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TE COMPS A4

15/12/21

AI
TT2

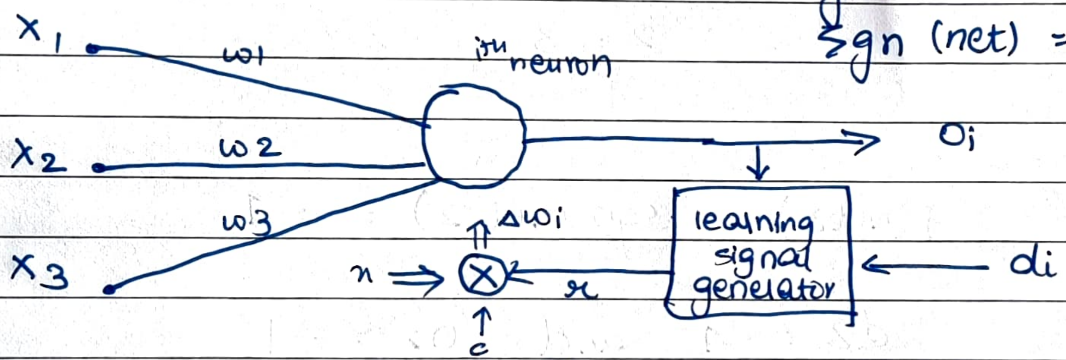
Q1

$w = [1, -1]$
$d = [1 \quad -1 \quad 1]$
$x_1 = [1 \quad -2]$
$x_2 = [2, \ 3]$
$x_3 = [1, -1]$

$c = 1$

∴ we use bipolar function

$sgn(net) = \begin{cases} +1 & net \\ -1 & net \end{cases}$




Step 1: $x_1 = [1 \quad -2]$

$net_1 = w_1 x_1$

$= [1 \quad -1] \begin{bmatrix} 1 \\ -2 \end{bmatrix}$

$= 1 + 2$

$= 3$

$f(net_1) = sgn(3) = 1$

$d_1 = 1$ and $o_1 = 1$

$\therefore \Delta w_1 = 0$

$w_2 = w_1 + \Delta w_1$
$= [1 \quad -1]$

step 2 : $x_2 = [2 \quad 3]$

$net\ 2 = w_2 x_2$
$= [1 \quad -1] \begin{bmatrix} 2 \\ 3 \end{bmatrix}$
$= 2 - 3$
$= -1$

$f(net2) = sgn\ (net\ 2) = -1$

$d2 = -1$ and $o_2 = -1$
$\Delta w_2 = 0$

$w_3 = w_2 + \Delta w_2$
$= [1 \quad -1]$

step 3 : $x_3 = [1 - 1]$
$net\ 3 = w_3 x_3 = [1 \quad -1] \begin{bmatrix} 1 \\ -1 \end{bmatrix} = 1 + 1 = 2$

$f(net\ 3) = sgn(net\ 3) = 1$
$d3 = 1$ and $o_3 = 1$
$\therefore \Delta w_3 = 0$
$w_4 = w_3 + \Delta w_3 = [1 \quad -1]$




$w_4 = [1 \quad -1]$ //

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Q2

(i) To prove $f'(net) = o(1-o)$
→

let $o = f(net)$

$$= \frac{1}{1 - exp(-\lambda net)}$$

Assume $\lambda = 1$

$$o = f(net)$$

$$= \frac{1}{1 - exp(-net)}$$

$$LHS = f'(net)$$

$$= \frac{d}{d(net)}\left[\frac{1}{1 + exp(-net)}\right]$$

$$= \frac{-1 \frac{d}{d(net)}[1 + exp(-net)]}{[1 + exp(-net)]^2}$$

$$= \frac{-(-exp(-net))}{(1 + exp(-net))^2}$$

$$= \frac{exp(-net)}{[1 + exp(-net)]^2}$$

$$RHS = o(1-o) = \frac{1}{1 + exp(-net)}\left[1 - \frac{1}{1 + exp(-net)}\right]$$

$$= \frac{1 + exp(-net) - 1}{(1 + exp(-net))^2} = \frac{exp(-net)}{[1 + exp(-net)]^2}$$

$\because$ LHS = RHS

Hence Proved $f'(net) = o(1-o)$

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(ii) To prove $f'(net) = (1-o^2)/2$ [Bipolar continuous]

