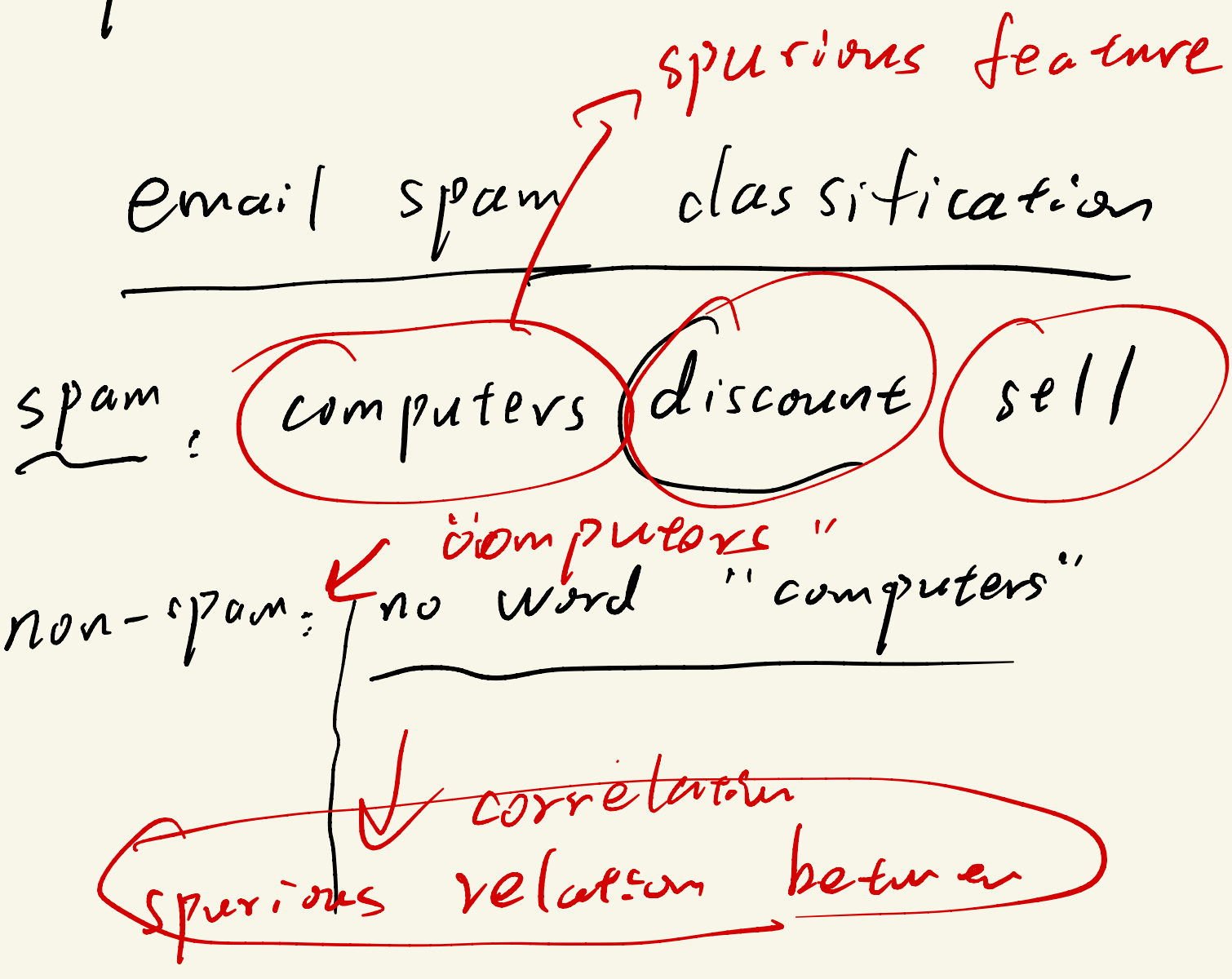
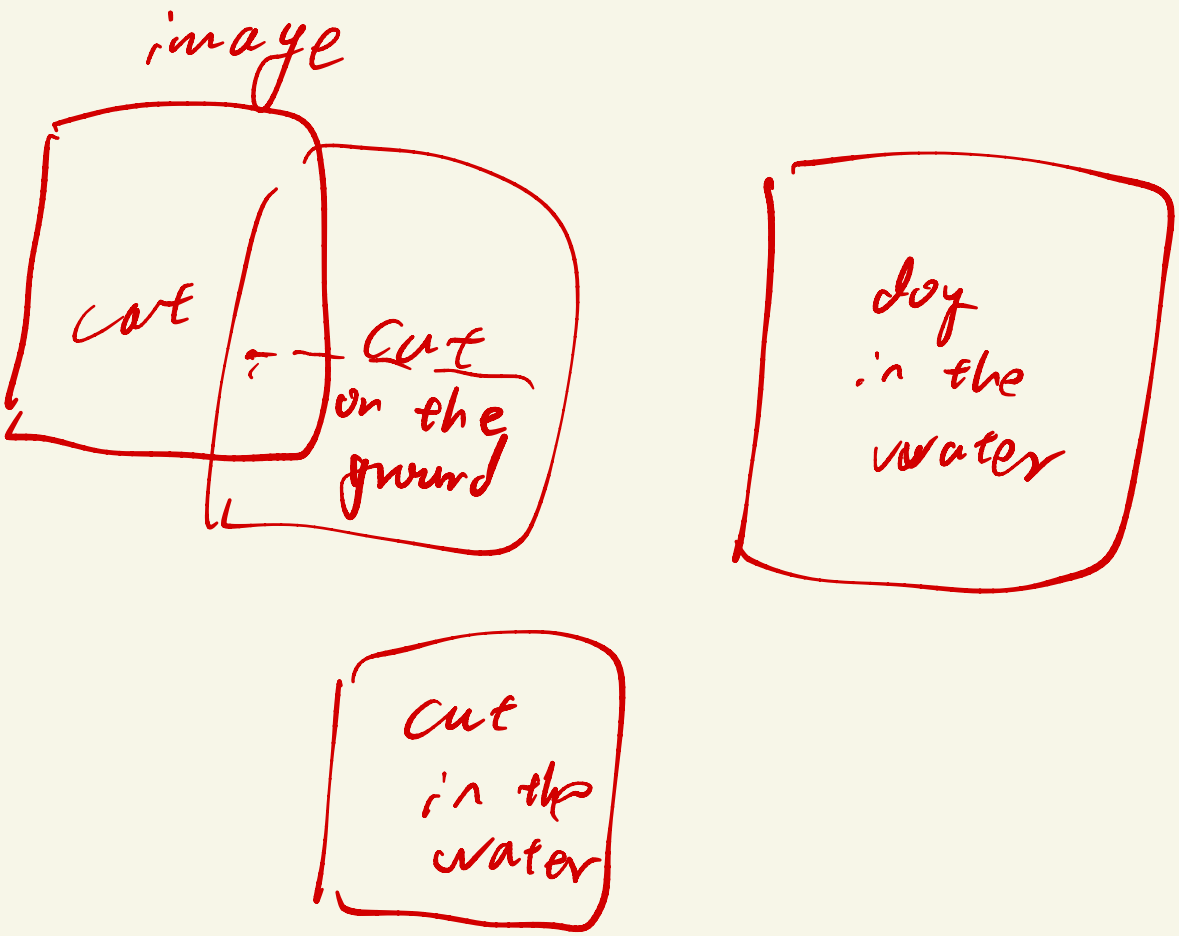
Lecture 10 Generalization

