## besture 18: loss functions and regression

statistical inference tells us how to infer parameters from data

karning goods

- interpret loss functions
- solve a simple regression poplem

common approach is through minimization of a loss function

min LCOIX)

parameters 0, data X

## example: linear regression

say we are measuring force on a spring us, distance relationship should be linear,

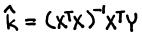
$$Y = -kX + b$$

force stratch

if measurements were perfect use would only need a single point, but in reality there is noise

find the spring constant by making multiple measurements and finding the best fit line

in this special cose we can solve exactly



General form valid :f measuring multiple wiables)

## regularization

what if our data is very noisy, so that we don't have too much confidence in small # of measurements?

we can regularize to control the estimate how could use do this?

example: add parameter estimates to the loss-function

$$\rightarrow$$
 solution is  $\hat{k} = (X^TX + XI)^{-1}X^TY$ 

Tikhorov or Lization

note scaling, as # measurements -> 00 effect of regularization vanishes

\* notebook example