BIAS

- Predicted values
- Actual values
- Error

diff

Irreducible error

Reducible ,, Bias

Variance

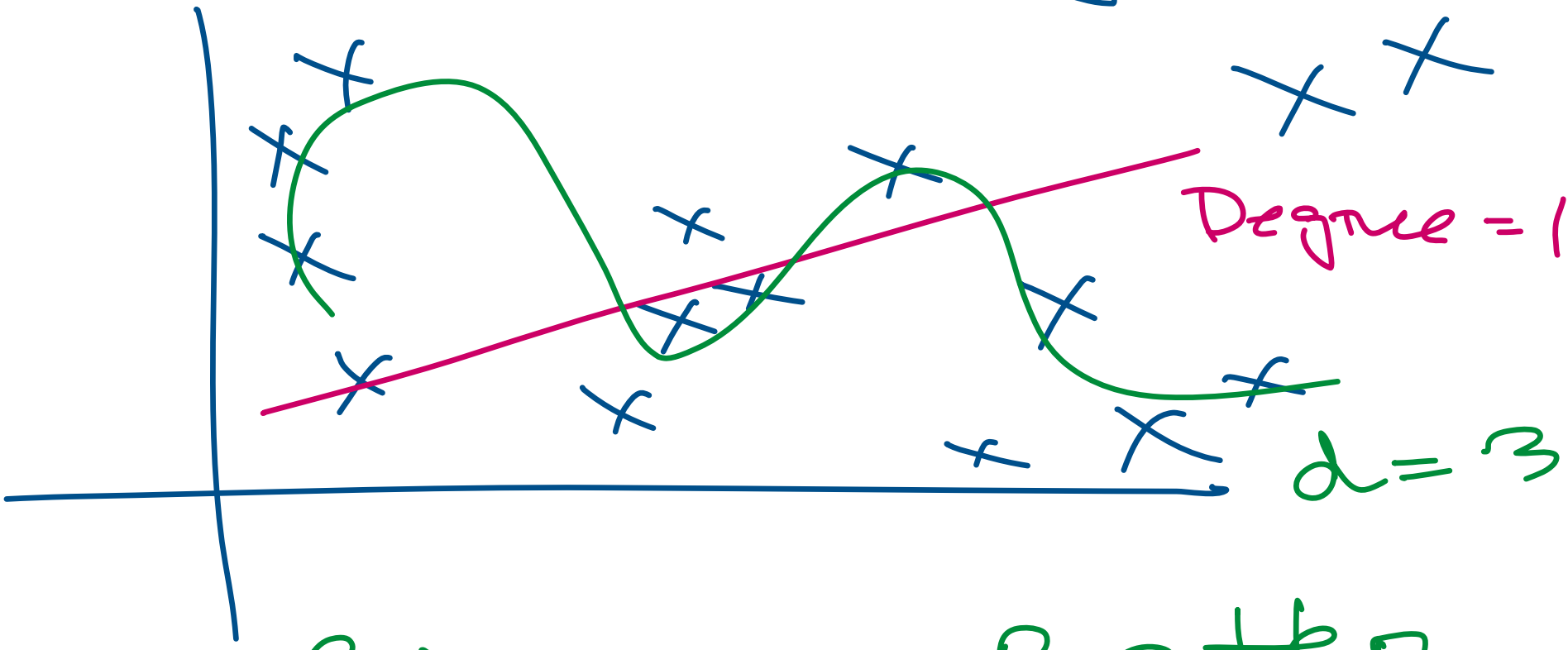
↳ optimize

BIAS

- Predicted vs. actual
- how far

- high/low

High Bias → Not good



Low Bias → Better

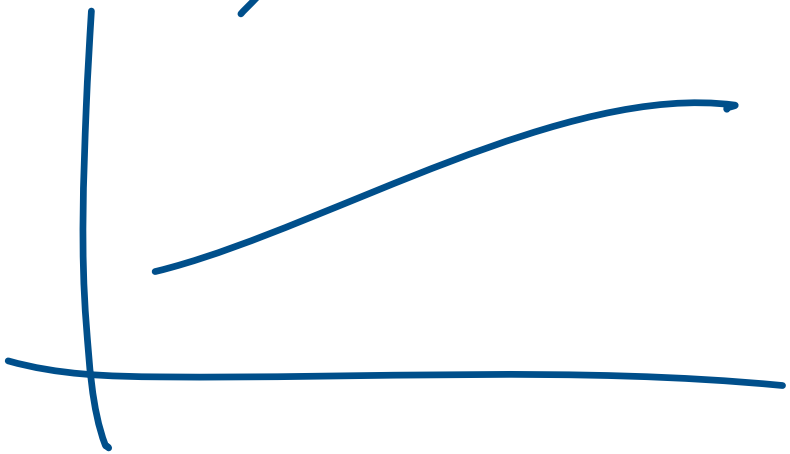
VARIANCE

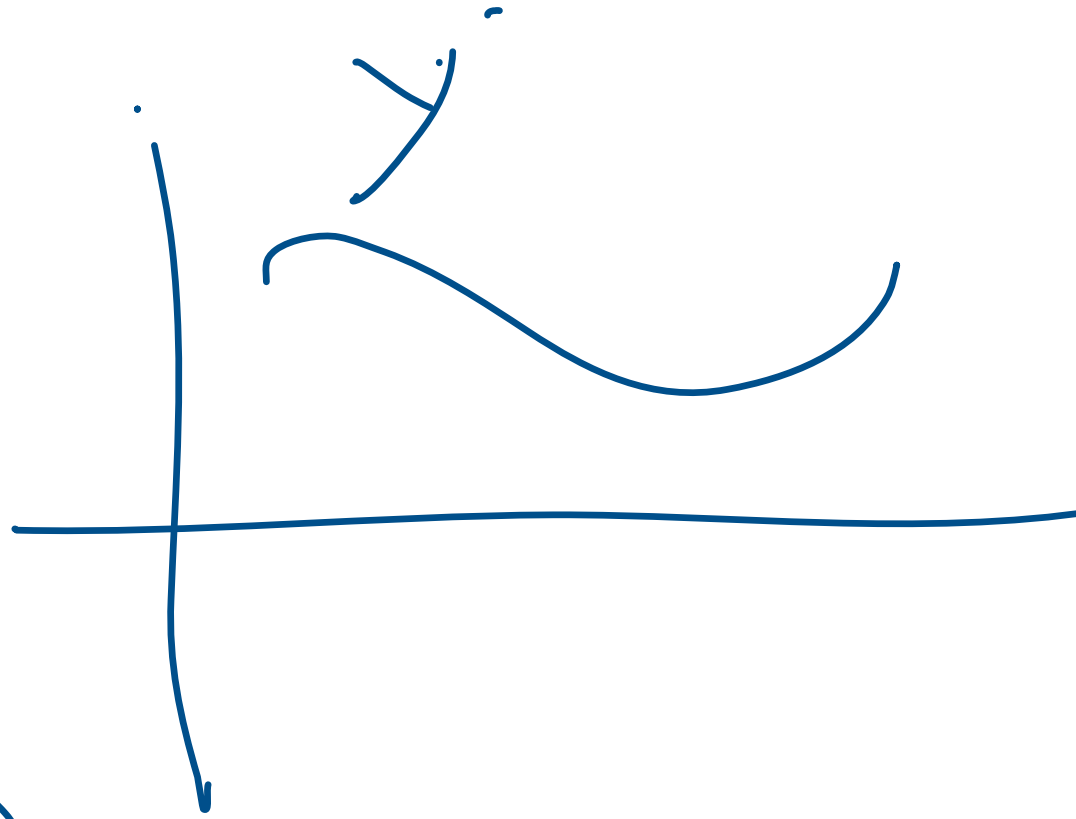
Train → Test

(Seen) (Unseen)

