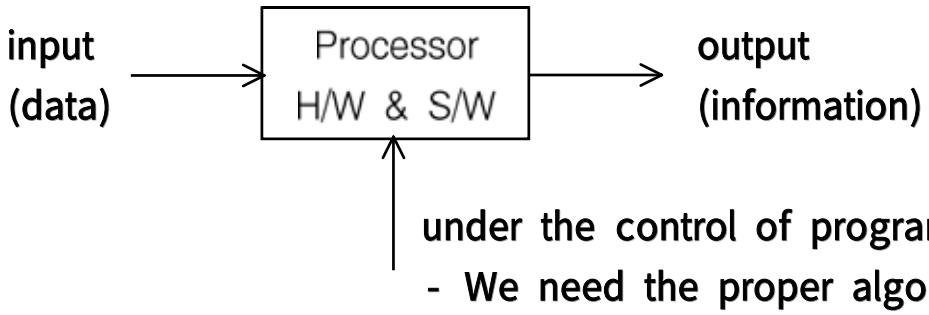
Introduction

- information processing system



1990s software crisis: hard to find out algorithms
(especially related to intelligence)

- machine learning

. programming computers to *learn* instead of finding out algorithms

. definition of learning:
a computer program is said to learn from experience E (data) with respect to some class of tasks T and performance P, if its performance at tasks in T, as measured by P, improves with experience E.

example: learning to recognize spoken words
  task T: recognizing spoken words
  performance measure P: recognition rate
  training experience E: speech data

example: learning to play checkers
  task T: playing checkers
  performance measure P: percentage of games won
  training experience E: playing practice games against itself

- some disciplines related to machine learning:
  artificial intelligence, computational learning theory (COLT), information theory, statistics, psychology and neurobiology, philosophy, etc.,
- design procedure of machine learning system
  Step 1. Choosing the training experience
  Step 2. Choosing the target function
  (what type of knowledge will be learned)
  Step 3. Choosing a representation for the target function
  (functional form of targets)
  Step 4. Choosing a learning algorithm
  Step 5. Measuring the performance and updating the learning system

- some issues in machine learning
  . What algorithms can approximate functions well?
  . How does training examples influence accuracy?
    (sample complexity)
  . What is the upper bounds of general errors for
    a learning system? (generalization bounds)
  . How does noisy data influence accuracy?
  . How can prior knowledge of learner help?
  . What clues can we get from biological learning system?

Reference: Machine Learning, chapter 1.