LEARNING (AI)

Dr. Hrishikesh Bhaumik
Associate Professor
Department of Information Technology
RCC Institute of Information Technology

Learning

It denotes **changes** in the system that are **adaptive** in the sense that they enable the system to do the **same task or tasks** drawn from the same population more **efficiently and more effectively** the next time.

Knowledge Acquisition

It is the process of **adding new knowledge** to knowledge base and **refining** or otherwise **improving knowledge** that was previously acquired.

It is associated with some purpose such as **expanding the capabilities of a system** or **improving its performance** at some specified task.

Thus knowledge acquisition is a **goal oriented creation** and **refinement** of knowledge. Acquired knowledge may consist of **facts**, **rules**, **concepts**, **procedures**, **heuristics**, **formulas**, **relationships**, **statistics** or **other useful information**.

Rote Learning

This is also known as learning by **memorization**. It requires the least amount of interface and is accomplished by simply **coping the knowledge** in the same form that it will be used **directly into the knowledge base**. When **computation is more expensive than recall**, this strategy saves a significant amount of time.

Capabilities of Rote Learning System

In order to retrieve the stored information quickly, the system should have the following capabilities:

1. **Organized storage of information**: As complexity of stored information increases, more sophisticated techniques are required in order to **access the appropriate stored value quickly**.
2. **Generalization**: The number of distinct objects that might potentially be shared can be very large. In order to **store lesser number of objects**, some kind of generalization is required.

Inductive Learning

Classification is the process of **assigning** to a particular input, the **name of a class** to which it belongs.

The classes from which the classification procedure can choose can be described in many ways:

1. Each class can be defined by a **weighted sum of the values of features**, that are relevant to the task domain.
2. Each class can be defined as a **structure** so that features that are relevant to that of the task domain may be **compared**.

This task of constructing class definitions is called **concept learning** or **induction**.

Explanation-Based Learning

It uses an explicitly represented **domain theory** to **construct an explanation** of a training example which logically follows from the explanation of the instance, rather than from the instance itself.

Explanation-based learning **filters noise**, **selects relevant aspects** of experience and **organizes training data** into a **systematic** and **coherent structure**.

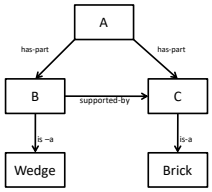
Explanation-Based Learning

Explanation based learning begins with:

1. **Target concept**: The learner's task is to determine an effective definition of this concept. Depending upon the specific application, the target concept may be a **classification**, a **theorem**, a plan for achieving a goal or a **heuristic** for a problem solver.
2. **Training example**: It is an **instance** of the target.
3. **Domain Theory** : It is a **set of rules** and **facts** that are used to **explain how** the training example is an instance of the goal concept.
4. **Operation criteria**: It is **some means of describing** the form that concept definitions may take.

Structural Description

Marry link – Two objects marry if they have faces that **touch** and they have a common edge.

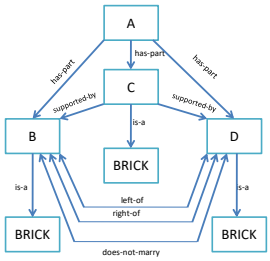


House

Node A→ Represents entire structure.

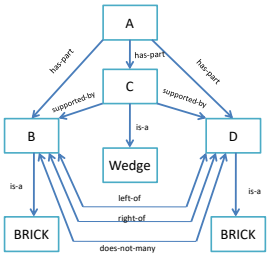
Structural Description

Arch



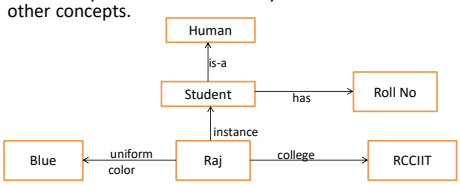
Structural Description

Arch



Semantic Nodes

In this, information is represented as a **set of nodes** connected to each other by a set of **labeled arcs**, which **represent relationship** among the nodes. Thus the meaning of a concept comes from the ways in which it is connected to other concepts.