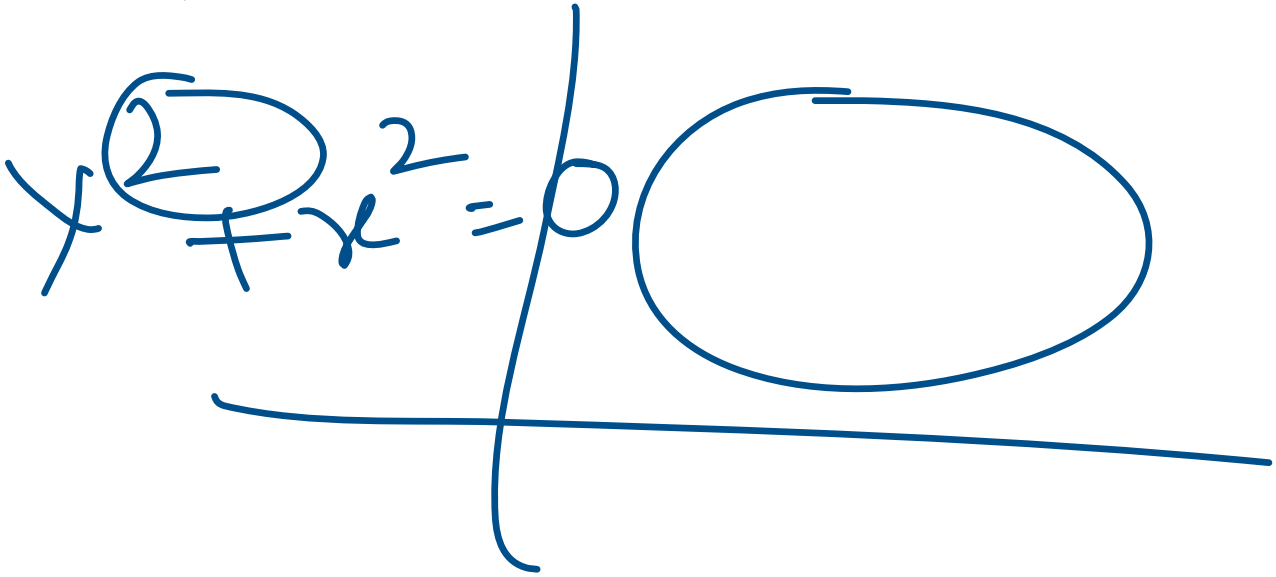
- How scattered

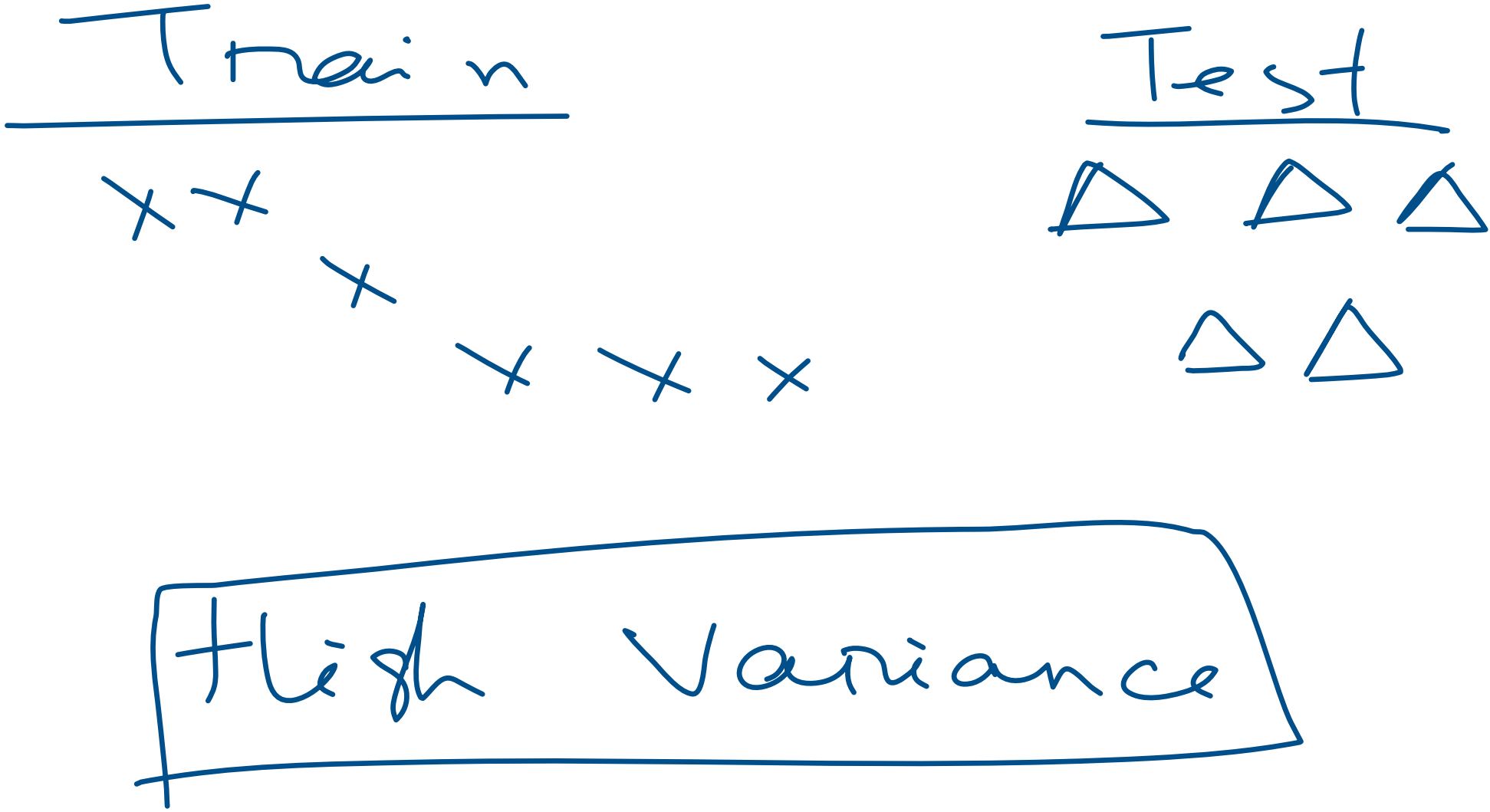
$y' = mx'$

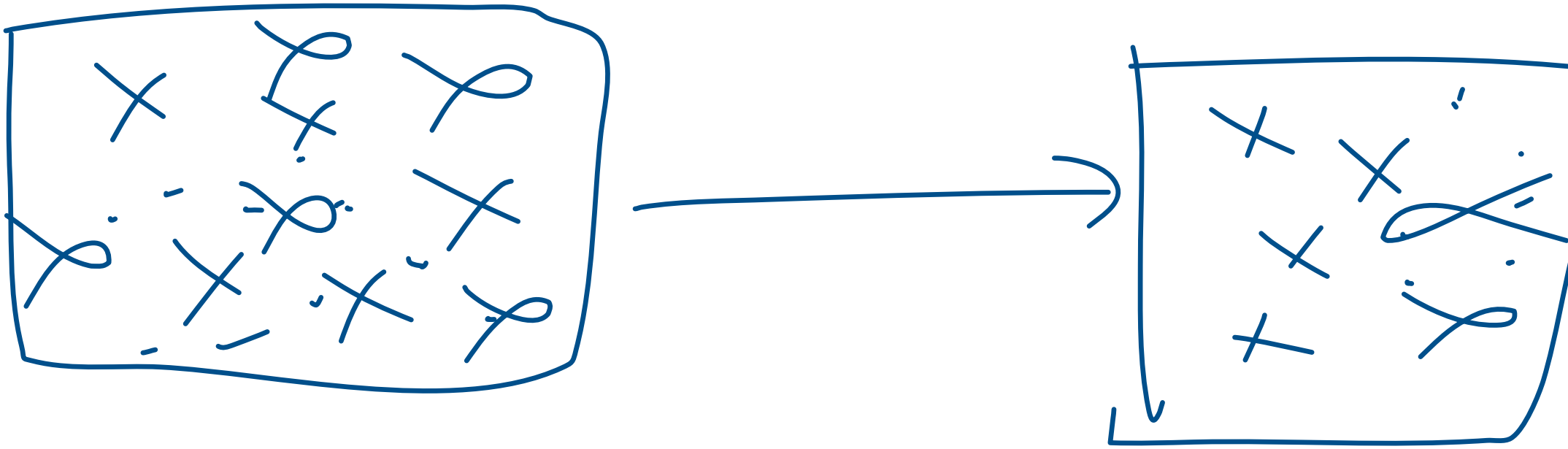




$y'' + x^2 = 0$




Train
Test
High Variance



Low variance

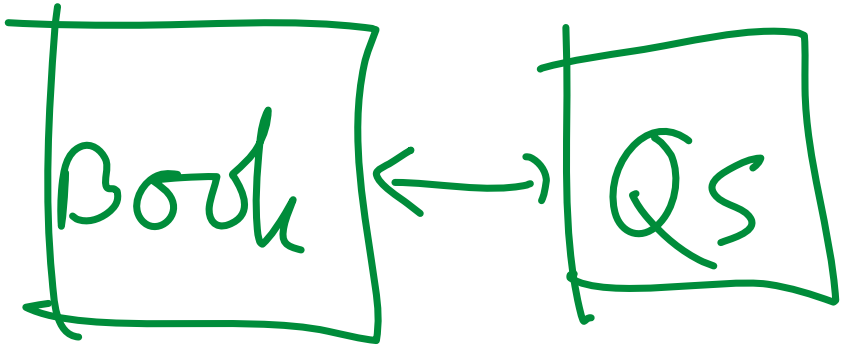
Generalization

