Applications

Areas of AI, Natural Language Processing, Case Study of Existing Expert Systems.

Where AI is Used Today?

Major areas and fields where **AI** is used

- Virtual Assistant or Chatbots
- Agriculture and Farming
- Autonomous Flying
- Retail, Shopping and Fashion
- Security and Surveillance
- Sports Analytics and Activities
- Manufacturing and Production
- Live Stock and Inventory Management
- Self-driving Cars or Autonomous Vehicles
- Healthcare and Medical Imaging Analysis
- Warehousing and Logistic Supply Chain

AI in Virtual Assistance

- Alexa, Siri and Google Assistance are the major examples of virtual assistance while automated bots answering the questions of customers are the example of AI-based chatbots working with the best performance.

- **AI techniques are used in Chatbots** to automate the customer support and assistance system more expedient and trouble-free.

- **Chatbots can transform your business** with multiple benefits keeping the client-customer relationship more intact.

AI in Agriculture

- In the agriculture sector, autonomous tractors and **AI-based drones** monitoring are used to enhance the productivity and crop yield of farmlands.

- Robots and automated machines are also used in these fields to monitor crop health conditions and harvesting.

- **AI can help agriculture** to boost crop productivity with better plant **health** and weather monitoring systems while making the entire process trouble-free. And data is also gathered to further train such models work in agricultural or farming related fields.

AI in Automotive

- **Autonomous Vehicles or Self-driving Cars** are the other examples of AI, fully integrated into such a system to make the machine work automatically while understanding the nearby surroundings and real-world scenario.

- Automated assembly lines in automotive sectors are making cars with higher production. While AI **ADAS(Advanced Driver Assistant System) technology** is helping to make the car driving more safe and effortless with semi-automatic features to alert drivers or assist them in case of negligence or rash driving.

AI in E-commerce

- E-commerce backed **automated warehousing and supply chain management** is reducing the manpower and helping storage companies to manage the huge amount of stock or inventory with proper management and supply system.

- This system is also helping e-commerce sector to operate with better efficiency and improve their operating margins.

- The **AI-based automated warehousing management system** is not only getting benefits but machine learning is improving the online shopping experience of the customers.

AI in Healthcare

- **AI in healthcare sector** is playing a vital role in empowering the machines to diagnosis, analyze and predict the various types of diseases, and monitor the patient's health conditions.

- *It is also helping scientists to explore the new drug discoveries and medicine development providing the more effective treatments for people to get well soon and avoid health problems in their life.*

- **AI in radiology** is playing a crucial role in detecting different types of critical diseases with the best level of accuracy making the medical diagnosis and treatment process faster.

AI in Banking

- AI in banking is growing faster than you thought! A lot of banks have already adopted AI-based systems to provide customer support, detect anomalies and credit card frauds. An example of this is HDFC Bank.

- HDFC Bank has developed an AI-based chatbot called ***EVA*** (Electronic Virtual Assistant), built by Bengaluru-based Senseforth AI Research.

- Since its launch, Eva has addressed over 3 million customer queries, interacted with over half a million unique users, and held over a million conversations. Eva can collect knowledge from thousands of sources and provide simple answers in less than 0.4 seconds.

AI in Robotics

- Artificial Intelligence has a remarkable role in Robotics. Usually, general robots are programmed such that they can perform some repetitive task, but with the help of AI, we can create intelligent robots which can perform tasks with their own experiences without pre-programmed.

- Humanoid Robots are best examples for AI in robotics, recently the intelligent Humanoid robot named as **Erica and Sophia has been developed which can talk and behave like humans.**

AI in Education

- AI can automate grading so that the tutor can have more time to teach. AI chatbot can communicate with students as a teaching assistant.

- AI in the future can be work as a personal virtual tutor for students, which will be accessible easily at any time and any place.

AI in Gaming

- AI can be used for gaming purpose. The AI machines can play strategic games like chess, where the machine needs to think of a large number of possible places.

- **AI is benefiting humans** in multiple ways making their life more automated with better accessibility and control of various things around us.

- However, AI is possible into these things only when a model is well-trained through the right **machine learning training data** using the right algorithms to make it fully functional into their relevant fields.

NATURAL LANGUAGE PROCESSING

Language is a method of communication with the help of which we can speak, read and write.

