



Start-Tech Academy

# Linear Regression

## Bias-Variance Trade-Off

$$\text{Expected test error} = E(\text{Bias}) + E(\text{Variance}) + E(\epsilon)$$

$$E(\epsilon)$$

Variance of error, Irreducible

$$E(\text{Variance})$$

Amount by which predicted function will change if we change training dataset

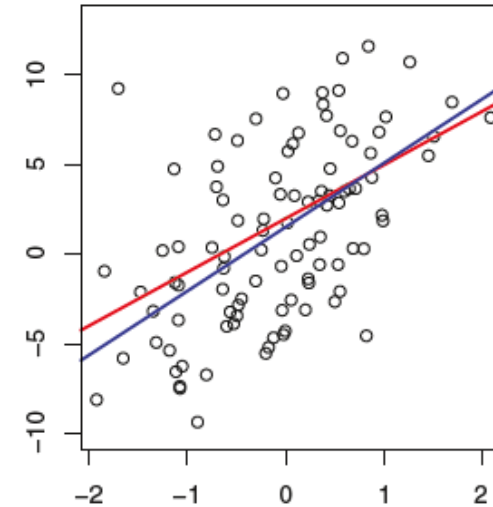
$$E(\text{Bias})$$

Error due to approximation of complex relationship as a simpler model such as linear model

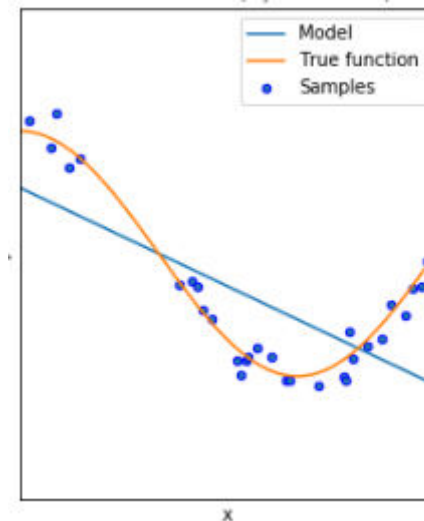


# Linear Regression

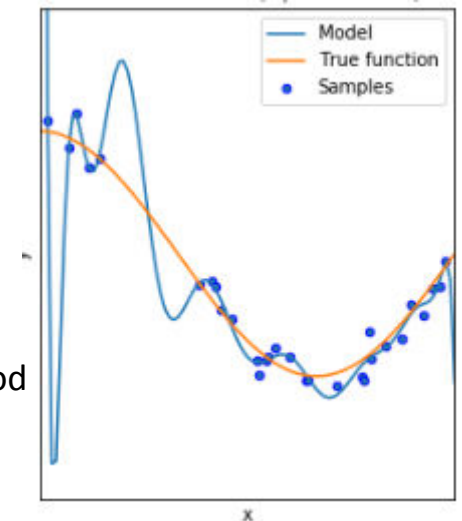
## Variance



— Population regression line  
— Sample regression line



Less Flexible method



More Flexible method

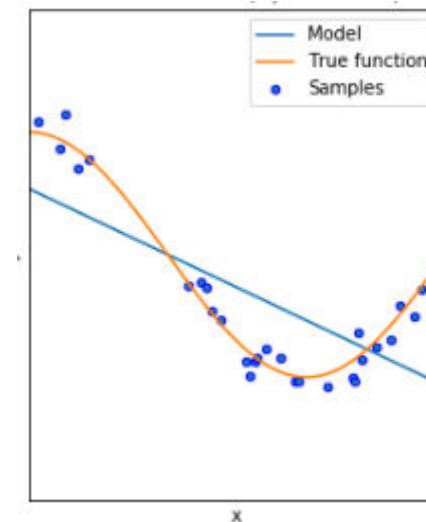


# Linear Regression

## Bias

$E(Bias)$

Error due to approximation of complex relationship as a simpler model such as linear model



# Linear Regression

## Bias-Variance Trade-Off

### The Tradeoff

If we try to decrease one by changing model flexibility, other one increases

— Bias + Variance  
— Bias  
— Variance