Effects

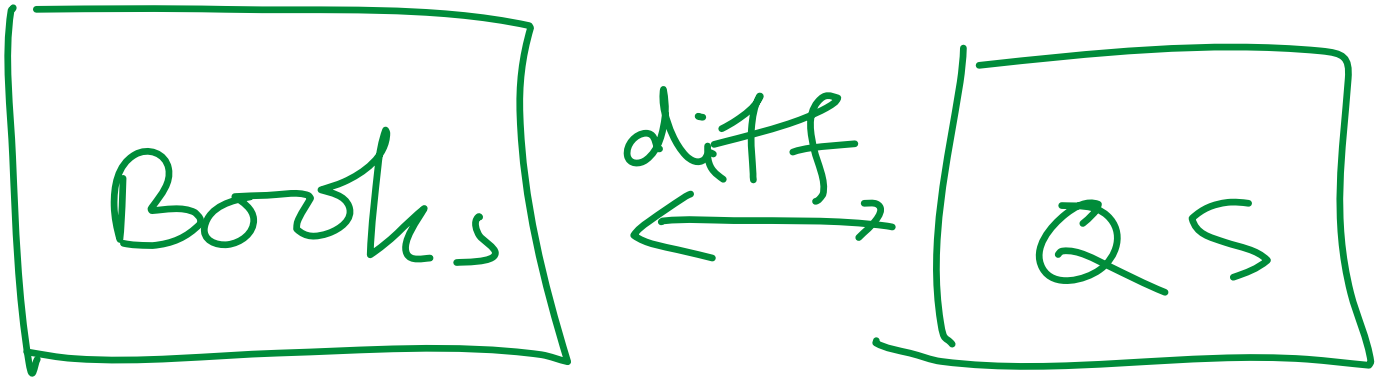
① Math ✗

Physics ✗

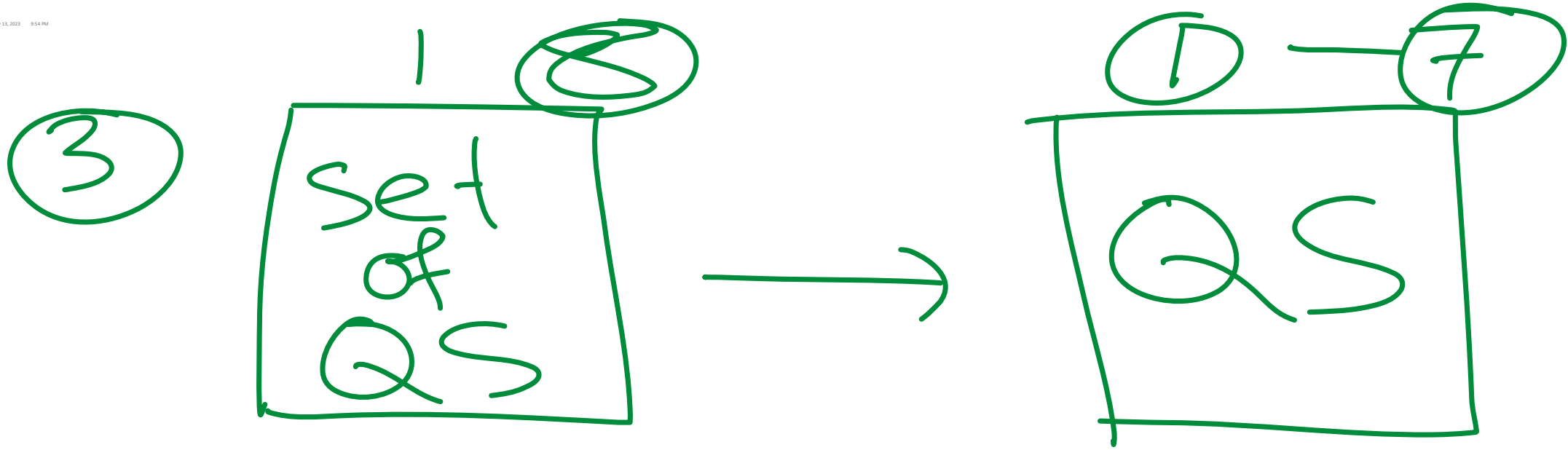
} high bias



② Both



low bias, low variance

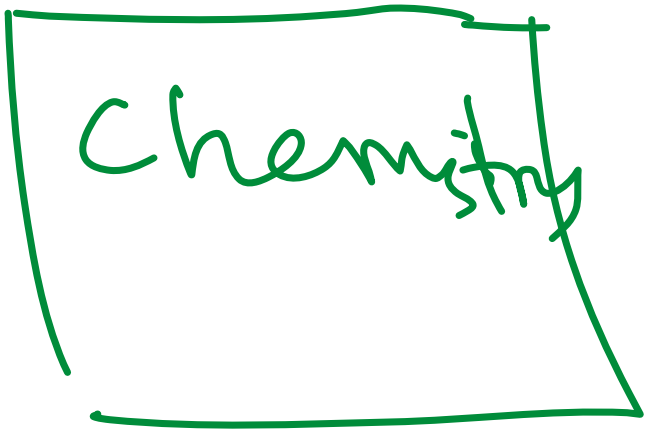


low bias

high variance

④ high bias → 0

low variance



