Sameep Dhakal
ACE074BCT063

Subject: AI.

Q. NO. 1 ⇒.

Solution:

Step 1: Converting given sentences into predicate logic.

1. $\forall x \forall y \forall z$ (American$(x) \wedge$ weapon$(y) \wedge$ sells$(x, y, z) \wedge$ Hostile$(z) \Rightarrow$ Criminal(x)

2. Enemy (XYZ, America).

3. $\exists x$ [Owns (XYZ, x) $\wedge$ Missile (x).]

4. $\forall x$ (Missile$(x) \wedge$ Owns (XYZ, x) $\Rightarrow$ sells(Donald, x, XYZ)

5. $\forall x$ [Missile$(x) \Rightarrow$ ~~Missile$(x) \Rightarrow$~~ weapon (x)] ~~$\Rightarrow$ Missile(x)~~].

6 $\forall x$ [Enemy $(x$, America) $\Rightarrow$ Hostile (x)]

7 American (Donald)

Step 2: Converting to CNF.

Step 2.1. Eliminate implications.

1. $\forall x \forall y \forall z$ ($\neg$ [American $(x) \wedge$ weapon $(y) \wedge$ sells $(x, y, z) \wedge$ Hostile $(z) \Rightarrow \vee$ criminal (x)

2

3.

5 $\forall x$ Missile$(x) \vee$ weapon (x).

6. $\forall x \neg$ Enemy $(x$, America) $\vee$ Hostile (x).

Step 2.2. Drop quantifiers and move negation inwards.

1. ¬American(x) ∨ ¬weapon(y) ∨ ¬Sells(x, y, z) ∨ ¬Hostile(z) ∨ Criminal(x).

2. Owns(~~x, y,~~ XYZ, x) ∧ Missile(x).

3 Enemy(XYZ, America)

4. ¬Missile(x) ∨ ¬Owns(XYZ, x) ∨ Sells(Donald, x, XYZ)

5. ¬Missile(x) ∨ weapon(x).

6. ¬Enemy(x, AMERICA) ∨ Hostile(x).

7. American(Donald).

Step 3: Flation Nested conjuctions and disjunction and standarize variables apart -

1. ¬American(x_1) ∨ ¬weapon(y_1) ∨ Sells(x_1, y_1, z_1) ∨ ¬Hostile(z_1) ∨ Criminal(x_1)

2. a. Owns(XYZ, x_2)
   b. Missile(x_3)

3. Enemy(XYZ, America).

4 ¬Missile(x_4) ∨ ¬Owns(XYZ, x_4) ∨ Sells(Donald, x_4, XYZ)

5. ¬Missile(x_5) ∨ weapon(x_5).

6. ¬Enemy(x_6, America) ∨ Hostile(x_6)

7. American(Donald).

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Step4: Assert Negation of Goal.

¬ Criminal (Donald)

Resolution Proof Tree:

¬ Criminal (Donald).

1. ¬American(x_1) v ¬weapon(y_1) v ¬sells (x_1, y_1, z_1) ¬ Hostile (z_1) v Criminal (x_1)

{ x_1 / Donald }.

¬ American (Donald) v ¬ weapon(y_1) ¬ sells (Donald, y_1, z). ¬ Hostile (z)

3. ¬ American (Donald).

¬ weapon (y_1) ¬ sells (Donald, y_1, z) ¬ Hostile (z).

[y_1 / Missile, z_1 / xyz]

4. ¬ Missile (x_4) v ¬ Owns (xyz, x_4) v sells (Donald, x_4, xyz).

¬ weapon (Missile) ¬ Hostile (xyz) v ¬ Missile (x_4)

5. ¬ Missile (x_3) v weapon (x_3)

¬ Missile (x_3) ¬ Hostile (x_3, y, z) v ¬ Missile (z)

6.

