

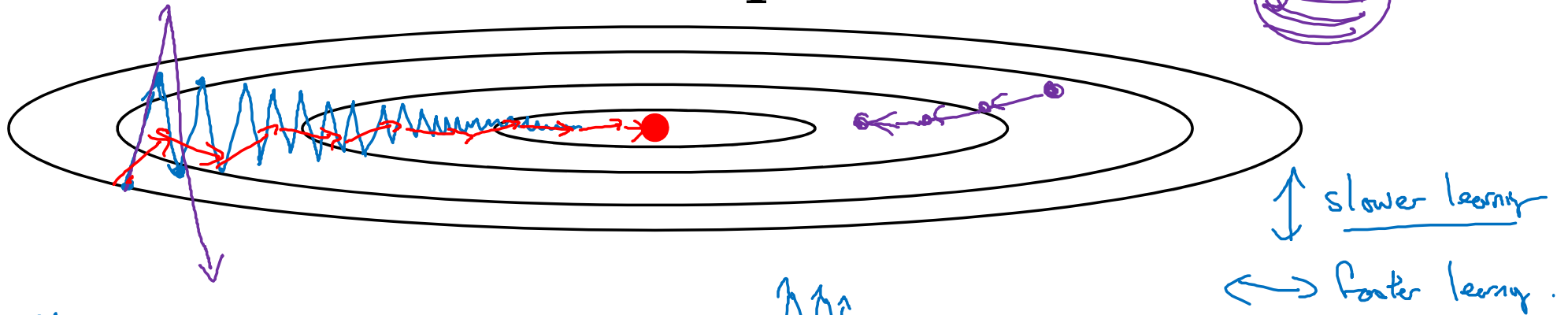


deeplearning.ai

Optimization Algorithms

Gradient descent with momentum

Gradient descent example



Momentum:

On iteration t :

Compute $\Delta W, \Delta b$ on current mini-batch.

$$V_{\Delta W} = \beta V_{\Delta W} + (1-\beta) \Delta W$$

$$V_{\Delta b} = \beta V_{\Delta b} + (1-\beta) \Delta b$$

friction \rightarrow \uparrow velocity

$$W = W - \alpha V_{\Delta W}, \quad b = b - \alpha V_{\Delta b}$$



$$V_{\theta} = \beta V_{\theta} + (1-\beta) \theta_t$$

Implementation details

$$v_{dW} = 0, v_{db} = 0$$

On iteration t :

Compute dW, db on the current mini-batch

$$\begin{aligned} \rightarrow v_{dW} &= \beta v_{dW} + (1 - \beta) dW \\ \rightarrow v_{db} &= \beta v_{db} + (1 - \beta) db \end{aligned} \quad \left| \quad \underline{v_{dW}} = \beta v_{dW} + dW \leftarrow$$

$$W = W - \alpha v_{dW}, \quad b = \underline{b} - \alpha v_{db}$$

$$\frac{v_{dW}}{1 - \beta^t}$$

Hyperparameters: α, β

$$\underline{\beta = 0.9}$$

average over last ≈ 10 gradients