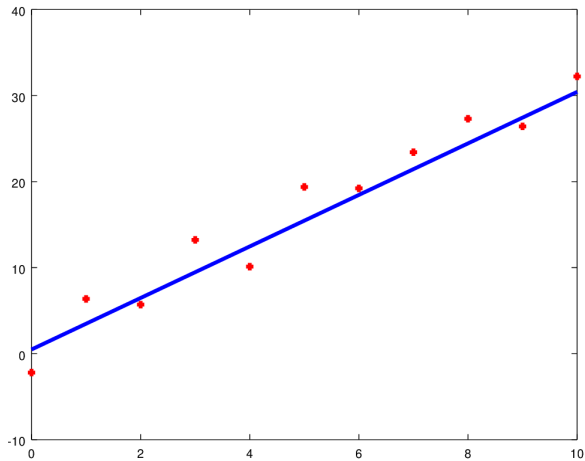
# Gradient et mise à jour

- $a = 2.89$  ( $\hat{a} = 3.0$ )
- $b = 0.47$  ( $\hat{b} = 0.5$ )



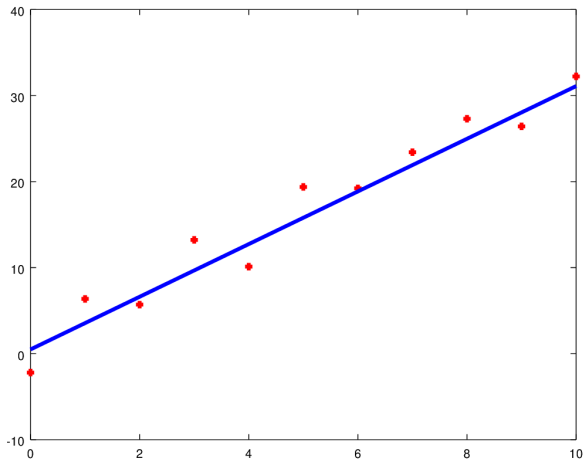
# Gradient et mise à jour

- $a = 2.99$  ( $\hat{a} = 3.0$ )
- $b = 0.48$  ( $\hat{b} = 0.5$ )



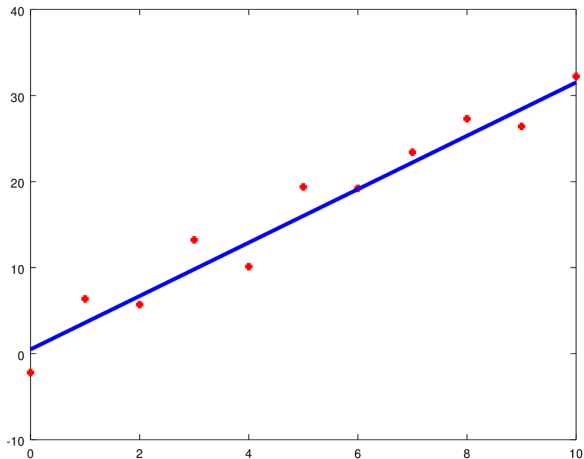
# Gradient et mise à jour

- $a = 3.06$  ( $\hat{a} = 3.0$ )
- $b = 0.49$  ( $\hat{b} = 0.5$ )



# Gradient et mise à jour

- $a = 3.10$  ( $\hat{a} = 3.0$ )
- $b = 0.49$  ( $\hat{b} = 0.5$ )



# Gradient et mise à jour

- $a = 3.13$  ( $\hat{a} = 3.0$ )
- $b = 0.50$  ( $\hat{b} = 0.5$ )

