

AIAssignment-2

Q1

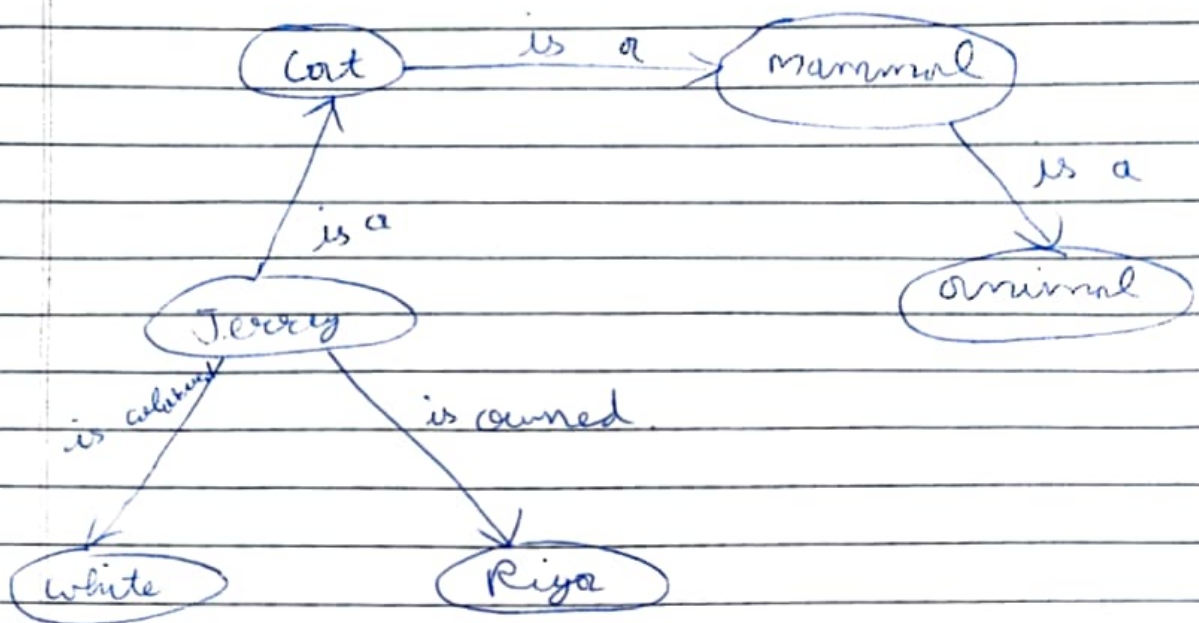
Ans i) Semantic Networks:

A semantic network is a graphic notation for representing knowledge in patterns of interconnected nodes. It became popular in patterns of popular in Artificial Intelligence and Natural Language Processing only because it knowledge or support reasoning. These acts as another alternative for predicate logic in a form of knowledge representation.

This network consists of nodes representing objects and arcs which describe the relationship between these objects. which describe the semantic network categorize in different forms and can also link these objects. This network are easy to understand and can be easily extended.

Example

- Terry is cat
- Terry is mammal
- Terry is owned by Riya
- Terry is white coloured
- All mammals are animal



ii) The semantic web makes use of RDF and OWL which occur in 2 layers as follows.

RDF is acronym for Resource Description Framework which is special type of framework work found online that is related with representation of online exchange of data.

OWL is acronym for Ontology Web Language which is special language used in description of ontologies online.

RDF allows expression of relationship between things while OWL is similar but bigger letter and heavier. Some other major differences are Vocabulary, logical consistency and Annotations / metadata.

OWL gives such variety of annotation unlike RDF, which OWL satisfies.

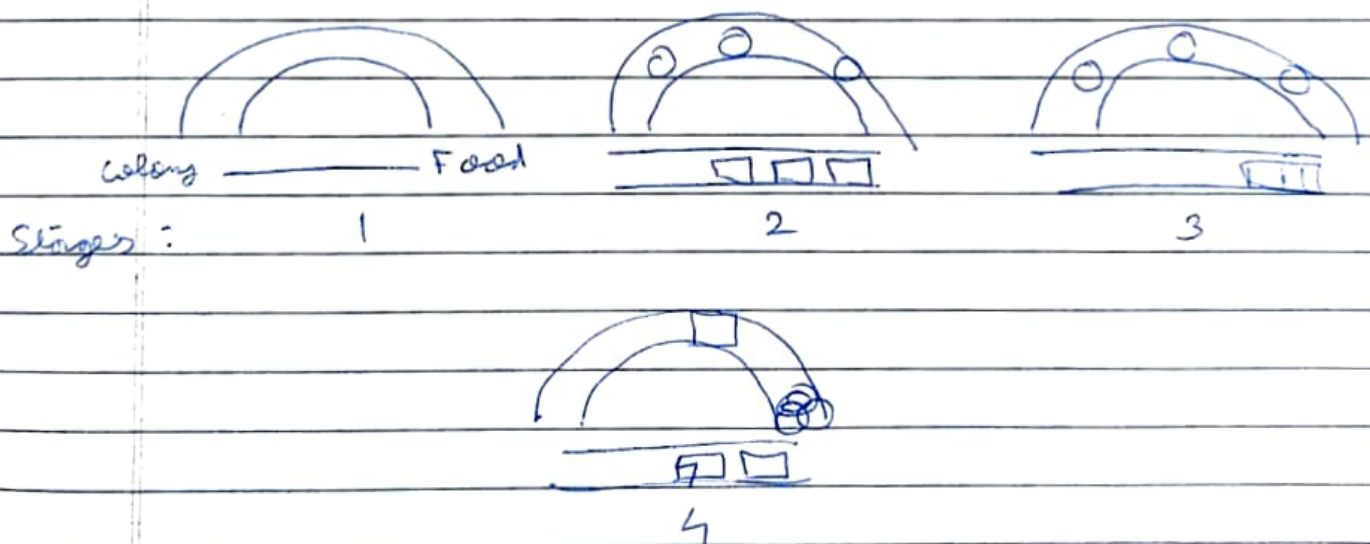
all metadata modelling needs.

