

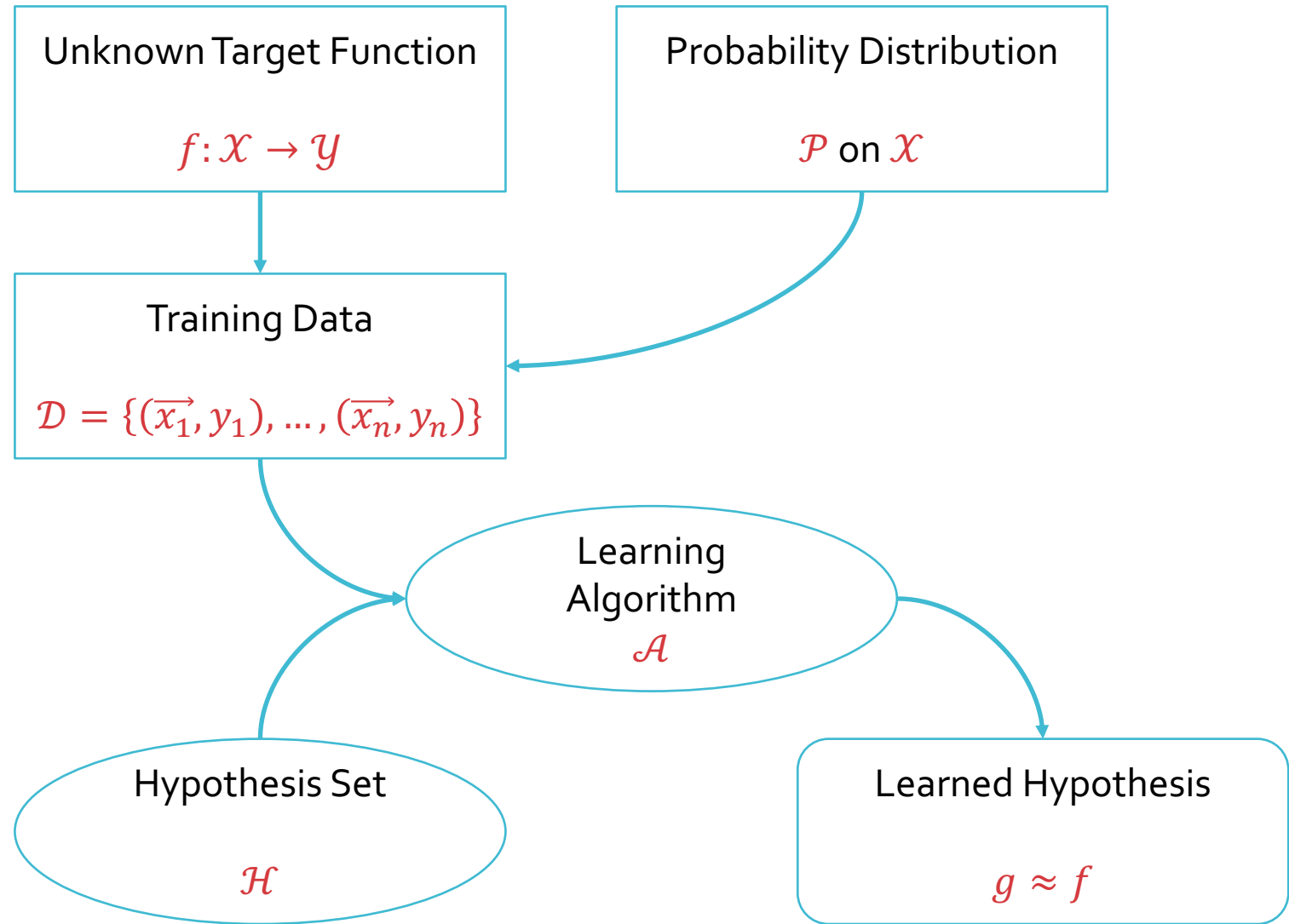
CSE 417T: Introduction to Machine Learning

Lecture 3: Error and Noise

Henry Chai

09/04/18

Recall



Error: is
 $h \approx f$?

- $E(h, f)$ is a function that measures how close h is to f : the smaller the better
- $g = \operatorname{argmin}_{h \in \mathcal{H}} E(h, f)$
- E is usually defined in terms of a pointwise error function $e(h, f, \vec{x})$
 - Binary error (classification): $e(h, f, \vec{x}) = \mathbb{I}[f(\vec{x}) \neq h(\vec{x})]$
 - Squared error (regression): $e(h, f, \vec{x}) = (f(\vec{x}) - h(\vec{x}))^2$

Error: is
 $h \approx f$?

