

Quizzes for today

(Answer in Japanese or English, and submit after the lecture class)

- What is AI as a research area?

- What is Search?

- What are the three MAPs for knowledge acquisition?

- Write one learning model you have heard from the TV or other publications.

Quizzes

- What is the main problem of “random search” ?
- What is the main problem of “search with closed list”?
- How to implement the open list if we want to do breadth-first search?
- What is the relation of uniform-cost search and breadth-first search?

Quizzes

- What is result of uniform cost search?
- What are the advantage and dis-advantage of the best-first search algorithm, compared with the uniform cost search algorithm?
- What condition is needed to guarantee the best solution when we use the A* algorithm?
- Write the definitions of a local optimal solution and the global optimal solution.
 - Local optimal solution:
 - Global optimal solution:

Quizzes of today

- What are the main components of a production system?
 - How to define a “rule” in a production system?
 - What is “forward reasoning” or “forward inference”?
- Try to explain the physical meaning of the LEX strategy for conflicting resolution.
 - Draw an AND/OR tree for the sentence “The man made a desk”

Quizzes of today

- What are the meanings of “node” and “edge” in a semantic network?
- How to define a concept?
- Prove “Fox has sharp teeth” using the semantic network of Fig. 4.4 (p. 79) in the textbook.

- What is the main difference between a semantic network and a frame system?
- What is a demon in a frame system?

Quizzes of today

- The most fundamental proposition is called “P_____ proposition”.
- A primitive proposition, when denoted by a symbol, is an “A_____ formula”.
- Write the double negation (Involution) law:
- Write the distributive law:
- Atomic formula and its negation is called a “L_____”.
- The disjunction of several literals is called a “C_____”.
- Any logic formula can be converted to a Clausal _____.
- To conduct formal proof, it is necessary to have a set of “A_____” and the reasoning rules.
- A provable formula B is denoted by

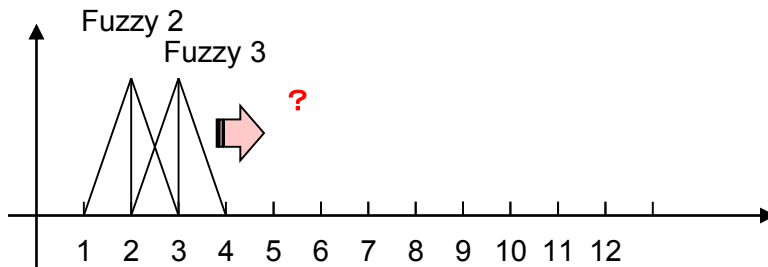
Quizzes of today

- In 1st order predicate logic, [_____]
can be a variable.
 - In predicate logic, the return value of a
function is [_____].
 - To specify the scope of a variable, we
use quantifiers. The universal
quantifier is denoted by [_____].
 - In predicate logic, we have “terms” and
“atomic formulas”. The smallest unit of
a logic formula is [_____].
- We can use [_____]
constant to remove existential
quantifiers in a formula.
 - Unification is used to make two literals
the same form. After unification, we
can derive a resolvent clause from two
[_____] clauses.
 - A Horn clause is a clause with
[_____] positive literal.
 - Prolog is a short of
[_____].

Quizzes for lecture 9

(1) Find the complement set of A given in Example 5.1.

(2) Using the extension principle, find the membership function of “fuzzy 5”, when “fuzzy 2” and “fuzzy 3” are defined below.



(3) Below is a fuzzy rule for controlling a robot based on light sensors.

$R_s : \text{if } (x_1 = \text{VeryBright} \wedge x_2 = \text{VeryBright} \wedge$
 $x_3 = \text{VeryDark} \wedge x_4 = \text{VeryDark})$
 $\text{then}(y = \text{GoForwardQuickly})$

Suppose that the minimum and maximum values of each sensor are 0 and 1024. Try to define the membership functions for the linguistic values VeryBright and VeryDark.



Quizzes of today

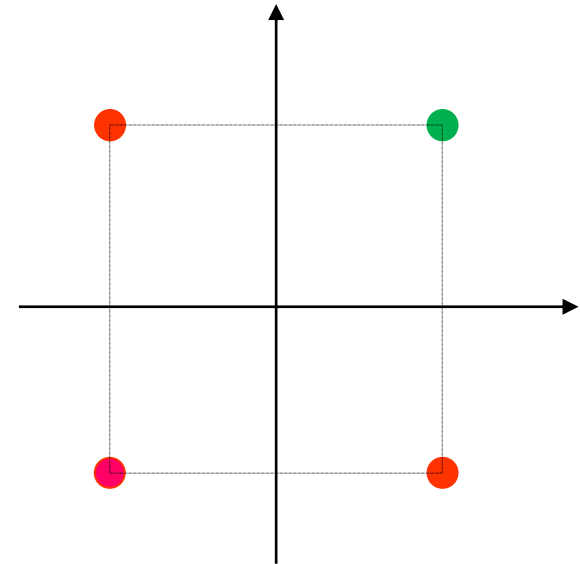
1. What is the purpose of pattern classification?
2. What is the purpose of pattern recognition?
3. For a two-class problem, we usually call the two classes positive and _____.
4. In an NNC, recognition is conducted by finding the _____ of the given pattern x .
5. To reduce the computational cost of an NNC, we can use _____ of each class.
6. If the desired class label is available for each training datum, learning is called _____ learning.
7. If the learner or learning model is determined by a set of parameters, learning is called _____ learning.

