



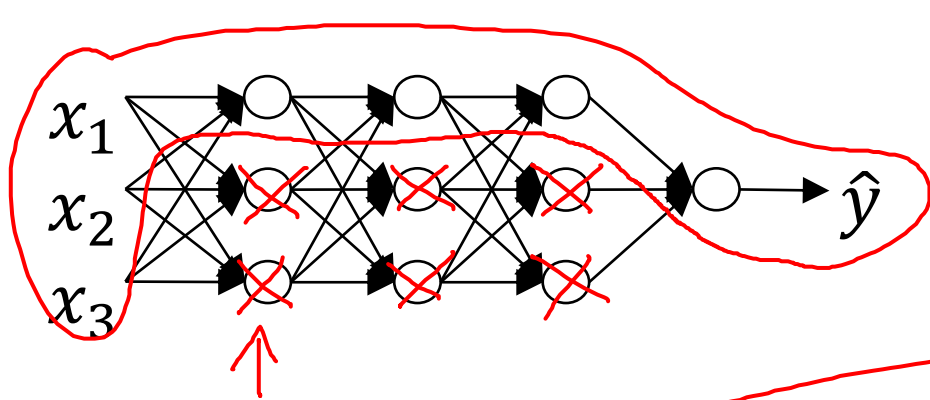
deeplearning.ai

# Regularizing your neural network

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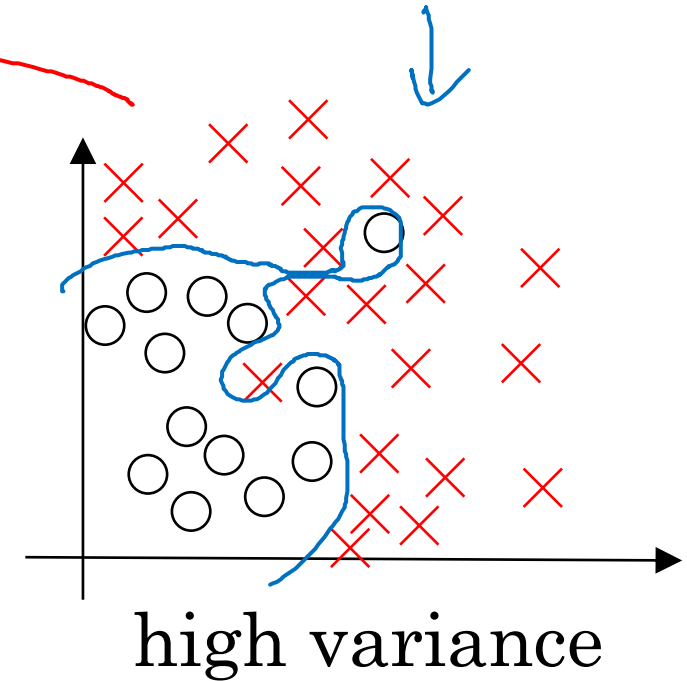
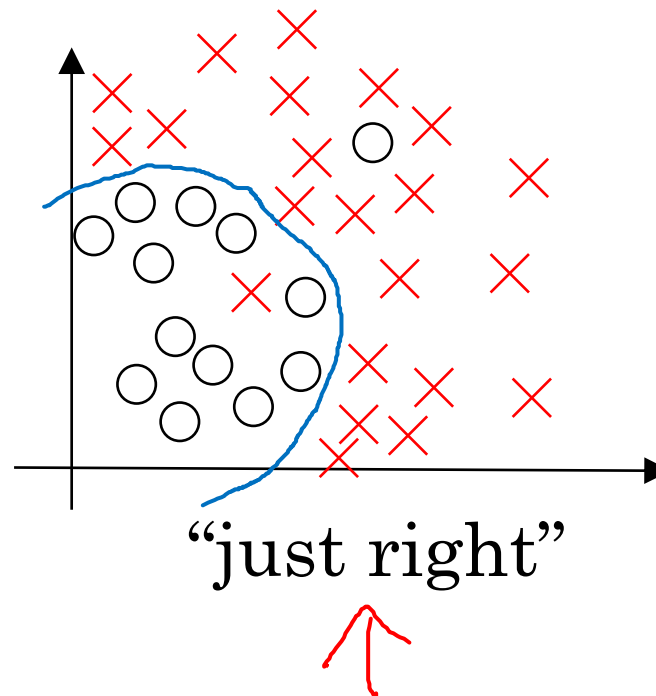
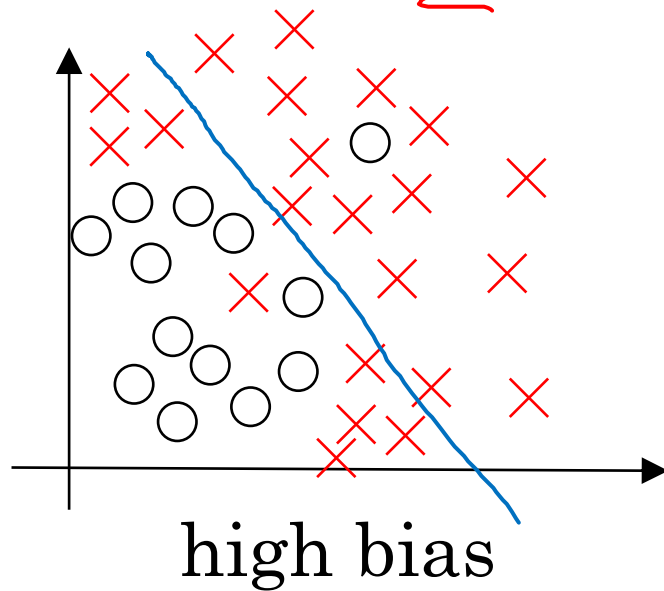
## Why regularization reduces overfitting