i) LB, LV → Best

LB — Bull's eye, good Pred

LV — No scattered data points

Close to each other

i) LB, HV → Accurate, but

LB — (i) Inconsistant

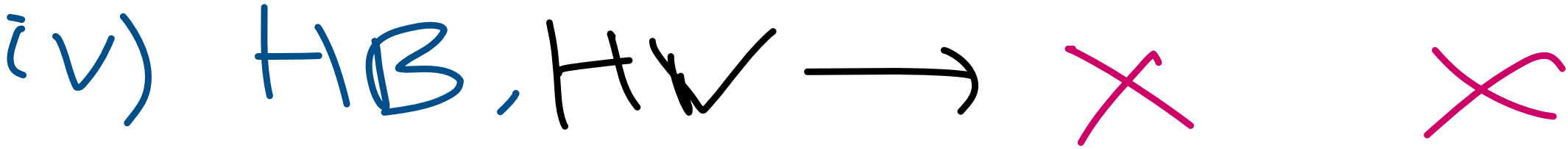
HV — Data points are

scattered

iii) HB, LV → Consistant but inaccurate

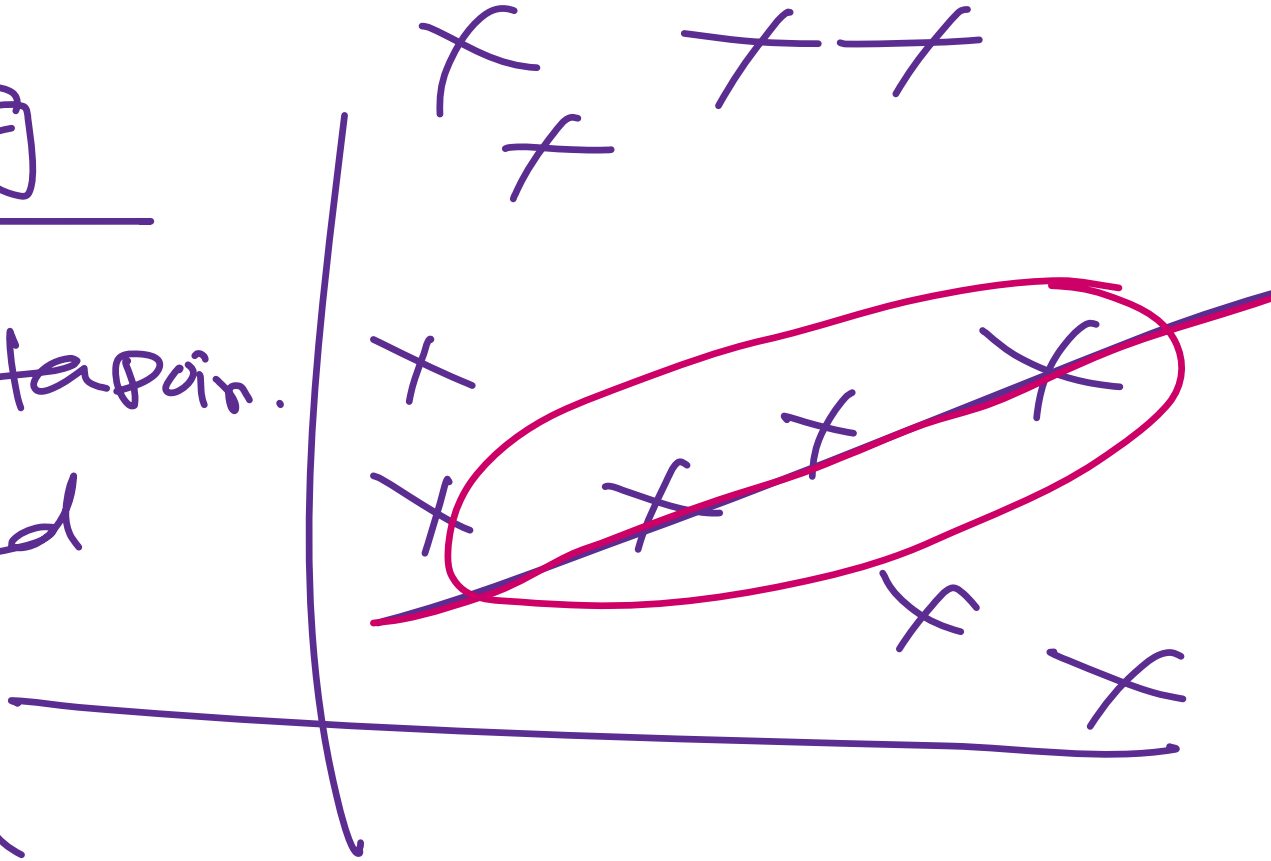
HB — poor prediction

LV — pred data points far away



Underfitting

- major datapoin. not covered



- scattered
- accuracy ↓↓

- low var, high bias
- Training accuracy → 65%

- Testing " → 50%

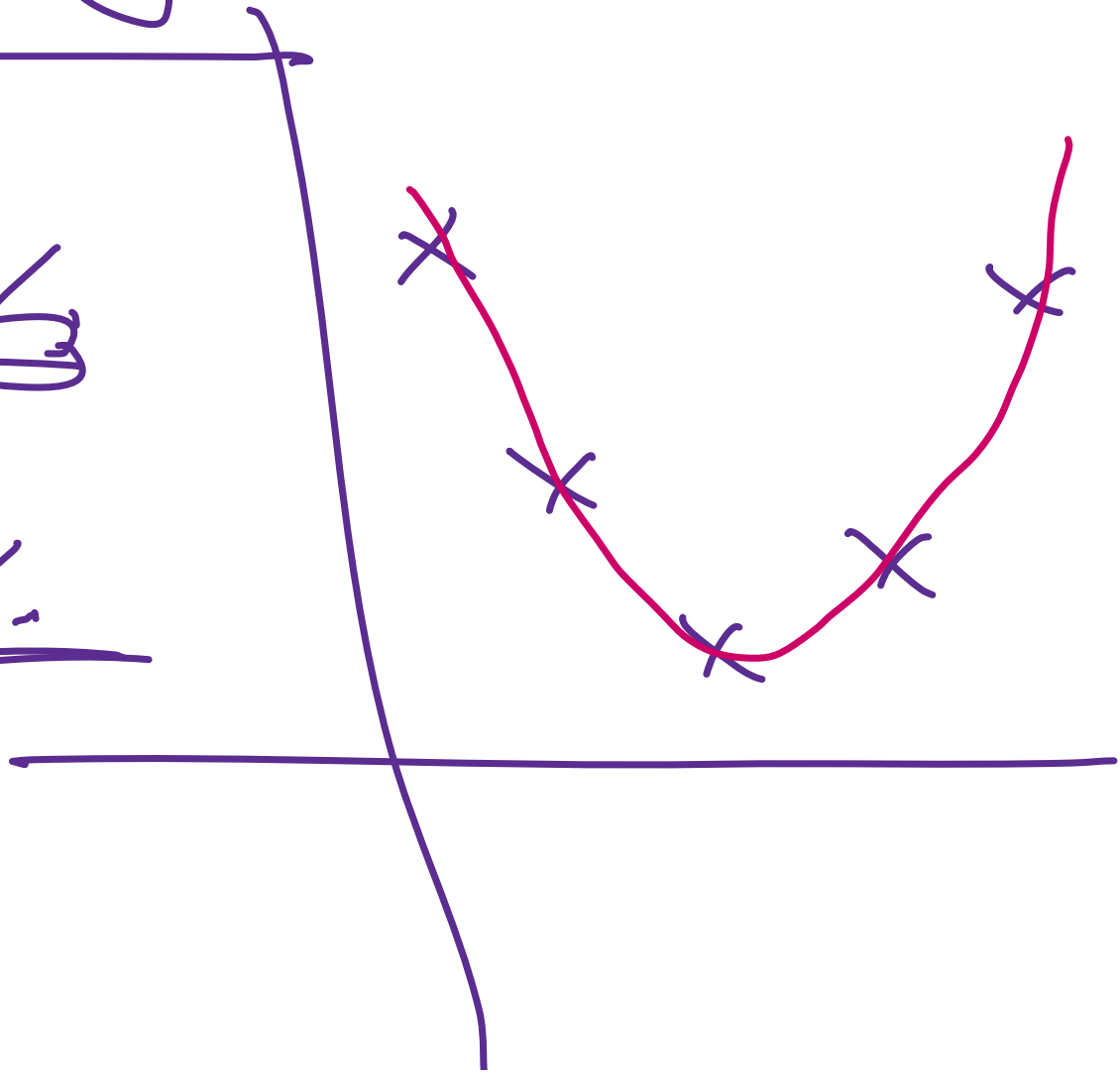