In this network, inheritance can be used to derive the additional relation has(Raj, Roll No)

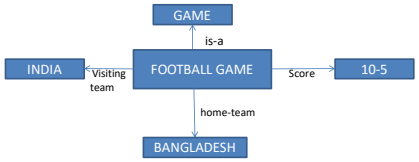
Intersection Search

It is a **process** which is used to **find relationships among objects** by **spreading out activation** from each of the nodes and seeing where the activations meet. The kind of reasoning exploits the **entity-based organization of knowledge** to find relationships among objects.

Representing Non-Binary predicates:

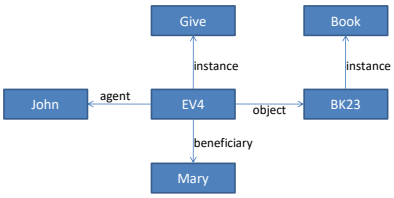
Three or more place predicates can be represented (converted) into binary form by creating one new binary object representing the entire predicate statement and then introducing binary predicates to describe the relations of this new object each of the original arguments.

Example: Score(INDIA, BANGLADESH, 10-5)

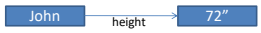


Semantic Network for an N place predicate

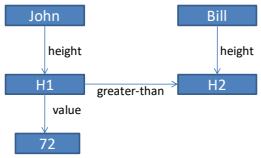
"John gave the book to Mary" – This sentence can be represented by a Semantic Net.



John is 72" tall .



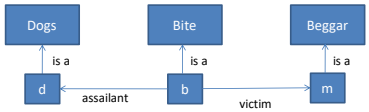
John is 6 feet tall and he is taller that Bill



The arc values may define **entities** or **relationship**

Partitioned Semantic Nets

" The dog bit the beggar"

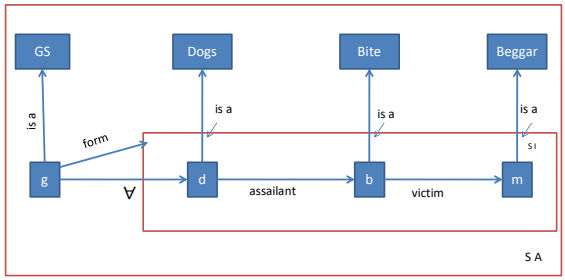


If we want to represent simple quantified expressions using semantic nets, then portioning of the semantic net is required.

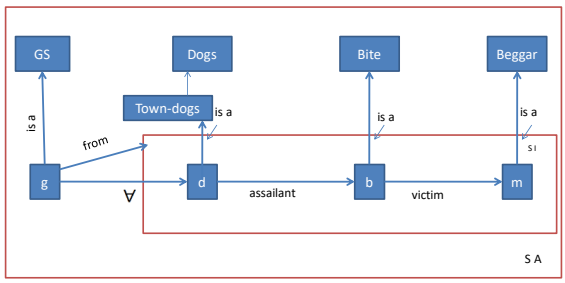
"Every dog has bitten a beggar".

$\forall x : Dog(x) \rightarrow \exists y : Beggar(y) \wedge Bite(x,y)$

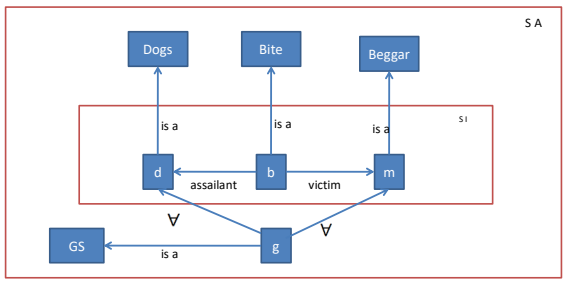
It is necessary to encode the scope of the universally qualified variable x.



Every dog has bitten the beggar



Every dog has bitten every beggar



Frame

A frame is a **collection** of **attributes**(slots) and **associated values** that describe **some entity** in the world. Sometimes a frame describes an entity in some absolute sense.

Frame **describes** a particular **node** and collection of frames are connected to each other by virtue of the fact that the value of an attribute of one frame may be another frame.

Frames as Sets and Instance

Frames represent either a **class**(a set) or an **instance** (element of a class). The attributes of a set can be about the set itself or **inherited** by each element of the set.

Human
isa: **Mammal**
Cardinality: 6,000,000,00
Student
isa: **Human**
Cardinality:2,000,000,000
*height: 4-5”
Raj
Instance: **Student**
Height:5-10

THANK YOU