$y = x^2$

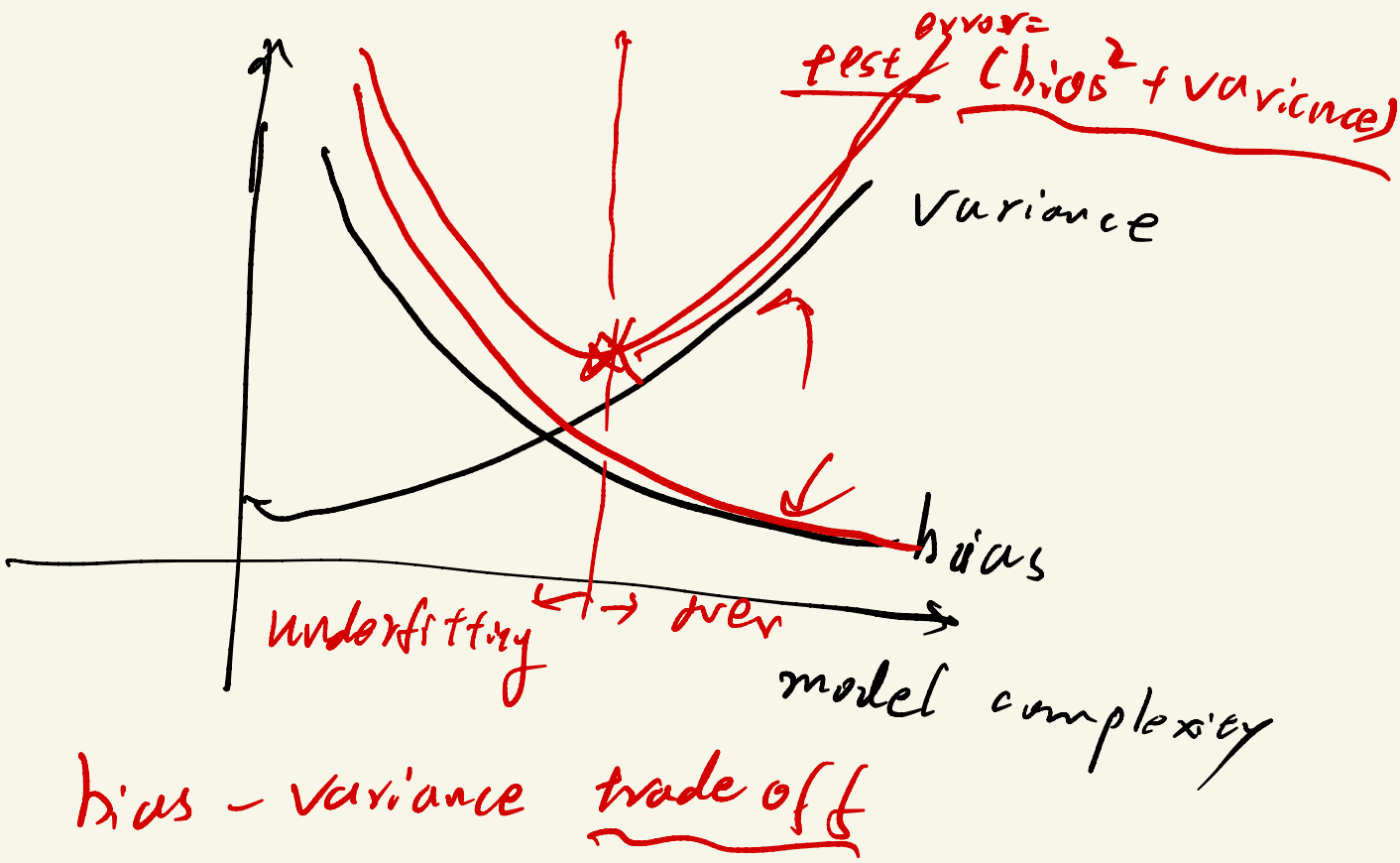
ground-truth distributions are the same

empirical distribution





ground or water ⟷ label



bias - variance trade off

$$E_{S,\xi}\left[(y - h_S(x))^2\right]$$

S ⟂ ξ

$$\xi \sim N(0, \sigma^2)$$

$$= E\left[(h^*(x) + \xi - h_S(x))^2\right]$$

$$= E\left[\xi^2 + 2\xi(h^*(x) - h_S(x)) + (h^*(x) - h_S(x))^2\right]$$

$$= \sigma^2 + E\left[(h^*(x) - h_S(x))^2\right]$$

$E_S[h_S(x)] = h_{avg}(x)$

$$= \sigma^2 + E\left[h^{*2}(x) - 2h^* h_S(x) + h_S^2(x)\right]$$

$$= \sigma^2 + h^{*2}(x) - 2h^* h_{avg}(x) + E\left[h_S^2(x)\right]$$

$$= \sigma^2 + h^{*2}(x) - 2h^* h_{avg}(x) + h_{avg}^2(x) - h_{avg}^2(x) + E\left[h_S^2(x)\right]$$