However, the big question that confronts us in this AI era is that can we communicate in a similar manner with computers. In other words, **can human beings communicate with computers in their natural language?**

It is a challenge for us to develop NLP applications because computers need structured data, but human speech is unstructured and often ambiguous in nature.

Natural Language Processing (NLP) is the sub-field of Computer Science especially Artificial Intelligence (AI) that is concerned about enabling computers to understand and process human language.

Technically, the main task of NLP would be to program computers for analyzing and processing huge amount of natural language data.

How to build an NLP pipeline?

Step1: Sentence Segmentation

Sentence Segment is the first step for building the NLP pipeline. It breaks the paragraph into separate sentences.

Example: Consider the following paragraph -

Independence Day is one of the important festivals for every Indian citizen. It is celebrated on the 15th of August each year ever since India got independence from the British rule. The day celebrates independence in the true sense.

Sentence Segment produces the following result:

- "Independence Day is one of the important festivals for every Indian citizen."
- "It is celebrated on the 15th of August each year ever since India got independence from the British rule."
- "This day celebrates independence in the true sense."

Step2: Word Tokenization

Word Tokenizer is used to break the sentence into separate words or tokens.

Example:

ABCompany offers Corporate Training, Summer Training, Online Training, and Winter Training.

Word Tokenizer generates the following result:

“ABCompany", "offers", "Corporate", "Training", "Summer", "Training", "Online", "Training", "and", "Winter", "Training", "."

Step3: Stemming

Stemming is used to normalize words into its base form or root form. For example, celebrates, celebrated and celebrating, all these words are originated with a single root word "celebrate." The big problem with stemming is that sometimes it produces the root word which may not have any meaning.

For Example, intelligence, intelligent, and intelligently, all these words are originated with a single root word "intelligen." In English, the word "intelligen" do not have any meaning.

Step 4: Lemmatization

Lemmatization is quite similar to the Stemming. It is used to group different inflected forms of the word, called Lemma. The main difference between Stemming and lemmatization is that it produces the root word, which has a meaning.

For example: In lemmatization, the words intelligence, intelligent, and intelligently has a root word intelligent, which has a meaning.

Step 5: Identifying Stop Words

In English, there are a lot of words that appear very frequently like "is", "and", "the", and "a". NLP pipelines will flag these words as stop words. **Stop words** might be filtered out before doing any statistical analysis.

Example: He **is a** good boy.

Step 6: Dependency Parsing

Dependency Parsing is used to find that how all the words in the sentence are related to each other.

Step 7: POS tags

POS stands for parts of speech, which includes Noun, verb, adverb, and Adjective. It indicates that how a word functions with its meaning as well as grammatically within the sentences. A word has one or more parts of speech based on the context in which it is used.

Example: "Google" something on the Internet.

In the above example, Google is used as a verb, although it is a proper noun.

Step 8: Named Entity Recognition (NER)

Named Entity Recognition (NER) is the process of detecting the named entity such as person name, movie name, organization name, or location.

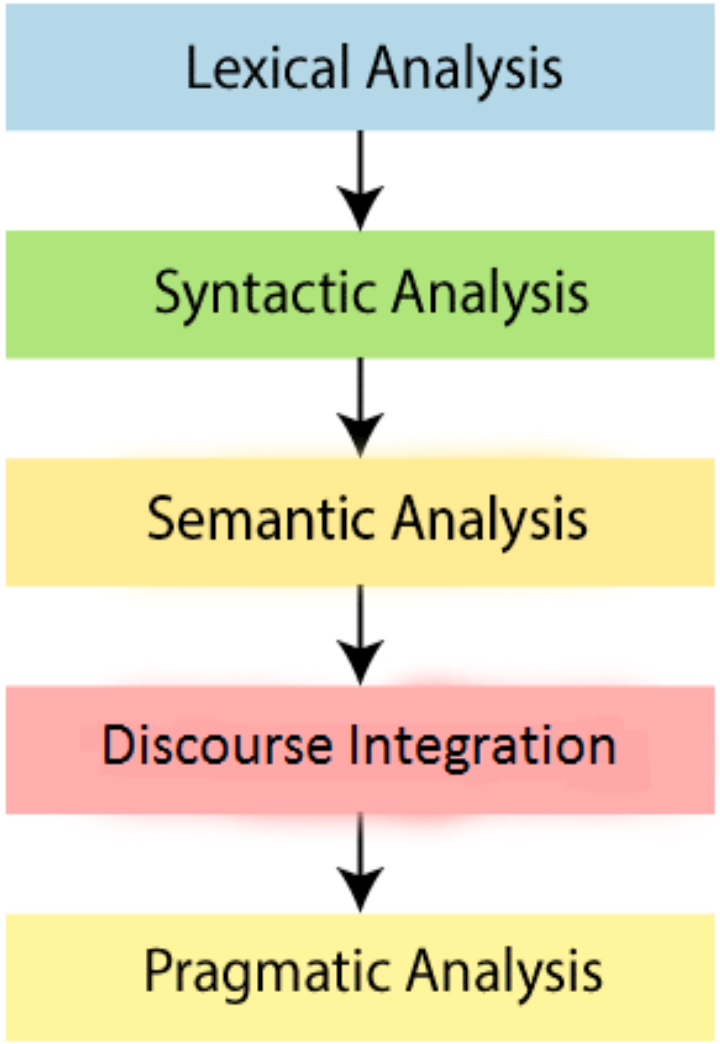
Example: Steve Jobs introduced iPhone at the Macworld Conference in San Francisco, California.

