

# ML-Lecture2 Where does the error come from

ML Lecture 2 Where does the error come from?

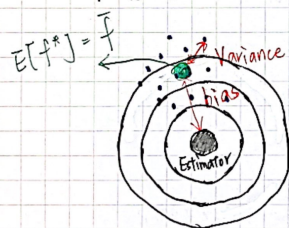
- come from  $\Rightarrow$  bias  $\Rightarrow$  how to improve?
- $\Rightarrow$  variance

Estimator

實際的 function  $\Rightarrow f$

你推算的 function  $\Rightarrow f^*$

$f^*$  is an estimator of  $f$



• 用不同的 data 去  
找到的  $f^*$   
(用同個 model)

High bias, high Variance.

bias variance

複雜 Model

N1

\*

簡單 Model

\*

N1

underfitting

overfitting.

Diagnosis

- If your model cannot even fit the training examples, then you have large bias.
- If you can fit the training data, but large error on testing data, then you probably have large variance.

\* For bias: redesign your model.

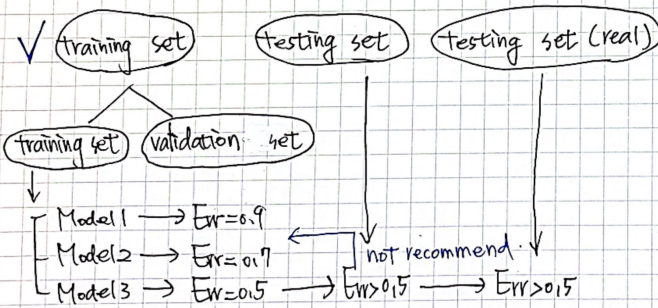
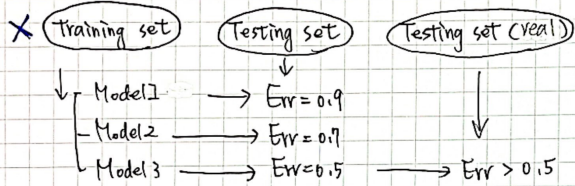
- ① Add more features as input
- ② A more complex model

\* For variance

- ① More data - very effective, but not always practice.
- ② Regularization: 加上一個 term

Scanned with CamScanner

- What you should NOT do:



## N-fold Cross Validation.

