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Course: CSE440

Final Exam

Ans. to the Q. No. - 1

a) $(p \to q) \leftrightarrow (\neg q \to \neg p)$

p	¬p	q	¬q	p→q	¬q→¬p	$(p \to q) \leftrightarrow (\neg q \to \neg p)$
F	T	F	T	T	T	T
F	T	T	F	T	F	T
T	F	F	T	F	F	T
T	F	T	F	T	T	T

b) Animals are giraffes (G)
Animals are 15 feet or higher (F)
Animals are in the zoo (Z)
Animals belongs to me (M).

R1: There is no Animal less than 15 feet where all animal are giraffe

$\neg G \to \neg F$

R_2: All animals belong to me.

$2 \rightarrow M$

R_3: $M \rightarrow F$

So, $2 \rightarrow G$

[The inference rules used are in

R_2, R_3:

$2 \rightarrow M$ and $M \rightarrow F$

[by hypothetical syllogism]

$2 \rightarrow F$ is obtained

Then, from R1:

$\neg G \rightarrow \neg F$

[by taking contrapositive]

$M \rightarrow F$ is obtained

Then, from $M \rightarrow F$ and $2 \rightarrow F$

[by hypothetical syllogism]

$2 \rightarrow G$ is obtained.

Ans. to the Q. NO.-02

a) Premises

Mother (Lulu, Fifi)

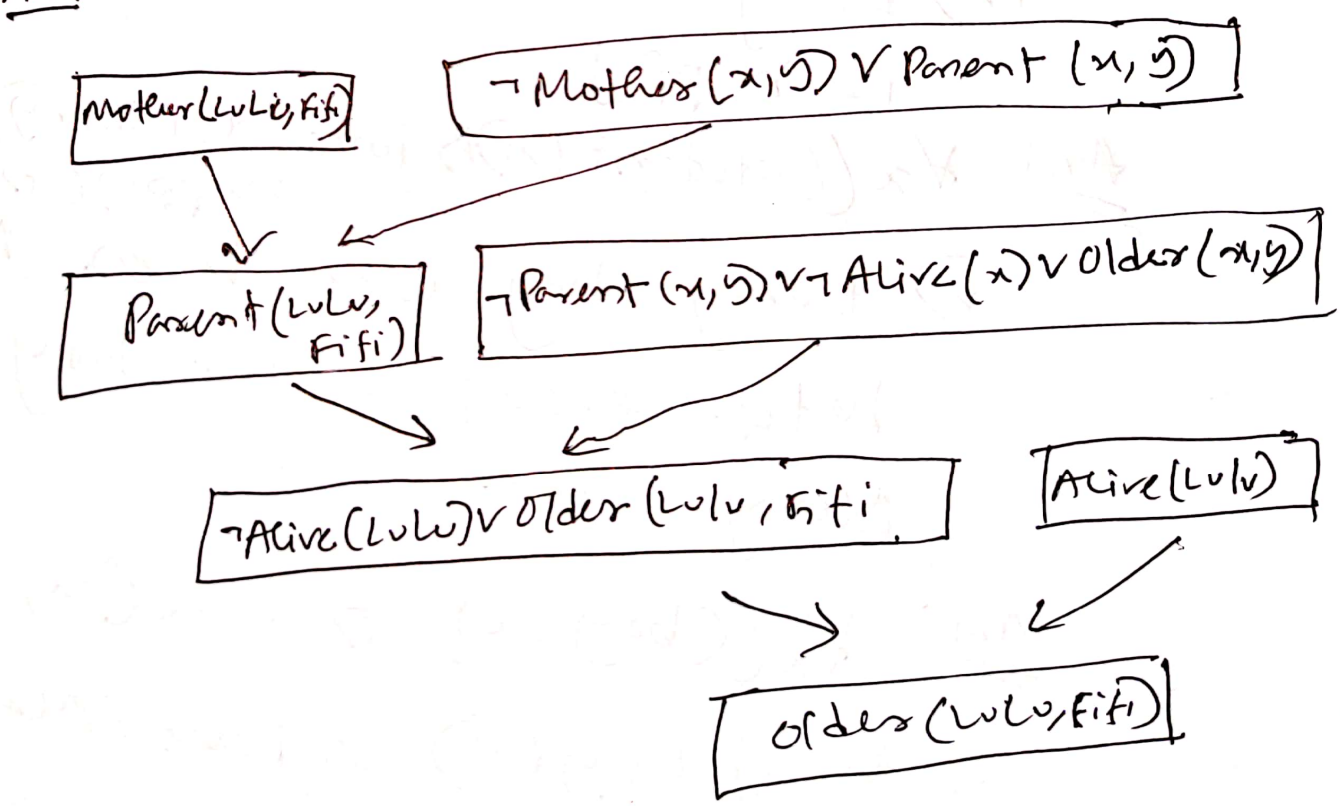
Alive (Lulu)

$\forall x \forall y$. Mother $(x, y) \Rightarrow$ Parent (x, y)

$\forall x \forall y$ (Parent $(x, y) \wedge$ Alive $(x) \Rightarrow$ older (x, y)

Prove: older (Lulu, Fifi)

Ans:



b)

i) Mary loves everyone.

Ans: $\forall x \, love(Mary, x)$

ii) Every student smiles

Ans: $\forall x (student(x) \rightarrow smile(x))$

iii) Every student except George smiles

Ans: $\forall x ((student(x) \wedge x \neq George) \rightarrow smile(x))$

iv) Every student who loves Mary is happy

Ans: $\forall x ((student(x) \wedge love(x, Mary)) \rightarrow happy(x))$

v) Every boy who loves Mary hates every other boy who Mary loves.

Ans: $\forall x ((boy(x) \wedge love(x, Mary)) \rightarrow \forall y ((boy(y) \wedge love(Mary, y) \wedge y \neq x) \rightarrow hate(x, y)))$

Ans. to the Q. No. - 3

a) Supervised learning vs Unsupervised learning:

Supervised learning: Supervised learning collects the data then produce a data from previous. From previous data it helps to optimize decision. It helps to solve many real world problems. Example: Decision Tree, Neural networks, we can observe weather condition.

Unsupervised learning: Unsupervised learning finds all kind of unknown pattern in data. Unsupervised methods help to find out features which can be useful for categorization. It is easier to get unlabeled data from a computer than labeled data. Example: finding customer Segments.

Over fiting problem: Over fitting problem refers to model that model the training data perfetly In the decision tree, some attribute are irrelevant to decision - making process, for example, In student exam marks, there are student income attributes, which is irrelevant. ~~for this~~ this noisy data need to remove. for fix overfitting problem, we can use cross-validation and pruning lower nodes.

pruning lower nodes:

pre Pruning: stop growning before a fully grown tree that means, in the decision tree, if there will be more random-ness than others than we pruning this attribute.

Post pruning: If we see that there has been more random ness that we pruning the attribute then choice this attribute

b) Entropy is a measure of disorder or impurity. Entropy is used in ID3 algorithm because -

We select the atribute based on Gain(S, Ai), where,

$$Gain(S, A_i) = H(S) - \sum_{v \in values(A_i)} P(A_i - v)\, H(S_v)$$

In this gain we subtract others randomness from total entropy. So, we can classify the target attribute.

The entropy is high then the randomness of collection is high

$$Entropy(S) = -P_+ \log_2 P_+ - P_- \log_2 P_-$$