



الماده مقرر اختياري 2 التاريخ 12 - 1 - 2013

الزمن: 3 ساعه

Try All The Following

**Question 1**

20 Points

Consider the following Datalog knowledge base:

<b>Facts:</b> 1. parent(elizabeth,charles). 2. parent(philip,charles). 3. parent(elizabeth,anne). 4. parent(philip,anne). 5. parent(charles,william). 6. parent(charles,harry). 7. female(elizabeth). 8. male(philip). 9. male(charles). 10. female(anne). 11. male(william). 12. male(harry).	<b>Rules:</b> 13. grandparent(X,Z):- parent(X, Y), parent(Y,Z). 13. grandfather(X, Y) :- grandparent(X, Y) , male(X). 14. grandparent(X, Y) ^ female(X) => grandmother(X, Y). 15. ancestor(X, Y) :-parent(X, Y).  16. ancestor(X, Z) :- parent(X, Y), ancestor(Y, Z).
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A- How to extend your system by building the following rules (write rules in details)  1-Father 2-Mother 3-Son 4-Sister 5-Brother 6-grandparent 7- grandfather	B-Use that rules with the previous knowledge to answer the following and write all the following?  grandfather(philip,harry)? Yes or No Who is son of whom? Who is sister of whom? Who is brother of whom? Who is father of whom? Who is mother of whom? Who is ancestor of whom ?
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8-grandmother	
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**Question 2**

10 Points

Find in details how to apply the following algorithm on the XOR gate implementing the steps with any random values for the weights of the ANN network which will be 2 nodes in the input layers, 2 nodes in the hidden and 1 node in the output layer Assume any missing data?

**XOR Problem :** Exclusive OR operation

Input x1	Input x2	Output	
0	0	0	} Even parity •
1	1	0	
0	1	1	} Odd parity •
1	0	1	

**XOR truth table**

Even parity means even number of 1 bits in the input

Odd parity means odd number of 1 bits in the input

**Perceptron Learning Algorithm**

The algorithm is illustrated step-by-step.

▪ **Step 1 :**

Create a perceptron with (n+1) input neurons  $x_0, x_1, \dots, x_n$ , where  $x_0 = 1$  is the bias input.

Let  $o$  be the output neuron.

▪ **Step 2 :**

Initialize weight  $W = (w_0, w_1, \dots, w_n)$  to random weights.

▪ **Step 3 :**

Iterate through the input patterns  $x_j$  of the training set using the weight set; ie compute the weighted sum of inputs  $net\ j = \sum_{i=1}^n x_i w_i$  for each input pattern  $j$ .

■ **Step 4 :**

Compute the output  $y_j$  using the step function|

$$y_j = f(\text{net}_j) = \begin{cases} 1 & \text{if } \text{net}_j \geq 0 \\ 0 & \text{if } \text{net}_j < 0 \end{cases} \quad \text{where } \text{net}_j = \sum_{i=1}^n x_i w_{ij}$$

■ **Step 5 :**

Compare the computed output  $y_j$  with the target output  $y_j$  for each input pattern  $j$ .

If all the input patterns have been classified correctly, then output (read) the weights and exit.

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■ **Step 6 :**

Otherwise, update the weights as given below :

If the computed outputs  $y_j$  is 1 but should have been 0,

Then  $w_i = w_i - \alpha x_i$ ,  $i = 0, 1, 2, \dots, n$

If the computed outputs  $y_j$  is 0 but should have been 1,

Then  $w_i = w_i + \alpha x_i$ ,  $i = 0, 1, 2, \dots, n$

where  $\alpha$  is the learning parameter and is constant.

■ **Step 7 :**

goto step 3

■ **END**

Question 3

15 Points

Try the following as possible as you can?

A-A calculator company produces a scientific calculator and a graphing calculator. Long-term projections indicate an expected demand of at least 100 scientific and 80 graphing calculators each day. Because of limitations on production capacity, no more than 200 scientific and 170 graphing calculators can be made daily. To satisfy a shipping contract, a total of at least 200 calculators must be shipped each day. If each scientific calculator



sold results in a \$2 loss, but each graphing calculator produces a \$5 profit, how many of each type should be made daily to maximize net profits?

B-A building supply has two locations in town. The office receives orders from two customers, each requiring  $\frac{3}{4}$ -inch plywood. Customer A needs fifty sheets and Customer B needs seventy sheets. The warehouse on the east side of town has eighty sheets in stock; the west-side warehouse has forty-five sheets in stock. Delivery costs per sheet are as follows: \$0.50 from the eastern warehouse to Customer A, \$0.60 from the eastern warehouse to Customer B, \$0.40 from the western warehouse to Customer A, and \$0.55 from the western warehouse to Customer B. Find the shipping arrangement which minimizes costs.

C-You have \$12,000 to invest, and three different funds from which to choose. The municipal bond fund has a 7% return, the local bank's CDs have an 8% return, and the high-risk account has an expected (hoped-for) 12% return. To minimize risk, you decide not to invest any more than \$2,000 in the high-risk account. For tax reasons, you need to invest at least three times as much in the municipal bonds as in the bank CDs. Assuming the year-end yields are as expected, what are the optimal investment amounts?

#### Question 4

25 Points

- A- Explain the concept of optimization supporting your answer with examples?
- B- What is the architecture of the Artificial Neural Network explain the concept behind it and also learning phase supported with examples?
- C- What it means Expert System, Explain in details its components, applications examples?