

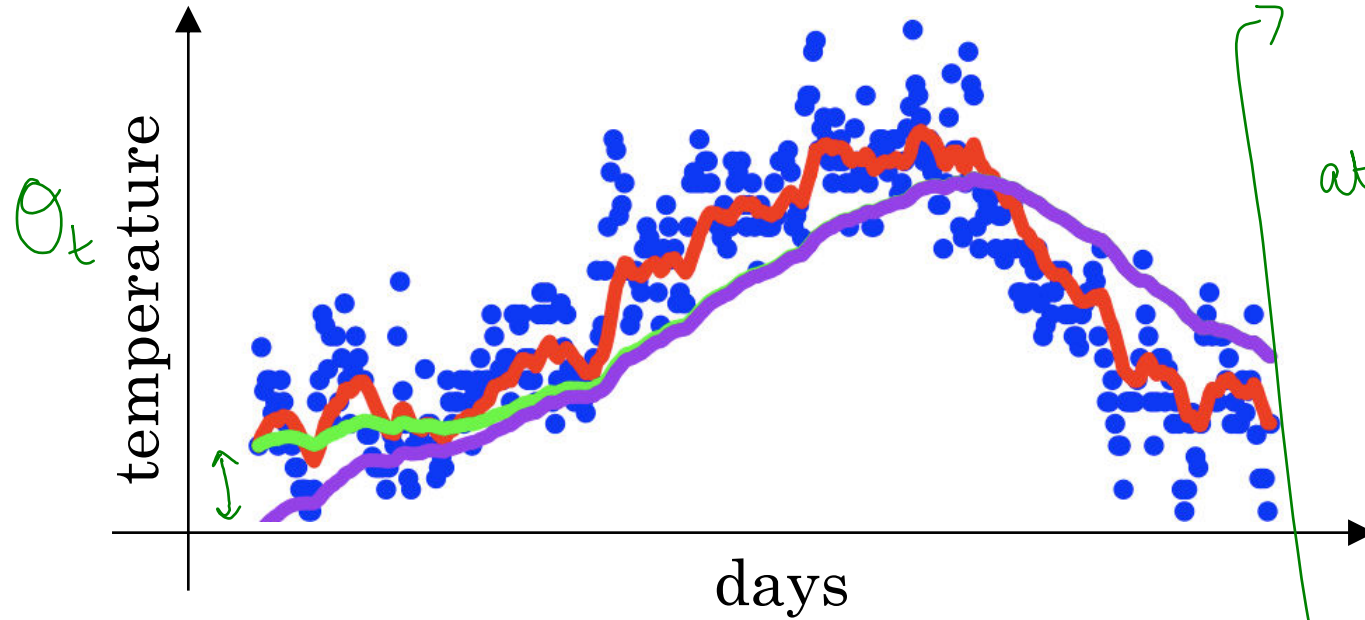


deeplearning.ai

Optimization Algorithms

Bias correction
in exponentially
weighted average

Bias correction



$$v_t = \beta v_{t-1} + (1 - \beta)\theta_t$$

- When $\beta = 0.98$, we agreed that we would get the green curve
- But in reality, we actually get the purple curve

Why?

we started $v_0 = 0$ [This is why]

$$v_1 = 0.98 v_0 + 0.02 \theta_1 = 0.02 \theta_1 \text{ [So we eliminate our highest weight]}$$

$$v_2 = 0.98 (0.02 \theta_1) + 0.02 \theta_2$$

$$= 0.0196 \theta_1 + 0.02 \theta_2 \text{ [Lower than } \theta_1 \text{ or } \theta_2 \text{ - hence purple line]}$$

If we actually, calculate $\frac{v_t}{1 - \beta^t}$, Let's see what happens

at $t=2$ with $\beta = 0.98$ $\left[1 - (0.98)^2 = 0.0396 \right]$

\Rightarrow temp on day 2

$$\frac{v_2}{0.0396} = \frac{0.0196 \theta_1 + 0.02 \theta_2}{0.0396}$$

[Note $0.02 + 0.0196 = 0.0396$]

\Rightarrow this becomes a weighted avg & will \uparrow weight & bump up the graph for θ_1 's prediction

Note that for large "t"

$$1 - (0.98)^{100} = 1$$

$$\Rightarrow \frac{v_t}{1 - \beta^t} = v_t \Rightarrow \text{green \& purple lines merge for larger "t"}$$