ARTIFICIAL INTELLIGENCE

UNIT – 3

Natural language processing (NLP)

Natural language processing (NLP) is an area of computer science and artificial intelligence concerned with the interaction between computers and humans in natural language. **The ultimate goal of NLP is to help computers understand language as well as we do.**

Examples: virtual assistants, speech recognition, sentiment analysis, automatic text summarization, machine translation etc.

Syntactic analysis (syntax) and semantic analysis (semantic) are the two primary techniques that lead to the understanding of natural language.

1. **Syntactic analysis:** It is also referred to as syntax analysis or parsing, is the process of analyzing natural language with the rules of a formal grammar. Grammatical rules are applied to categories and groups of words, not individual words. Syntactic analysis basically assigns a semantic structure to text.

2. **Semantic Analysis:** The word "semantic" is a linguistic term and means "related to meaning or logic." Semantic analysis is the process of understanding the meaning and interpretation of words, signs and sentence structure. This lets computers partly understand natural language the way humans do.
Speech recognition, for example, has gotten very good and works almost flawlessly, but we still lack this kind of proficiency in natural language understanding. Your phone basically understands what you have said, but often can't do anything with it because it doesn't understand the meaning behind it.

   Pragmatic Analysis : It deals with the overall communicative and social content and its effect on interpretation. It means abstracting or deriving the meaningful use of language in situations. In this analysis, the main focus always on what was said in reinterpreted on what is meant.
E.g., "close the window?" should be interpreted as a request instead of an order.

Discourse Integration – The meaning of any sentence depends upon the meaning of the sentence just before it. In addition, it also brings about the meaning of immediately succeeding sentence.

Learning

Learning is a process that improves the knowledge of an AI program by making observations about its environment.

To understand the different types of AI learning models, we can use two of the main elements of human learning processes: knowledge and feedback. From the knowledge perspective, learning models can be classified based on the representation of input and output data points. In terms of the feedback, AI learning models can be classified based on the interactions with the outside environment, users and other external factors.

Rote learning: It is the process of memorizing specific new items as they are

encountered. The basic idea is simple and easy to realize within a computer program: Each time a new and useful piece of information is encountered, it is stored away for future use.

For example Face Recognition

An AI system might be designed to recognize faces by extracting a variety of features (such as distance between the eyes) from an image and searching for a match within a database of 1000 stored feature sets. If it finds a match, it has recognized the person; if not, it reports "unknown person."

Learning by taking advice

This is a simple form of learning. Suppose a programmer writes a set of instructions to instruct the computer what to do, the programmer is a teacher and the computer is a student. Once learned (i.e. programmed), the system will be in a position to do new things.

The advice may come from many sources: human experts, internet to name a few. This type of learning requires more inference than rote learning. The knowledge must be transformed into an operational form before stored in the knowledge base. Moreover the reliability of the source of knowledge should be considered.

Learning in Problem Solving

Humans have a tendency to learn by solving various real world problems.

The forms or representation, or the exact entity, problem solving principle is based on reinforcement learning.

Therefore, repeating certain action results in desirable outcome while the action is avoided if it results into undesirable outcomes.

As the outcomes have to be evaluated, this type of learning also involves the definition of a utility function. This function shows how much is a particular outcome worth?

Explanation-based learning (EBL)

Explanation-based learning (EBL) deals with an idea of single-example learning.

This type of learning usually requires a substantial number of training instances

EBL is more knowledge-intensive, knowledge-driven.

Induction learning (Learning by example).

Induction learning is carried out on the basis of supervised learning.

In this learning process, a general rule is induced by the system from a set of observed instance.

However, class definitions can be constructed with the help of a classification method.