- In-sample error: $E_{in}(h) = \frac{1}{n} \sum_{i=1}^n e(h, f, \vec{x}_i)$

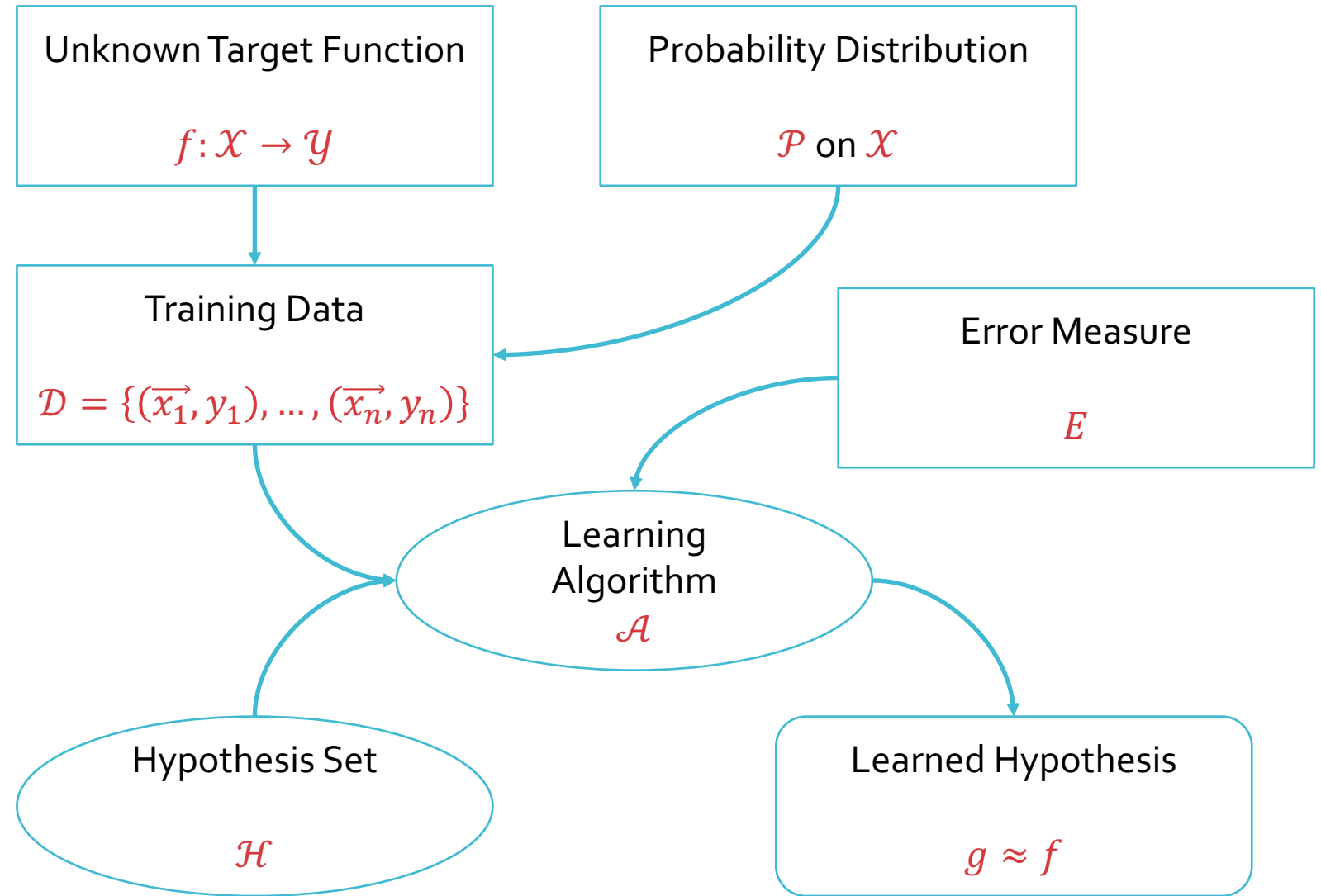
		$f(\vec{x})$	
		+1	-1
$h(\vec{x})$	+1	No error	False positive
	-1	False negative	No error

Error: Classification

Error: Classification

- Fingerprint recognition:
 - Inputs are fingerprints
 - Outputs: +1 means "you", -1 means "not you"

Error



Noise

- The target function is not always deterministic, it is sometimes **stochastic**
- Instead of a target function, a target **distribution**
- Instead of $y = f(\vec{x})$, $P\{y|\vec{x}\}$
 - $y = f(\vec{x}) + \epsilon$ where $\epsilon \sim N(0, \sigma^2)$

Noise