$$= \sigma^2 + (h^*(x) - h_{avg})^2 + E\left[h_S^2(x) - 2h_S(x) h_{avg}(x) + h_{avg}^2(x)\right]$$

h_{avg} equivalent to the model from sample fit on infite

$$= \sigma^2 + (h^*(x) - h_{avg})^2 + E\left[(h_S(x) - h_{avg}(x))^2\right]$$

σ^2 : irreducible error

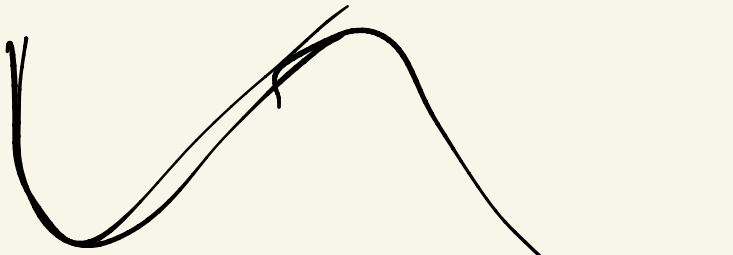
$(h^*(x) - h_{avg})^2$: bias^2

$E\left[(h_S(x) - h_{avg}(x))^2\right]$: var

test error $\propto O(\text{bias}^2)$

$+ O(\text{variance})$

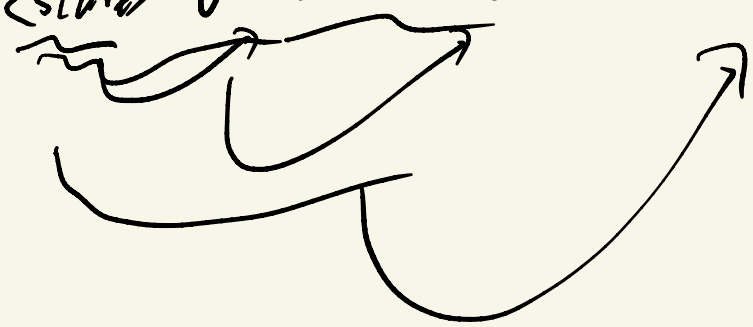
Over parameterization



training 11 tech email

test finance law

<start> We are having a lecture

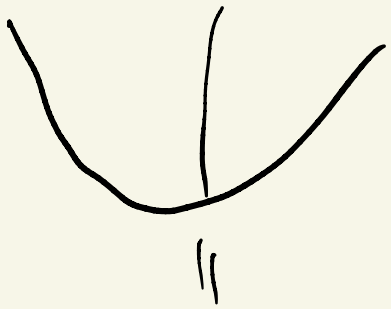


A:

English: < sense -->

Chinese:

tl; dr:



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