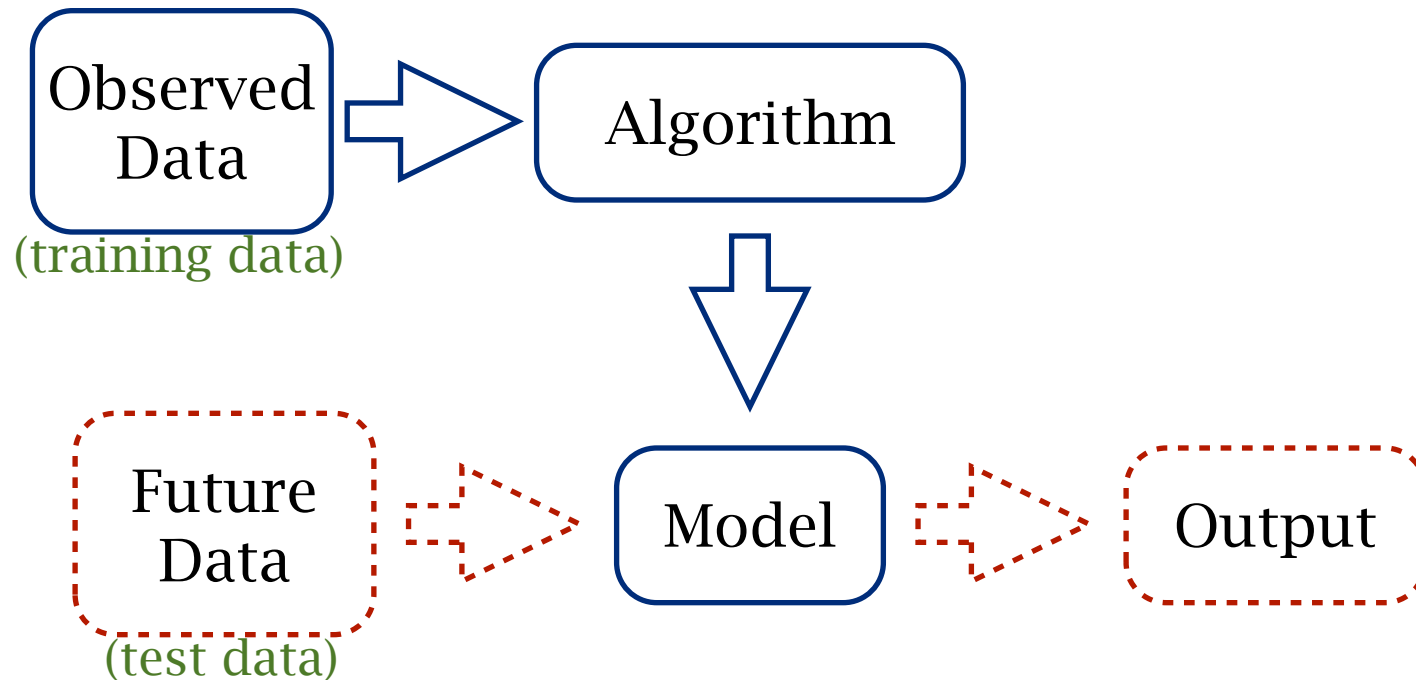


Mini Lecture: Experiment Design and Analysis

http://cs.nju.edu.cn/yuy/course_dm12.ashx



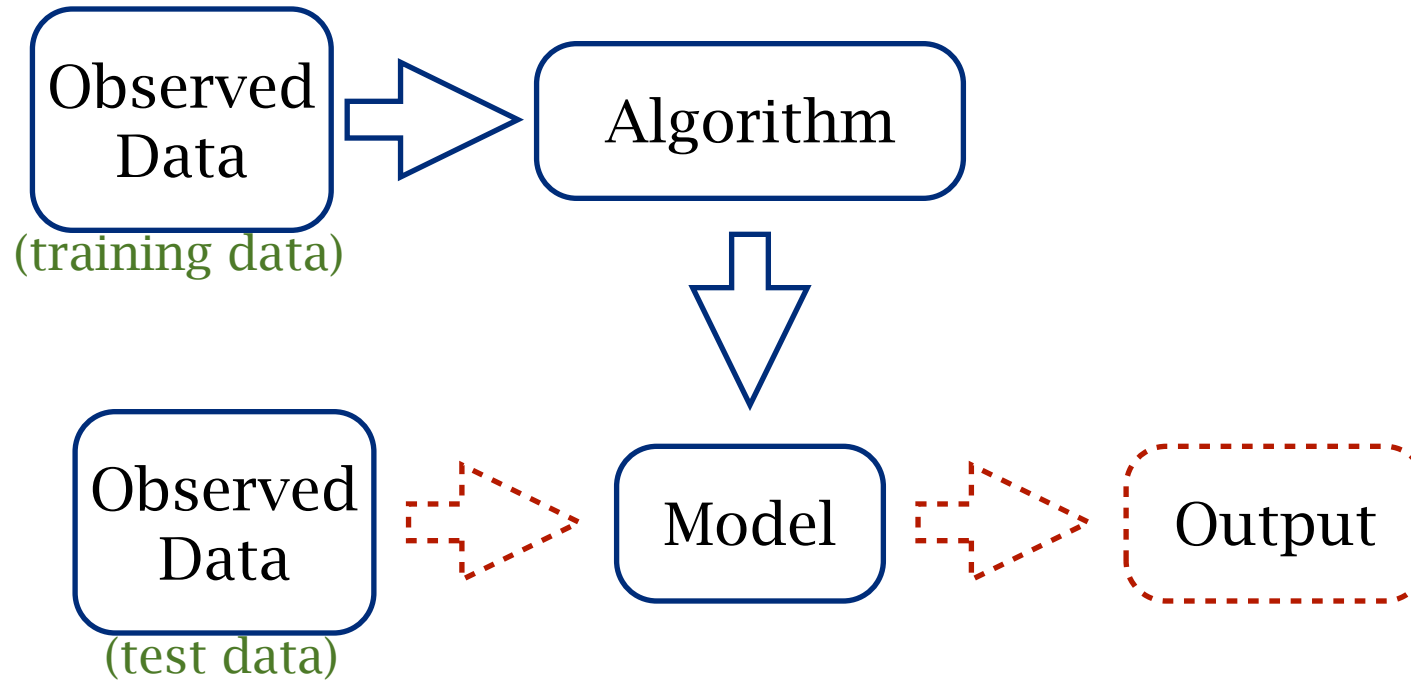