Truth - Pred

Train > Test

Overfitting

Train 95%

Test 70%

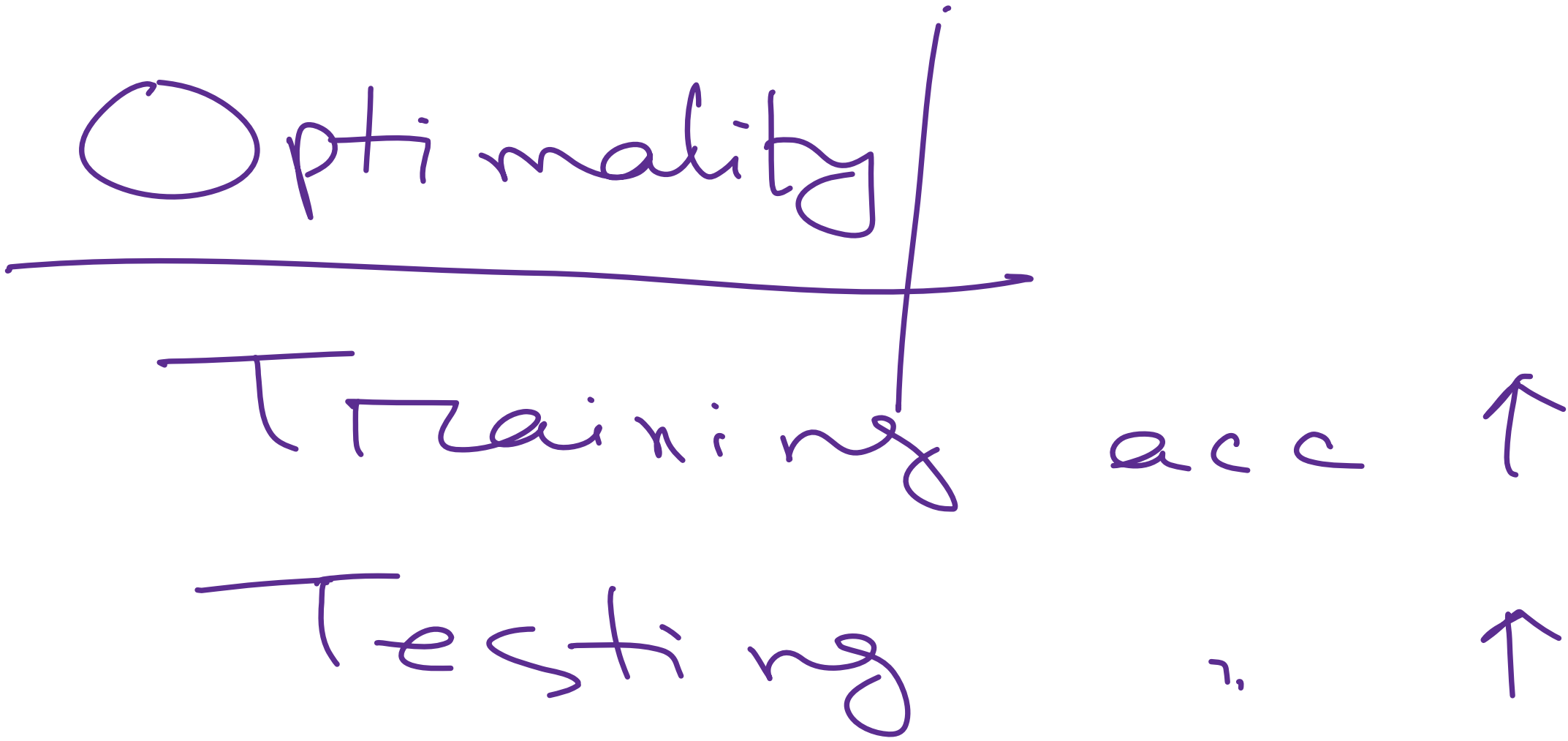


- High Variance

Train

Test

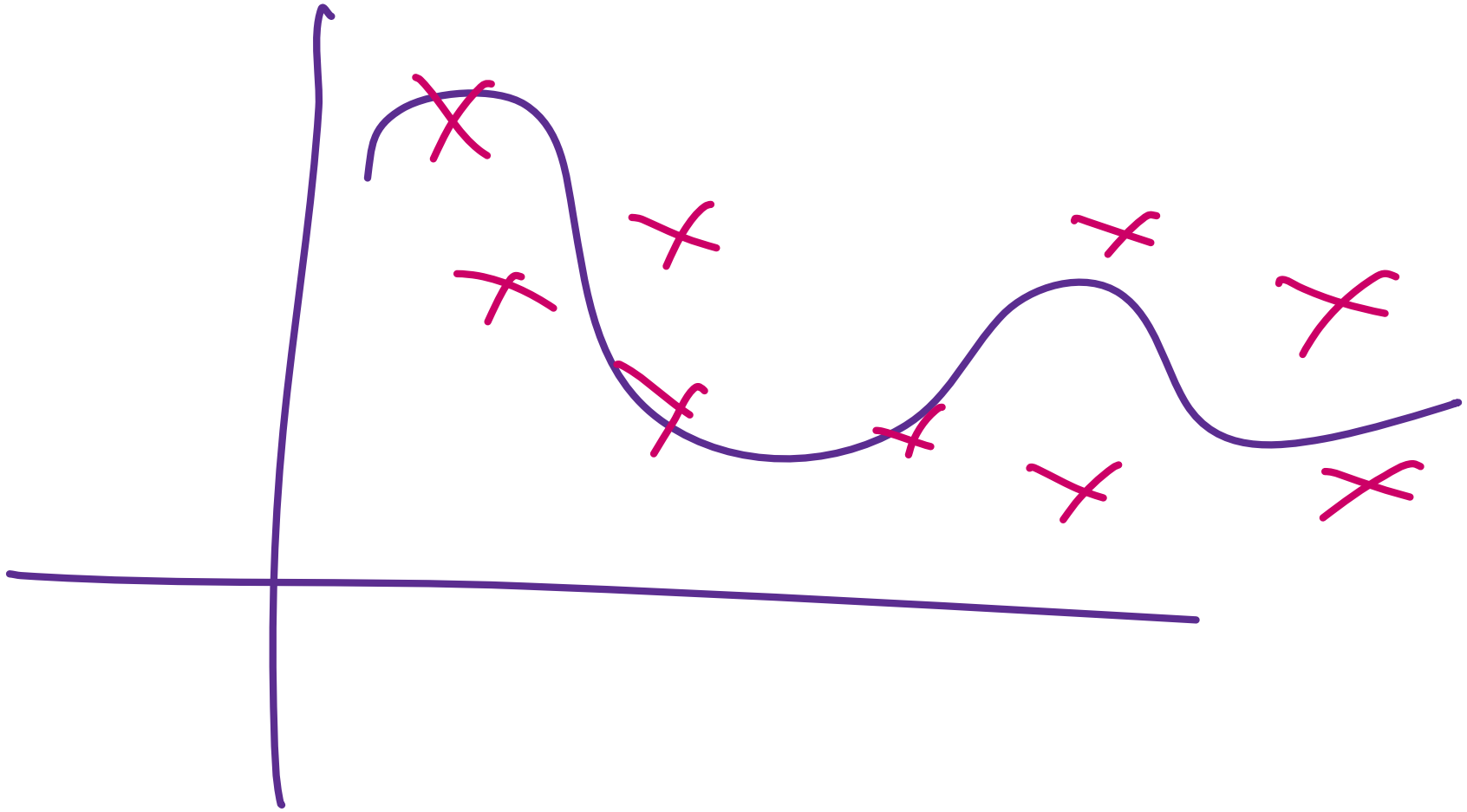
- Low bias


Optimality
Training acc ↑
Testing " ↑

Bias - Variance Tradeoff

LV ↓ B

RMSE



Under