Step 9: Chunking

Chunking is used to collect the individual piece of information and grouping them into bigger pieces of sentences.

Phases of NLP

There are the following five phases of NLP:



1. Morphological Processing

- It is the first phase of NLP. The purpose of this phase is to break chunks of language input into sets of tokens corresponding to paragraphs, sentences and words.
- For example, a word like **“uneasy”** can be broken into two sub-word tokens as **“un-easy”**.

2. Syntax Analysis

- It is the second phase of NLP. The purpose of this phase is two folds: to check that a sentence is well formed or not and to break it up into a structure that shows the syntactic relationships between the different words.
- For example, the sentence like **“The school goes to the boy”** would be rejected by syntax analyzer or parser.

3. Semantic Analysis

It is the third phase of NLP. The purpose of this phase is to draw exact meaning, or you can say dictionary meaning from the text. The text is checked for meaningfulness. **For example, semantic analyzer would reject a sentence like "Hot ice-cream".**

4. Discourse Integration

Discourse Integration depends upon the sentences that proceeds it and also invokes the meaning of the sentences that follow it. **Example the word "it" in the sentence "she wanted it" depends upon the prior discourse context.**

5. Pragmatic Analysis

Pragmatic is the fifth and last phase of NLP. It means abstracting or deriving the purposeful use of the language in situations importantly those aspects of language which require world knowledge the main focus is on what was said is reinterpreted on what it actually means.

For Example: "Open the door" is interpreted as a request instead of an order.

Why NLP is difficult?

NLP is difficult because Ambiguity and Uncertainty exist in the language.

Ambiguity

There are the following three ambiguity -

1. **Lexical Ambiguity:** Lexical Ambiguity exists in the presence of two or more possible meanings of the sentence within a single word.

Example:

Manya is looking for a **match**.

In the above example, the word match refers to that either Manya is looking for a partner or Manya is looking for a match. (Cricket or other match)

2. Syntactic Ambiguity: Syntactic Ambiguity exists in the presence of two or more possible meanings within the sentence.

Example:

I saw the girl with the binocular.

In the above example, did I have the binoculars? Or did the girl have the binoculars?

3. Referential Ambiguity: Referential Ambiguity exists when you are referring to something using the pronoun.

Example: Kiran went to Sunita. She said, "I am hungry."

In the above sentence, you do not know that who is hungry, either Kiran or Sunita.

Applications of NLP

1. **Question Answering:**

   Question Answering focuses on building systems that automatically answer the questions asked by humans in a natural language.

2. **Machine Translation:**

   Machine translation is used to translate text or speech from one natural language to another natural language.

   Example: Google Translator

3. **Speech Recognition**

   Speech recognition is used for converting spoken words into text. It is used in applications, such as mobile, home automation, voice biometrics and so on.

4. Chatbot:

Implementing the Chatbot is one of the important applications of NLP. It is used by many companies to provide the customer's chat services.

5. Spelling correction:

Microsoft Corporation provides word processor software like MS-word, PowerPoint for the spelling correction.

Any Queries?