A common mining system structure



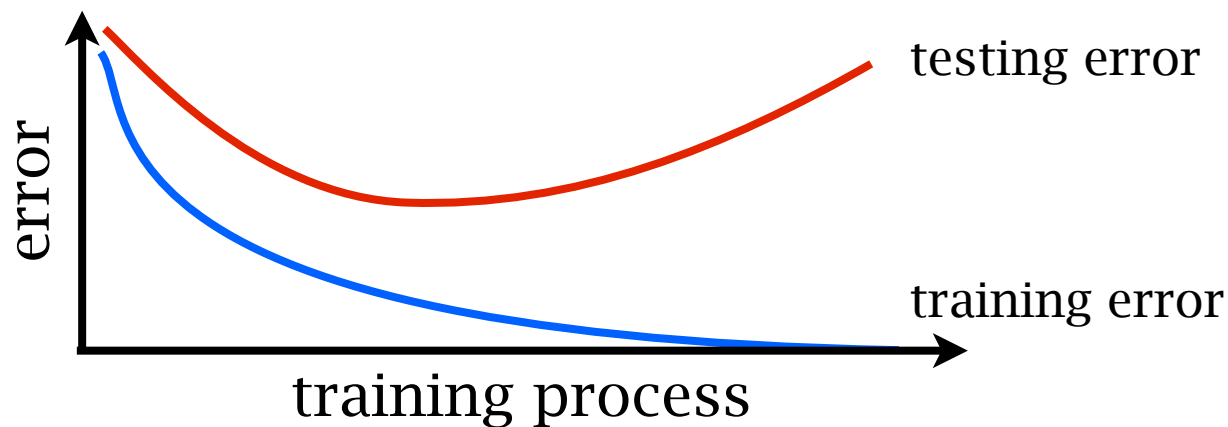
In experiment stage, we don't have the future data

How do we evaluate our algorithms and models?

A wrong way!