Q2)

Ans Ant Colony Optimisation is a popular 3/7

based metaheuristic that can be used to find approximate solutions to difficult optimisation problems.

In ant colony optimisation a set of software agents called artificial ants search for good solutions to given optimisation problem. These ants incrementally build solutions by moving on weight. The solution construction process is clockwise and is based on pheromone model, that is, set of parameters associated with graph components.



Ants all are in rest. There is no pheromone contention anymore. Ants begin



to search with equal probability. More ants return via shorter path. Therefore whole colony gradually uses shorter path.

Q.3 >

Ans Unification is process of making 2 different logical atomic expressions identical by finding a substitution. It depends on substitution process.

It takes literals as inputs and makes them identical using substitution.

Let  $\psi_1$  &  $\psi_2$  be 2 atomic sentences

that  $\psi_1 \sigma = \psi_2 \sigma$  then it can be expressed as

Unify ( $\psi_1, \psi_2$ )

For example:

Find MGU for Unify (King(x), King(John))

Let  $\psi_1 = \text{king}(x)$        $\psi_2 = \text{king}(\text{John})$

substitution  $\sigma = \{\text{John}/x\}$  is a unifier for these atoms and applying this substitution on both expression will be

identical. Unification is key component of all first order inference. It returns fail if expression don't match with each other. Substitution variables are called as Most general unifier MGU.

Q4

Ans Bayesian belief network is key computer technology for dealing with probabilistic events to solve a problem which has uncertainty.

A Bayesian Network can be defined as follows

'A probabilistic graphical model which represents set of variables and their conditional dependence using a directed acyclic graph'

Bayesian network are probabilistic because these network are built from a probability distribution and also use probability theory for prediction and anomaly detection.

It can also be used in various tasks including prediction, diagnosis, outcome, insight, reasoning, time series prediction and decision making under uncertainty.

Bayesian network can be used for building models for data and experts opinions.

It consist 2 parts:

Directed Acyclic graph.

Table of Acyclic Conditional Probability

The generalized form of Bayesian network.

represents and solves problems under certain knowledge is called Influence dig.



Q5

Ans Fuzzy refers to something that is vague. Here Fuzzy set is a set whose every key is associated with value which is between 0 to 1 based on uncertainty. This value is often called as degree of membership. Fuzzy set is denoted with a tilde sign on top of the normal set.

Fuzzy set operations:

1) Union:

$$\text{degree-of-membership}(Y) = \max(\text{degree-of-membership}(A), \text{degree-of-membership}(B))$$

For example:

$$A = \{ 'a': 0.2, 'b': 0.3, 'c': 0.6 \}$$

$$B = \{ 'a': 0.9, 'b': 0.9, 'c': 0.4 \}$$

$$Y = \{ 'a': 0.9, 'b': 0.9, 'c': 0.6 \}$$

2) Intersection:

$$\text{degree-of-membership}(Y) = \min(\text{degree of membership of } X \text{ and } Y)$$

For example:

$$A = \{ 'a': 0.2, 'b': 0.3 \}$$

$$B = \{ 'a': 0.9, 'b': 0.9 \}$$

$$Y = \{ 'a': 0.2, 'b': 0.3 \}$$

(6)

### 3) Complement

$$\text{degree-of-membership}(Y) = 1 - \text{degree-of-membership}(A)$$

For example:

$$A = \{ 'a': 0.2, 'b': 0.3 \}$$

$$Y = \{ 'a': 0.8, 'b': 0.7 \}$$

### 4) Difference:

$$\text{degree-of-membership}(Y) = \min(\text{degree-of-membership}(A), 1 - \text{degree-of-membership}(B))$$

For example:

$$A = \{ 'a': 0.2, 'b': 0.3 \}$$

$$B = \{ 'a': 0.9, 'b': 0.9 \}$$

$$Y = \{ 'a': 0.1, 'b': 0.1 \}$$