¬ Enemy (xyz, America) ¬ Missile (x_3) v ¬ Missil

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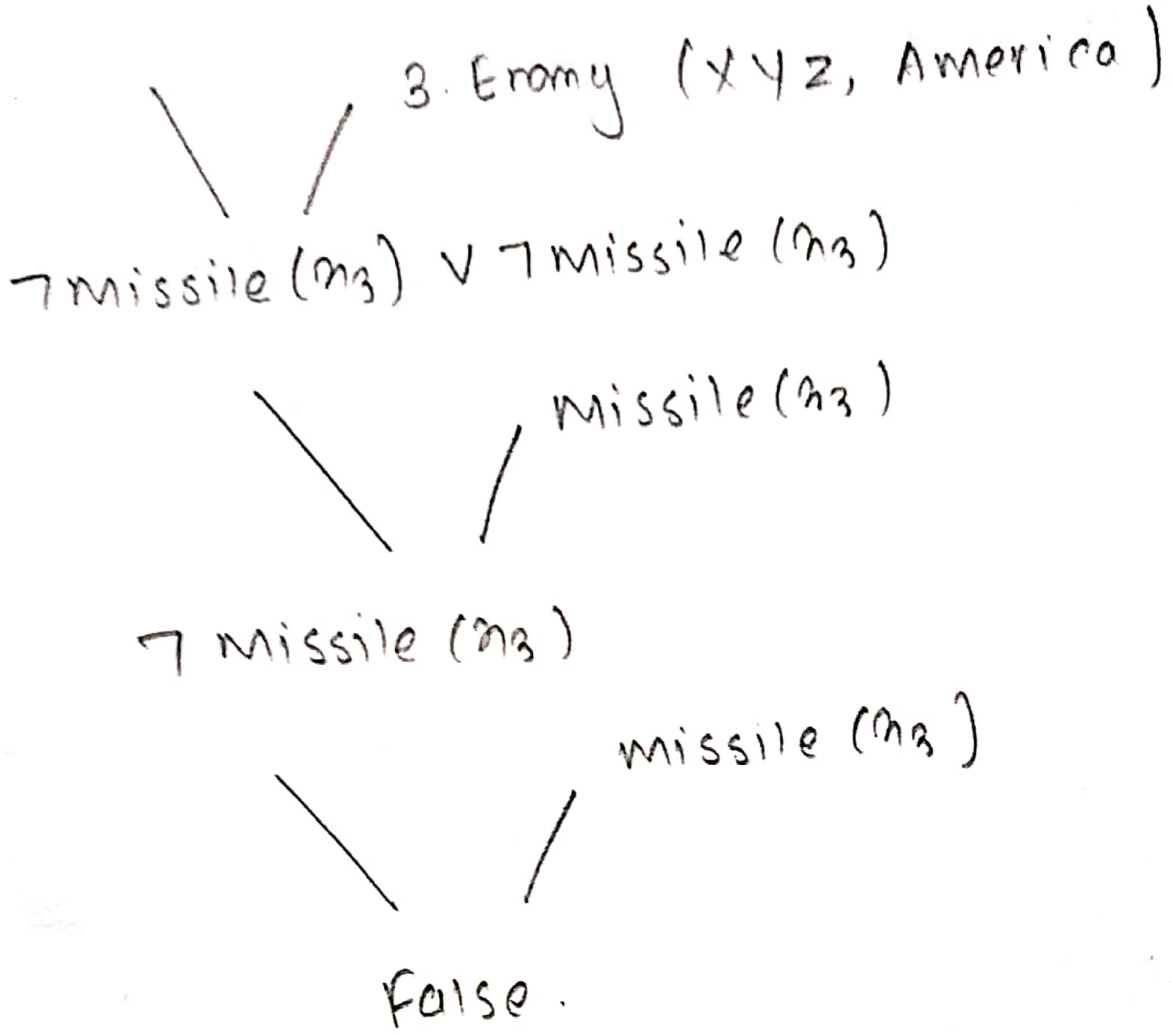
Subject:



Thus by contradiction Donald is a criminal.

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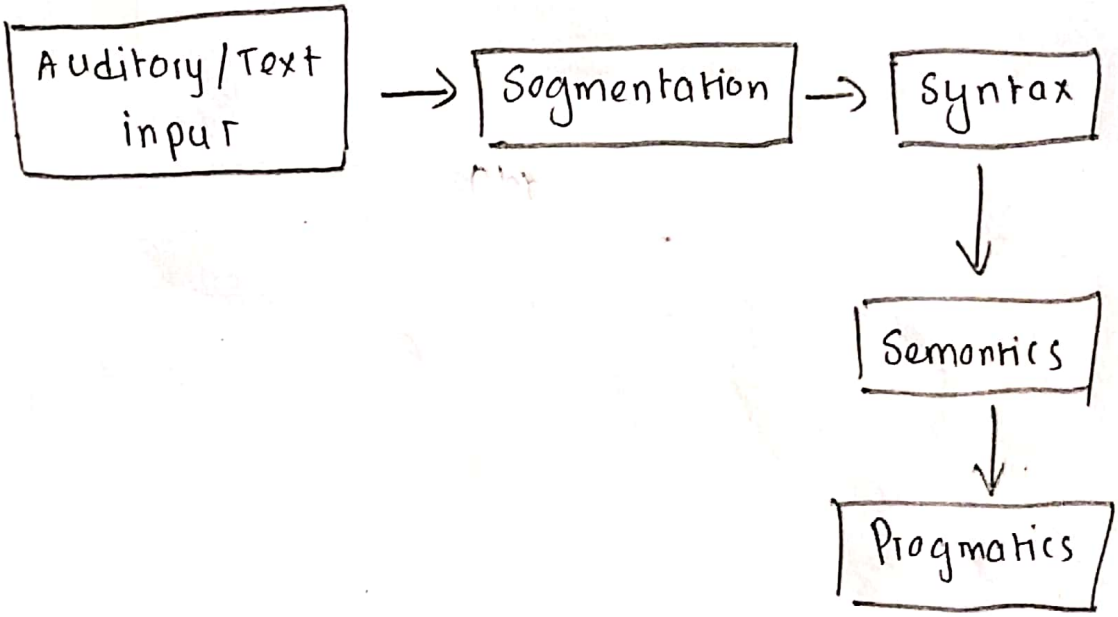
Subject:

