

## learning

Monday, November 7, 2016 9:51 AM

Finding Patterns in data — and acting on it

## Types of Learning

### • Supervised learning

- Give correct answer for each instance
- Learn a function from examples of inputs/outputs
- Take away the supervision and interpolate to new instances

Data: (examples, answers)

$F(\text{examples}) \rightarrow \text{answers}$

example  $\rightarrow$   $\boxed{f}$   $\rightarrow$  answer

$(\text{example}_1, \text{answer}_1), (\text{example}_2, \text{answer}_2), \dots$

## Types of Learning

### • Unsupervised learning

- No correct answers known (no labeled data)
- Can learn patterns in the input
- Can't learn what to do w/o feedback (don't know whether states are desirable/undesirable)
- But you can learn a probability distribution
- Clustering — dimensionality reduction

DATA:

example<sub>1</sub>, example<sub>2</sub>, ...

## Types of Learning

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- Sometimes you get a reward, sometimes you get punished
- Learn a policy while simultaneously learning how the environment works

Solves an MDP

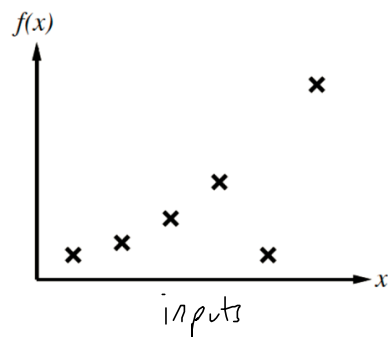
Don't Know  $T(s', a, s)$

- Example: a waiter will learn to prefer certain behaviors because he gets bigger tips
- Exploitation vs. exploration

online vs offline

## Induction

- Example: curve fitting



$$x \rightarrow \boxed{f(x)} \rightarrow y = f(x)$$

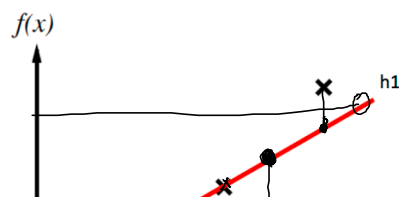
hypotheses

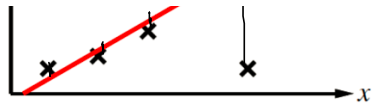
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## Induction

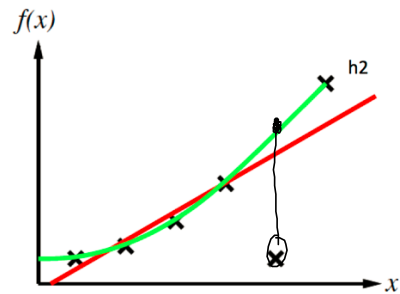
- Example: curve fitting





## Induction

- Example: curve fitting



## Induction

- Example: curve fitting

H is consistent if it agrees with all examples



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## Induction

- Example: curve fitting

Given multiple

consistent hypotheses,  
pick the simplest one

(Ockham's razor)