Never use the training data to evaluate your algorithm

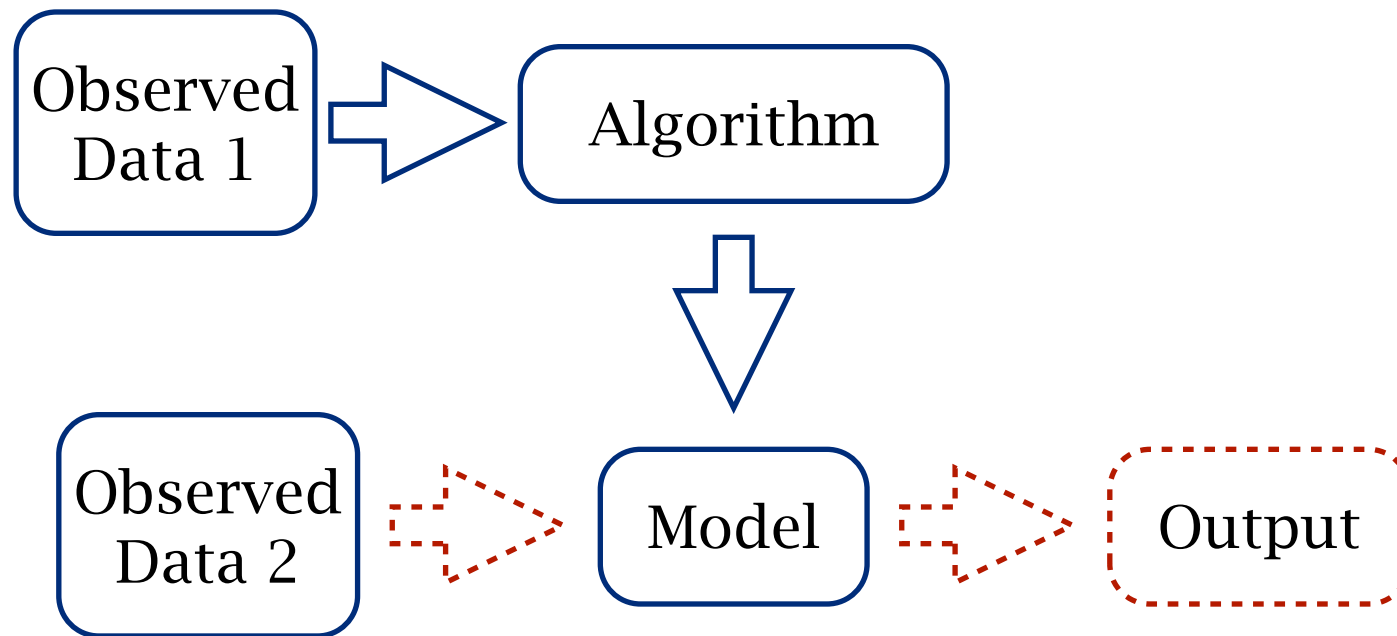


A right way



split the training data into non-overlap parts

$$\text{Observed Data} = \text{Observed Data 1} + \text{Observed Data 2}$$



In other words, you should simulate the real situation

A right way

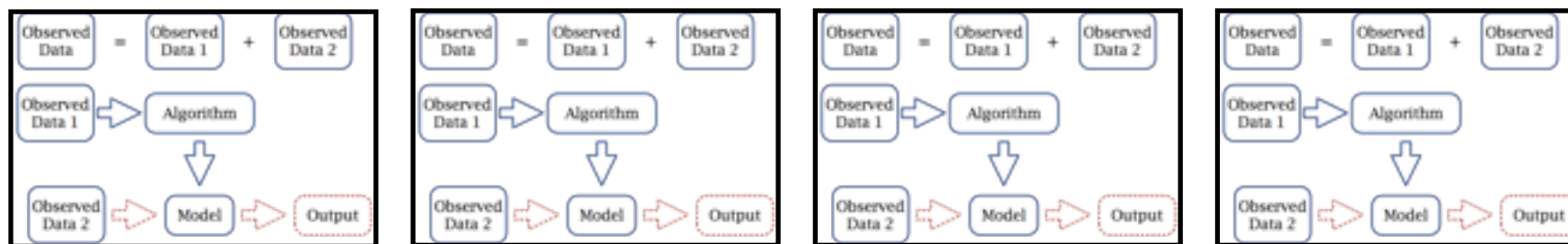


split the training data into non-overlap parts



Randomness!