Q.No. 2 =>.

Natural language Processing is a subfield of linguistics, computer science and artificial intelligence concerned with interactions between computers and human language, in particular how to program computers to process and analyze large amount of natural language data.

Steps in Natural language Processing.



1) Input.

The input can be written as text or speech.

2) Segmentation.

Text inputs are divided into segments and segments are analyzed.

Syntatic Analysis.

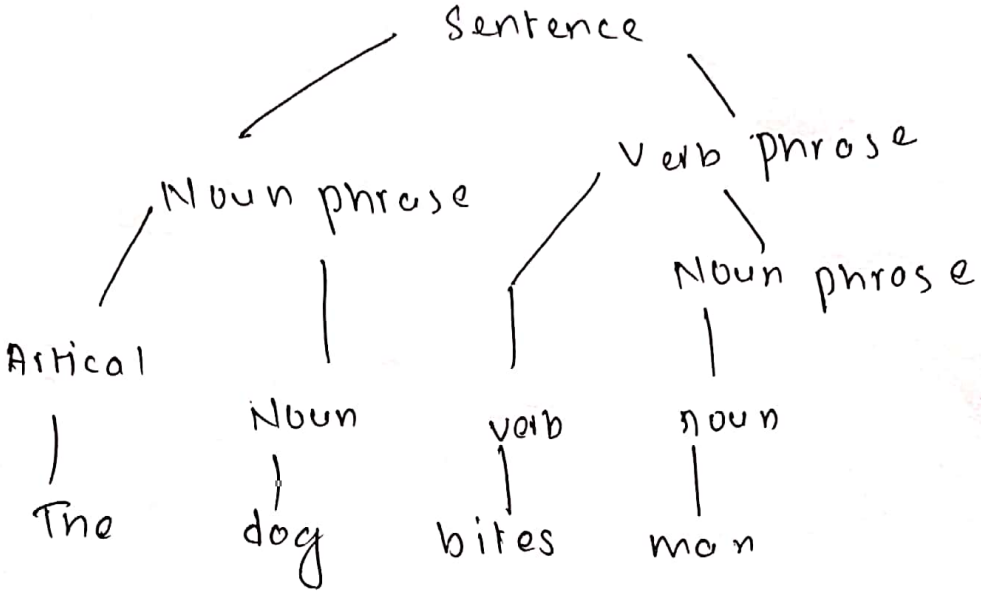
→ It takes input sentence and produces a representation of its gramatical structure

Sentence ↔ noun – phrase verb – phrase.

6. Article ↔ a.

7 noun ↔ man

etc



Semantic analysis.

It is process of converting syntanc representation into a meaning representation.

- word sense determine
- sentence level analysis.

word sens!

bat = "baseball bat"

bat = "flying mammal"

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Subject:

Sentence level.
She saw duck

* Pragmatic
Comprises aspects of meaning that depend upon context or upon facts about real world.
~~Those include~~.
eg.
Jack fell, Jill brought him and band-aid
Jack got hurt and Jill wanted to help.

Major issues in NLP.
1) The same expression mean different things.
where is water? (Chemistry lab? Must be pure)
where is water? (Thirsty? must be drinking)

2). NLP can't be complete because of new words.

3). There are lot of ways to say same thing.
- Ram was born on october 11
- Ram's birthday is october 11.