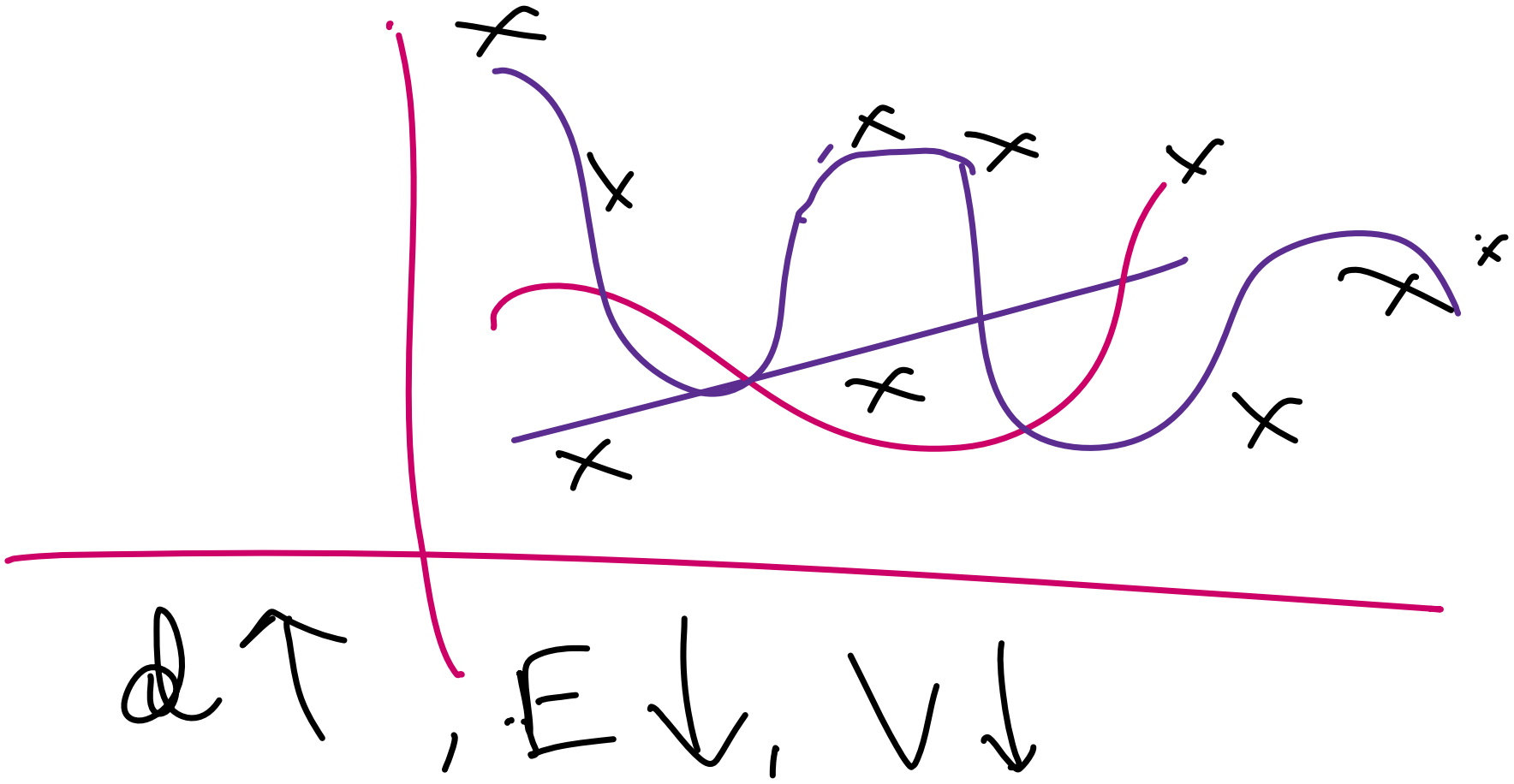
- Model Simple
- High bias
-

Over

- Complicated
- Low bias
- High vari

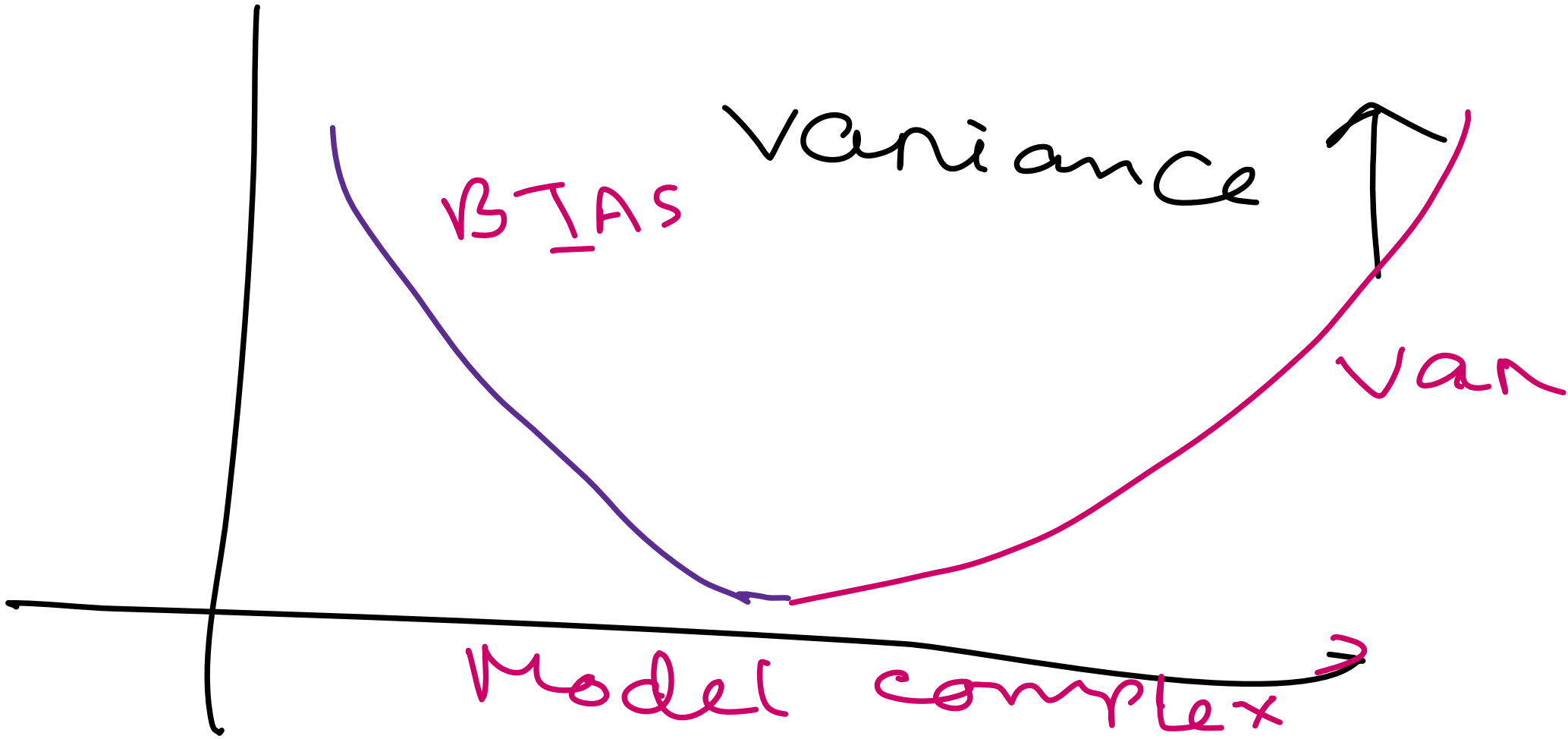
Balance

- degree of polynomial

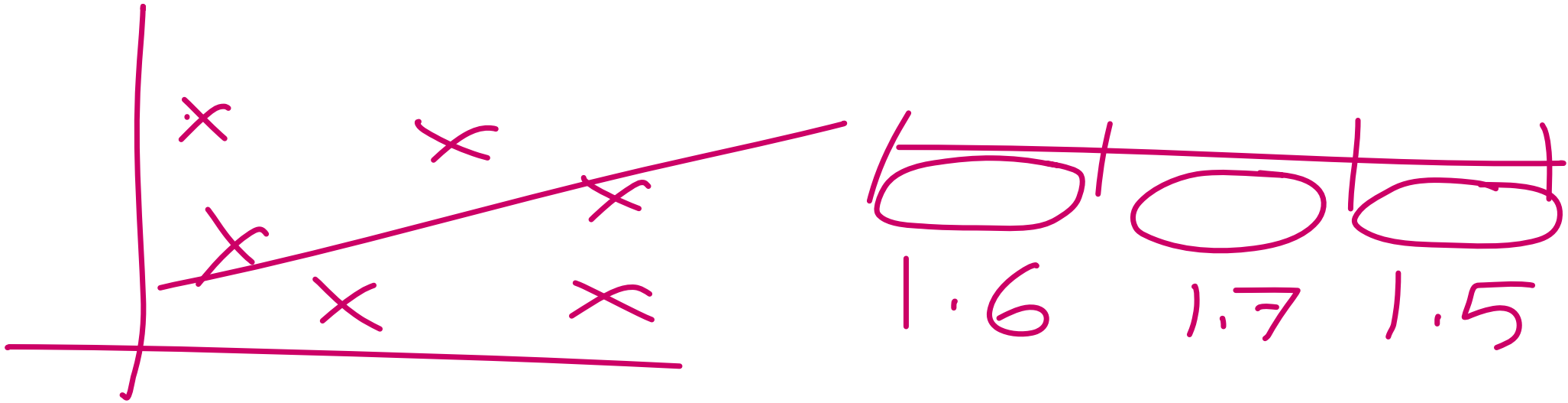


d↑ , E↓, V↓

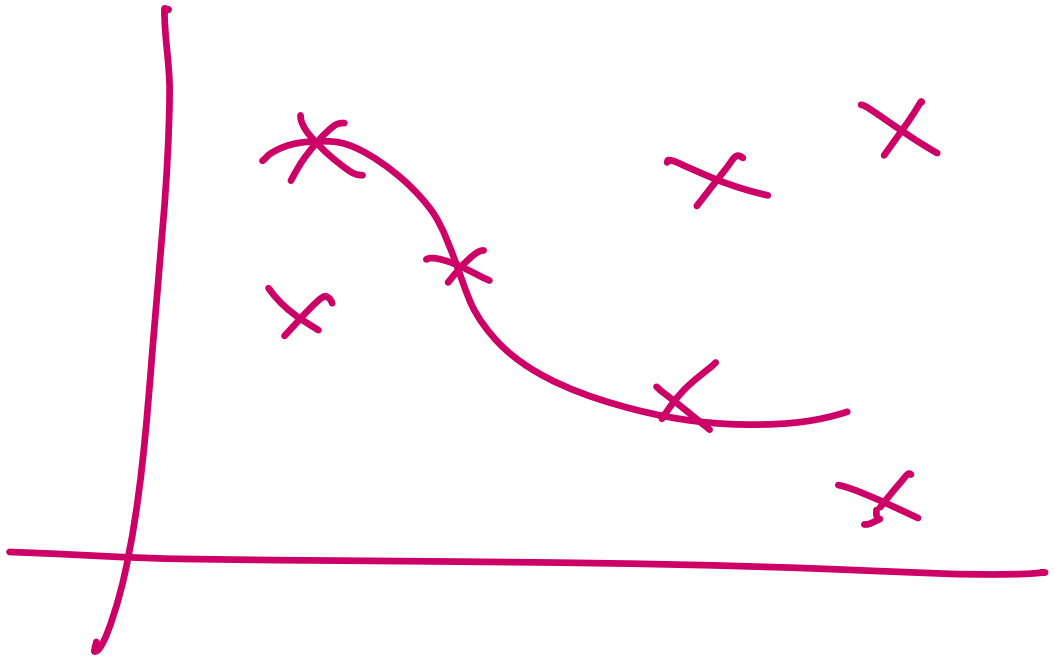