Use many different splits of the training data

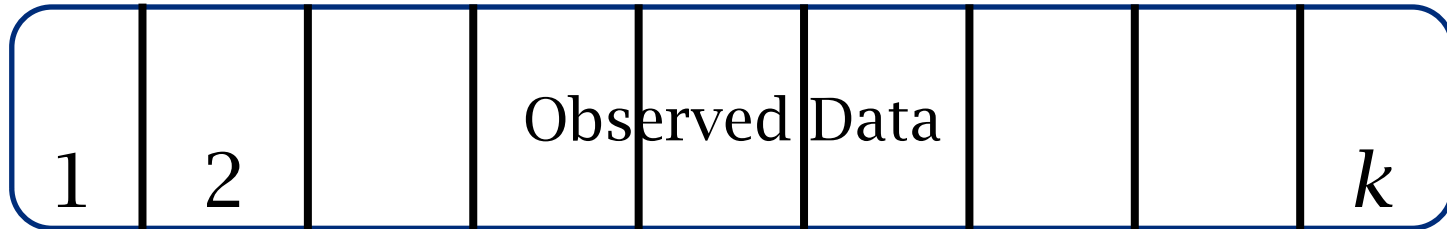


and report the average performance

A right way



k -fold cross-validation



1st fold: leave the 1st block as the test data

2nd fold: leave the 2nd block as the test data

...

k -st fold: leave the k -st block as the test data

n -times k -fold cross-validation

hold-one-out

= n -fold cross-validation

(n is the number of training instances)

m -times hold- $k\%$ -out

sampling $k\%$ data as the test data

Performance comparison



“my algorithm has error 11%. It is perfect!”

Performance comparison



their algorithm has error 10%

“my algorithm has error 11%. It is perfect!”

Comparison with baselines is necessary in order to show your superior.

Performance comparison



“their stupid algorithm has error 10%, my clever algorithm has error 9%. Mine is better!”



Performance comparison

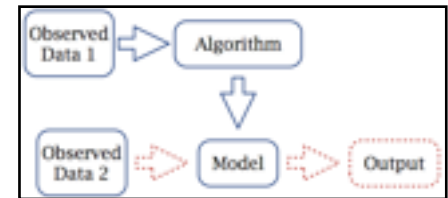
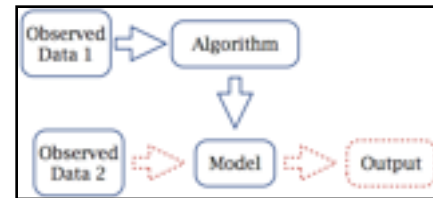
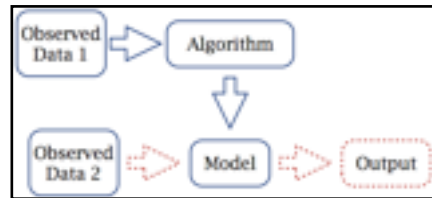
“their stupid algorithm has error 10%, my clever algorithm has error 9%. Mine is better!”

statistical hypothesis test:
how large is the probability my algorithm is better?

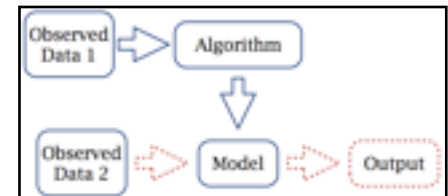
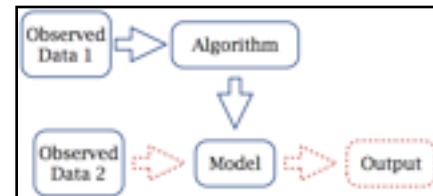
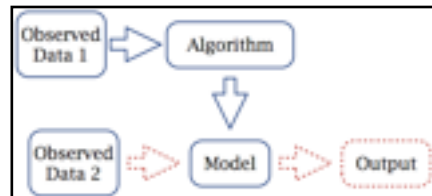
data split



my:



their:



Performance comparison



pair-wise *t*-test: Gaussian distribution

my:	0.091	0.089	0.088	0.090	0.088
their:	0.100	0.088	0.092	0.089	0.095

probability
threshold:
0.05

(Excel: ttest function)

The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F
1	0.091	0.089	0.088	0.09	0.088	
2	0.1	0.088	0.092	0.089	0.095	
3					p=	2, 1)
4					reject=	FALSE

The formula bar shows: `=TTEST(A1:E1,A2:E2,2,1)`

The help window for the TTEST function includes the following information:

- 说明**
type 用于定义 t-检验的类型: 1 代表成对检验; 2 代表双样本等方差假设; 3 代表双样本异方差假设。
- 参数**
TTEST
array1 A1:E1 {0.091,0.089,0
array2 A2:E2 {0.1,0.088,0.095
tails 2 2
type 1 1
- 结果: 0.152317411

(Matlab: ttest function)