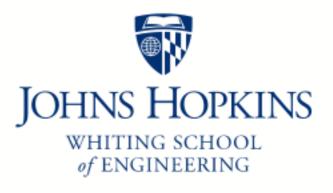
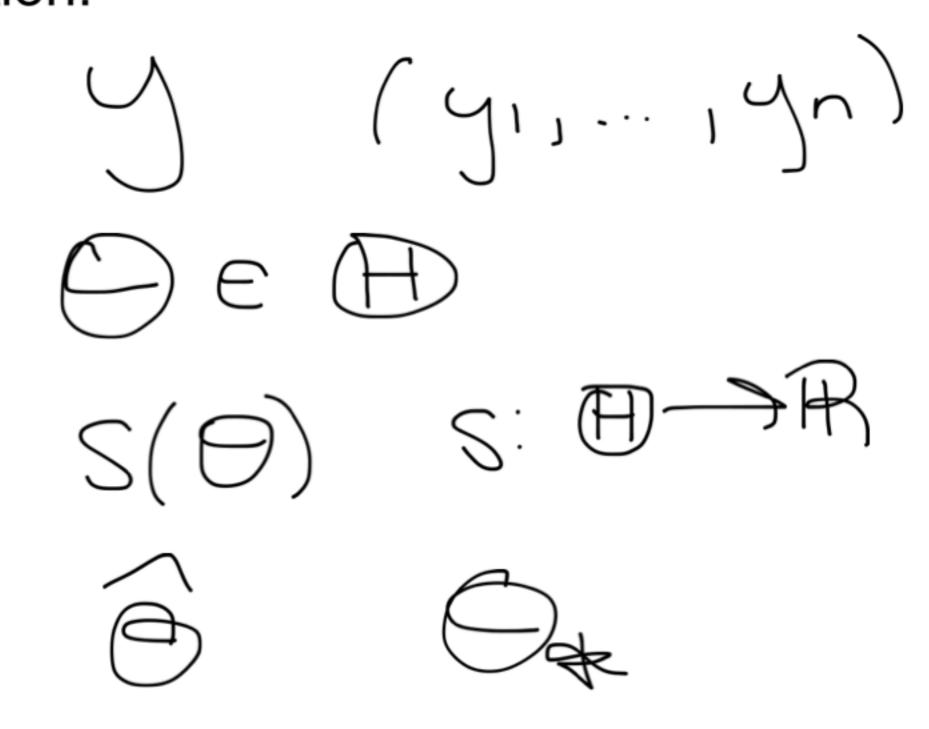
## Johns Hopkins Engineering 625.464 Computational Statistics

The Role of Optimization in Inference

Module 2 Lecture 2A



## The Role of Optimization in Inference Notation:



2 Types of Optimization Problems.

Where does computational statistics intervene?

Answer: In statistical problems where s( $\Theta$ ) doesn't behave.

Estimation by Minimum Residuals.

minimize 
$$r(b) = y(-f(b))$$
 over  $f(b) = [r(b)]$ 

$$f(b) = [r(b)]$$

Let p(i) be some nomegative

function thon minimizing

Sp(b) = Sp(igi-frol)

M-65timator

Many functions can be optimized analytically.

Find min 
$$f(x) = (x-1)^2$$
  
 $f'(x) = 2(x-1)$   
 $f'(x) = 0$   $x = 1$   
 $f''(x) = 2$  1 minimum  
 $f''(x) = \frac{1 \cdot 9^x}{1 + x}$   $g'(x) = \frac{1 + 1 \cdot 4 + 1 \cdot 9^x}{(1 + x)^2}$ 

Boumphoise

- D Want to sptimize a(x) writ.x (p-dim)
- 2) assume maximization
- 3) gis smooth and differentiable

$$g'(x) = 0$$

(i)  $\times_0$  (i) (i)  $\times_0$  (i) (i)  $\times_0$  (i) (i)