# How does regularization prevent overfitting?

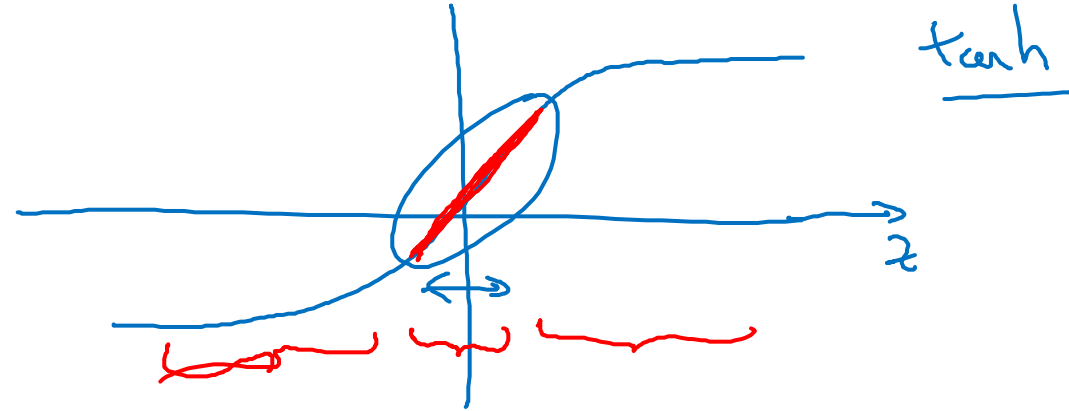


$$J(\mathbf{w}^{(L)}, \mathbf{b}^{(L)}) = \frac{1}{n} \sum_{i=1}^n \ell(y^{(i)}, \hat{y}^{(i)}) + \frac{\lambda}{2n} \sum_{l=1}^L \underbrace{\|\mathbf{w}^{(l)}\|_F^2}_{\text{Frobenius norm squared}}$$

$$\mathbf{w}^{(L)} \approx 0$$



# How does regularization prevent overfitting?



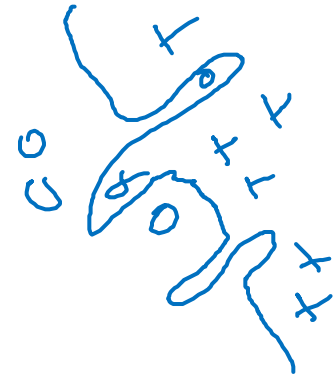
$$g(z) = \tanh(z)$$

$\lambda \uparrow$

$W^{[L]} \downarrow$

$$z^{[L]} = \underline{W}^{[L]} a^{[L-1]} + \underline{b}^{[L]}$$

Every layer  $\approx$  linear.



$$J(\dots) = \underbrace{\sum_i \mathcal{L}(\hat{y}^{(i)}, y^{(i)})}_{\text{training loss}} + \underbrace{\frac{\lambda}{2m} \sum_L \|W^{[L]}\|_F^2}_{\text{regularization term}}$$