4. Use of gramatically incorrect sentence
Ma rice eats.

Threshold value

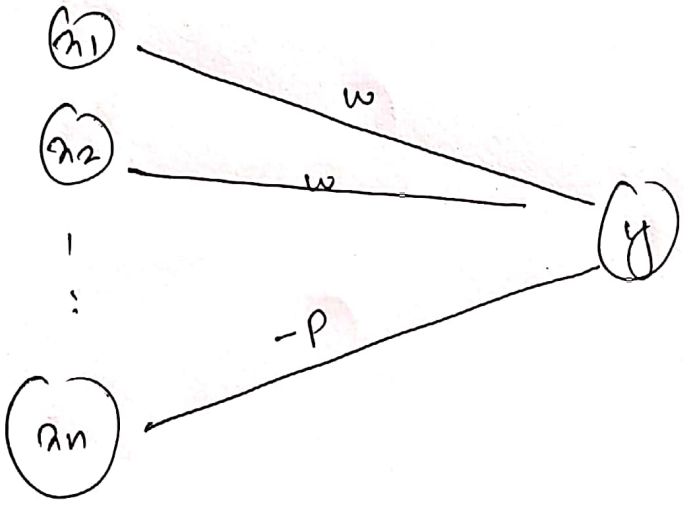
Samoep dhakol

Q. No. 4.

It is very well known that the most fundamental unit of deep neural network is called artificial neuron / perceptron. Mc Cullon - Pitt neural net is considered to be first neural network.

Realisation ~~of AND Gate~~

Architecture



Activation function

$$f(y_{in}) = \begin{cases} 1 & \text{if } y\text{-in} > \theta \\ 0 & \text{if } y\text{-in} < \theta \end{cases}$$

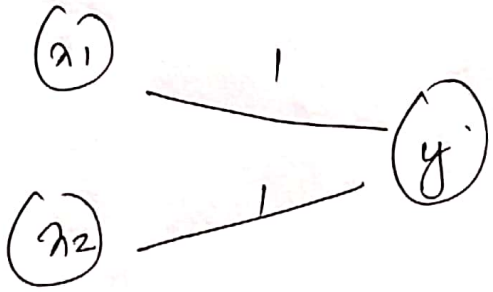
3rd lost

McCulloch-Pitts Nets of for And function

AND Gate:

A	B	y
0	0	0
0	1	0
1	0	0
1	1	1

implemontation



The threshold value is 2.

Net input $y_n = A + B$

Output is given by $Y = f(y_{in})$.

Activation fn $= \begin{cases} 1 & \text{if } y_n \geq 2 \\ 0 & \text{if } y_{in} < 2 \end{cases}$

Results:

weight $w_1 = 1$

$w_2 = 1$

theta $= 2$.

Output of	Net
0	0
0	0
0	1

Mccullon-pitts Nels of for And function

weights of Neuron

1

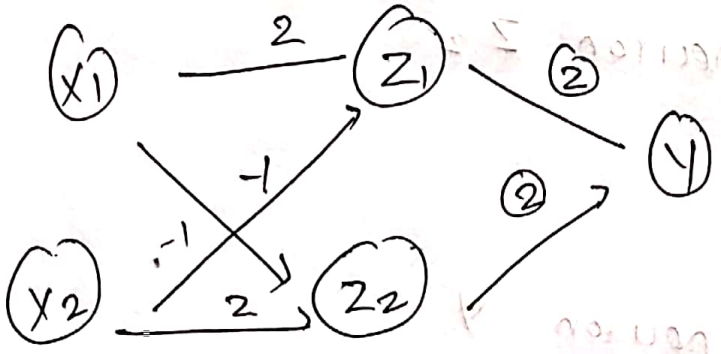
1

Threshold value

2

XOR gate:

x_1	x_2	y
0	0	0
0	1	1
1	0	1
1	1	0



Threshold fn = $y = f(y_{in}) = \begin{cases} 1 & \text{if } y_{in} \geq 1 \\ 0 & \text{if } y_{in} < 1 \end{cases}$

Subject:

Q. NO. 8 =>

A hopfiod network is a foim of recurrent orhificial neural network invented by John hopfied

They are gurantoed to converge to local minimum, but convergence to a false pattern (wrong local minimum) rather than stored pattern (expected local minimum) can occour. Hopefeild networks also provide a model for understanding human memory.

- The hopefeild neural network is perhaps the simplest of neural networks. The hopefeild neural networks is fully connected single layer auto associative network. This means it has one single layer, with each neuron connected to every other neuron.

- The units of in hopefeild network are binary threshold units i.e. the units only whether or not the units input exceeds their threshold. Hopfield nets normally have units that takes on value of 1 or -1

- Hopfeild network consists of a set of N interconnected neurons which update their activition values asynchronously and independent of other neurons.

Single layer n neuron Hopfield network

Primary application of the hopfeild network is an associative memory. Weights of the connections between the neurons have to be such that it corresponds to some patterns

- The net input value $s_k(t+1)$ of a neuron cycle $t+1$ is a weighed sum

$$s_k(t+1) = \sum_{j \neq k} y_j(t) w_{jk} + \theta_k$$

$$y_k(t+1) = \begin{cases} +1 & \text{if } s_k(t+1) > \theta_k \\ -1 & \text{if } s_r(t+1) < \theta_k \end{cases}$$