→

$$o = f(net) = \frac{2}{1+\exp(-\lambda net)} - 1$$

Assume $\lambda = 1$

$$\therefore o = f(net) = \frac{2}{1+\exp(-net)} - 1$$

$$LHS = f'(net)$$

$$= \frac{d}{d(net)}\left[\frac{2}{1+\exp(-net)} - 1\right]$$

$$= \frac{d}{d(net)}\left[\frac{2}{1+\exp(-net)}\right] - 0$$

$$= 2\frac{d}{d(net)}\left[\frac{1}{1+\exp(-net)}\right]$$

$$= 2\left[\frac{-\frac{d}{d(net)}(1+\exp(-net))}{(1+\exp(-net))^2}\right]$$

$$= \frac{-2(-\exp(-net))}{(1+\exp(-net))^2} \longrightarrow (i)$$

$$RHS = \frac{1}{2}(1-o^2) = \frac{1}{2}\left[1 - \left\{\frac{2}{1+\exp(-net)} - 1\right\}^2\right]$$

$$= \frac{1}{2} - \frac{1}{2}\left[\frac{2}{1+\exp(-net)} - 1\right]^2$$

$$= \frac{1}{2} - \frac{1}{2}\left[\frac{4}{(1+\exp(-net))^2} - 2\,\frac{2}{1+\exp(-net)} + 1\right]$$

$$= \frac{-2}{(1+\exp(-net))^2} + \frac{2}{1+\exp(-net)}$$

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$$= 2\left[\frac{-1 + (1 + \exp(-net))}{(1 + \exp(-net))^2}\right]$$

$$= \frac{2 \exp(-net)}{(1 + \exp(-net))^2} \longrightarrow \text{(ii)}$$

From equations (i) and (ii)
we get LHS = RHS

Hence proved $f'(net) = \frac{1}{2}(1 - o^2)$.

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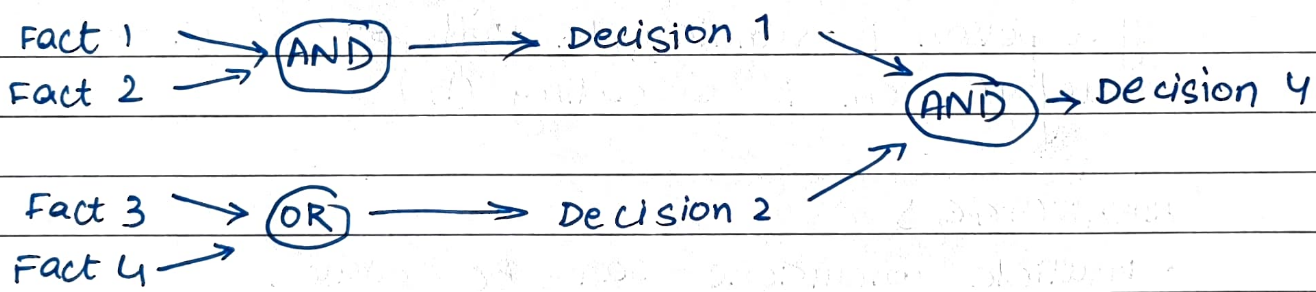
Q4

ANS Forward chaining is a method of reasoning in artificial intelligence in which inference rules are applied to existing data to extract additional data until an endpoint goal is achieved.

In this type of chaining, the inference engine starts by evaluating existing facts, derivations, and conditions before deducing new information. An endpoint goal is achieved through the manipulation of knowledge that exists in the knowledge base.




Properties

- Process uses a down-up approach
- It starts from an initial state and uses facts to make conclusion
- Apprach is data-driven
- It is employed in expert systems and production rule system

Example :

A

A → B

B

A is the starting point. A → B represents a fact. This fact is used to achieve a decision B.

Example 2:

Tom is running (A)

If a person is running, he will sweat (A → B)

therefore, Tom is sweating (B)

ADVANTAGES

- Multiple conclusions can be drawn
- It provides a good basis for arriving at conclusions
- It is more flexible that backward chaining because it does not have a limitation on the data derived from it

DISADVANTAGES

- It is time consuming.
- the explanation of facts or observations is not very clear