p↑↑↑, bias↓↓

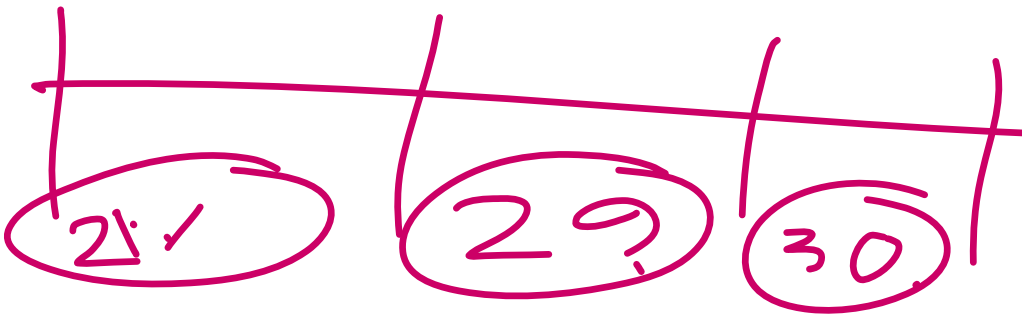

BIAS
Variance
Var
Model complex

- model — very simple
  - Super ,, x



Fnon n = 51.5%

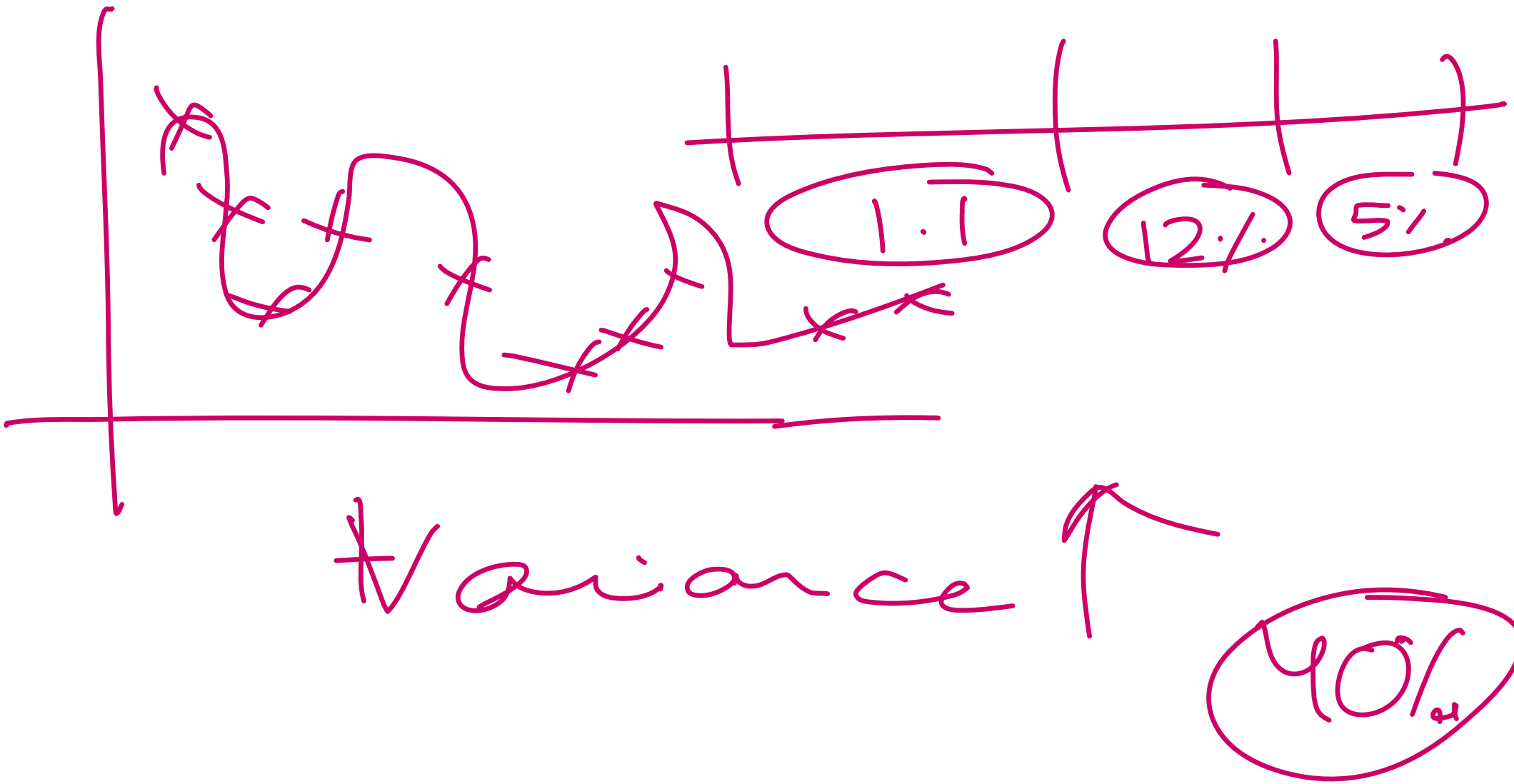




Not generalized

Low Bias

High Variance


1.1
12.1
5.1
Variance
40%