

Good News:

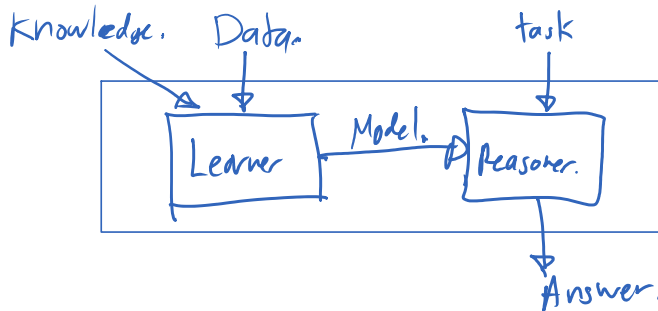
- Test #1 on Thursday
- Agents and Agent Architecture.

Machine Learning

Learning: - improve behavior with experience
 { range
 { accuracy of actions
 { speed

Components: - data: experience from where to learn
 Task: what to learn.

Measure of Improvement: - Is the agent learning.



Common Learning Tasks

• Supervised Classification: - Given a set of pre-classified examples, classify a new instance.

- spam filter

data: spam

e-mail

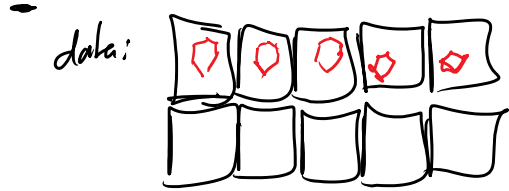
task: given new e-mail
is it spam?

• movie recommender.

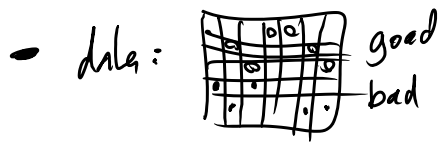
data: history

task: given a movie:
would you like it?

• ..



task: recognize a stop sign.



task: given a board decide if it is good or bad.

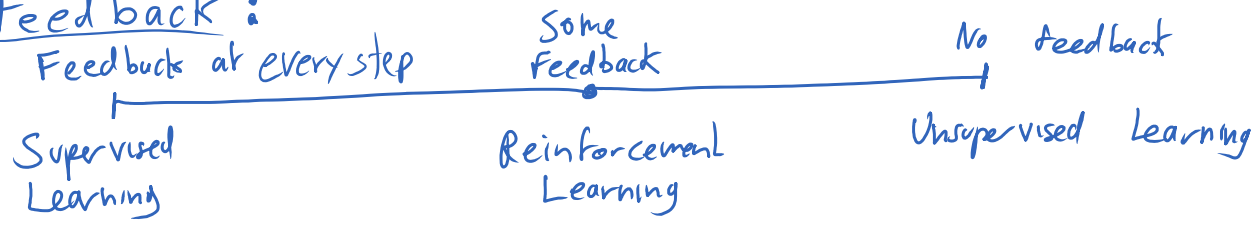
• Unsupervised Learning.
 • Find patterns in data. Clustering.

• Reinforcement Learning:
 • Determine what to do based on rewards and punishments
 Agent is allowed to Act. and finish an "episode"
 - data: win/lose

• Inductive Learning:
 - Logic Programming. Infer. representations from examples.
 data: database of cat informations Infer: all cats have fur

• Statistical Learning:
 Infer: with probability 98% cats have fur.

Feedback:



Online vs Offline Learning:

Offline: - Examples are available to agent before acting.
 Online: - Examples arrive as agent is acting.

Active Learning :- Agent acts to get examples.

Measuring Success:

Success is measured not on the data; but on the task

Representation of Model

Not the data: compact representation:

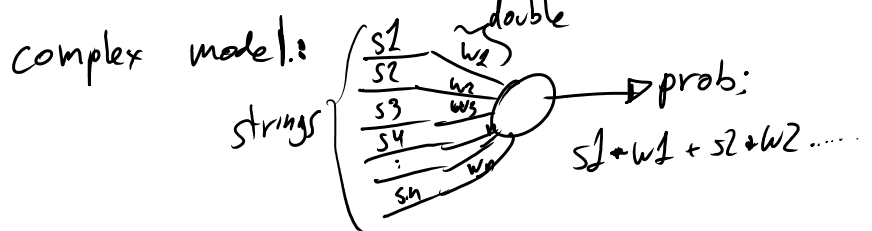
- The richer the model, the more useful, the more difficult to learn.

- DB
- function coef
- Neural Network (Graph)
- Tree
- Logic statements

EX spam classifier

data:  spam
 regular

Simple model: 1 string: "free"



Bias

- the tendency to prefer one hypothesis over another.
- what is a good bias?

Data

- Data isn't perfect
 - Data misses examples.
 - Data can be misclassified
- Overfitting: Agent identifies distinctions that appear in training data, but not in task.



Learning as Search

- Learning Model.
 - Tree
 - Neural Network
 - Graph

Search For Learning Model that is best for task
Search Driven by data.

Learning Algorithm : Search Space.