



deeplearning.ai

# Optimization Algorithms

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## Exponentially weighted averages

# Temperature in London

$$\theta_1 = 40^\circ\text{F} \quad 4^\circ\text{C} \quad \leftarrow$$

$$\theta_2 = 49^\circ\text{F} \quad 9^\circ\text{C}$$

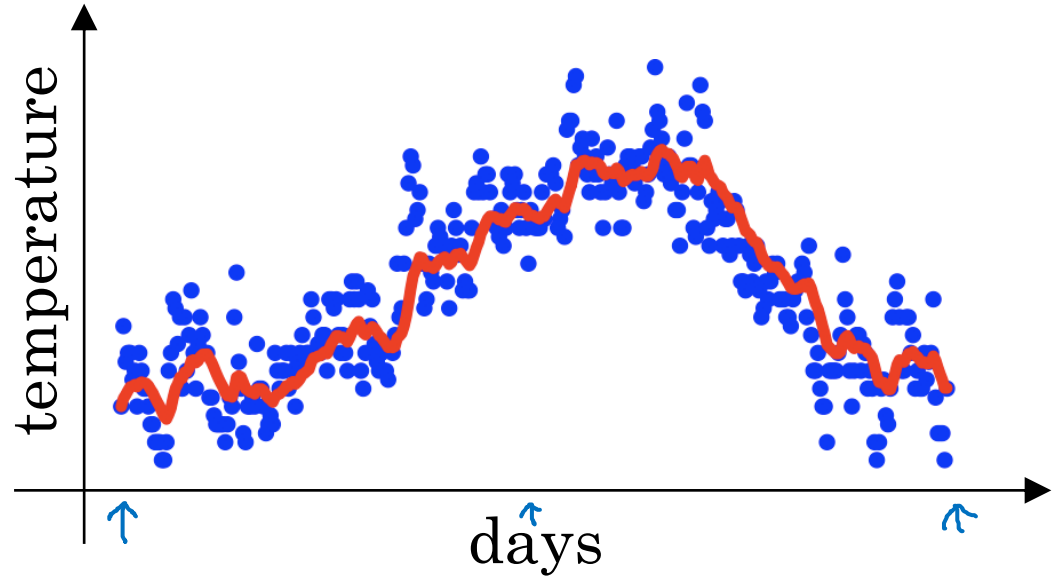
$$\theta_3 = 45^\circ\text{F} \quad \vdots$$

$\vdots$

$$\theta_{180} = 60^\circ\text{F} \quad 15^\circ\text{C}$$

$$\theta_{181} = 56^\circ\text{F} \quad \vdots$$

$\vdots$



$$V_0 = 0$$

$$V_1 = 0.9 V_0 + 0.1 \theta_1$$

$$V_2 = 0.9 V_1 + 0.1 \theta_2$$

$$V_3 = 0.9 V_2 + 0.1 \theta_3$$

$\vdots$

$$V_t = 0.9 V_{t-1} + 0.1 \theta_t$$

# Exponentially weighted averages <sup>moving</sup>

$$V_t = \beta V_{t-1} + (1-\beta) \theta_t \leftarrow$$

$\beta = 0.9$  :  $\approx 10$  days' temperature.

$\beta = 0.98$  :  $\approx 50$  days

$\beta = 0.5$  :  $\approx 2$  days

$V_t$  is approximately  
average over  
 $\rightarrow \approx \frac{1}{1-\beta}$  days' temperature.

$$\frac{1}{1-0.98} = 50$$