Quizzes of today

- KNN is the short for _____ .
- WTA is the short for _____.
- LVQ is the short for_____.
- R4-rule has the following 4 operations:
 - R_____,
 - R_____ ,
 - R_____ , and
 - R_____.
- Try to explain the physical meaning of the WTA algorithm.
- Why KNN is smarter compared with the NNC using all training data?

Quizzes for lecture 12 (1)

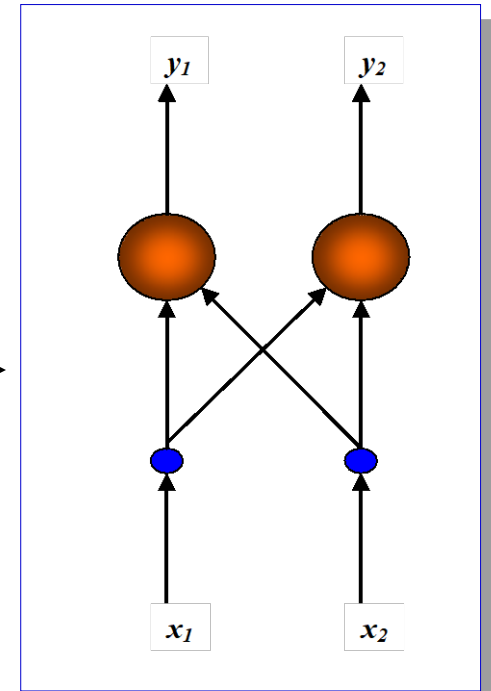
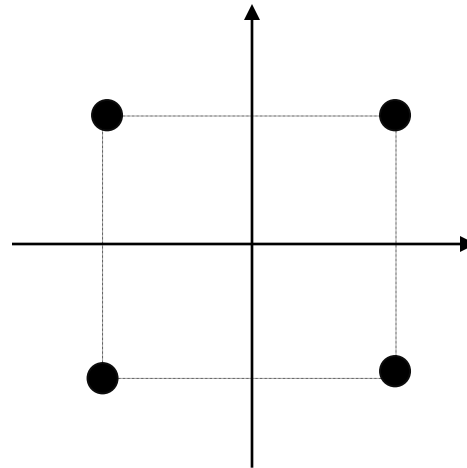
- Find the weights w_1 , w_2 , and w_3 of a neuron for classifying the four vertices of a square into two groups.
- The data and the teacher signals are given below:
 - $(-1,-1), (1,-1), (-1,1), (1,1)$
 - $-1, -1, -1, 1$
- There are infinitely many solutions. Please just provide one solution.



$$w_1x_1 + w_2x_2 - w_3 = 0$$

Quizzes for lecture 12 (2)

- Suppose that the data and their teacher signals are given by:
 - $(-1,-1), (1,-1), (-1,1), (1,1)$
 - $(-1,1), (1,-1), (1,1), (1,1)$
- Find two neurons to solve the problem. Just provide one solution.



$$\text{Neuron1} : w_{11}x_1 + w_{12}x_2 - w_{13} = 0$$

$$\text{Neuron2} : w_{21}x_1 + w_{22}x_2 - w_{23} = 0$$

Quizzes for lecture 13

- A decision tree contains two types of nodes, namely, the non-terminal nodes and _____ or leaves.
- A non-terminal node in a conventional decision tree contains a test function $f(x) = \underline{\hspace{2cm}}$. The left node will be visited when $f(x) < 0$.
- Among the three tasks in decision tree induction, the most important and time consuming one is to split _____.
- Conventional decision trees are also called _____ decision trees (APDTs).
- For complex problems, APDTs may become very large because the test function is too simple. To solve this problem, we can use _____ decision trees.
- An NNTree is a decision tree in which each non-terminal node is a _____.

Quizzes for lecture 14

- To use genetic algorithm we usually encode a solution or individual into a binary string. This string is called genotype of the solution. To evaluate the goodness of the solution, we should decode the genotype to _____. Only genotype evolves during evolution.
- The goodness of a solution is called the _____. We need a method to evaluate the _____ of a given solution. This method may not be given in a closed form formula.
- There are mainly three genetic operations in GA, namely, selection, crossover, and _____. Together they produce new candidate solutions for further evolution. _____ is important for preserving the diversity of the population.
- In PSO, each candidate solution is called a _____. We need to keep the current position and velocity of a _____ in the search process.
- In PSO, each particle learns by itself. There are main two factors for learning. One is the personal factor, and another is _____ factor. The latter is important for “information sharing”.