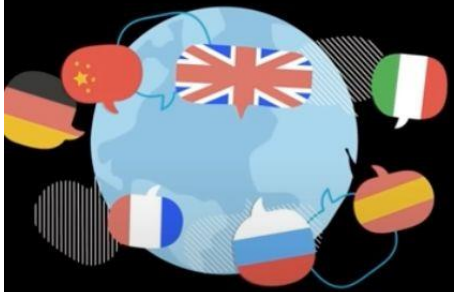
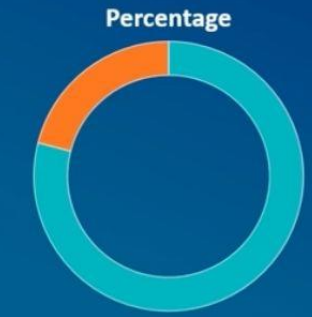
Natural Language Processing


The Human Language

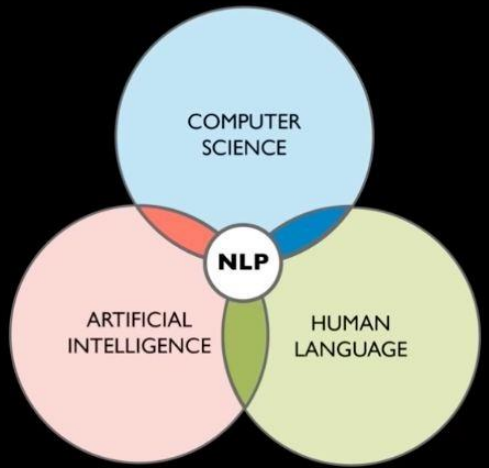
The 21st Century

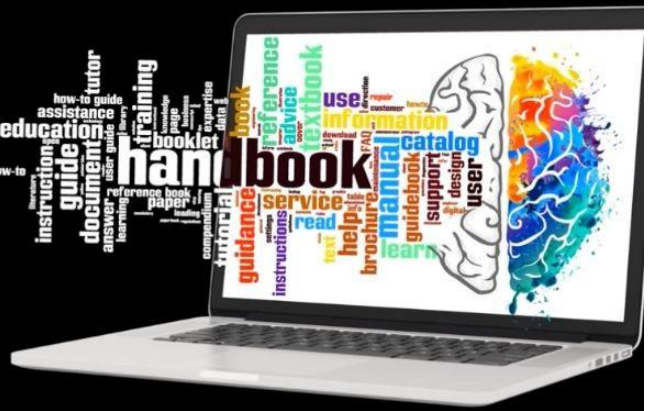




Text Mining and NLP

Text Mining / Text Analytics is the process of deriving meaningful information from natural language text





NLP: Natural Language Processing is a part of computer science and artificial intelligence which deals with human languages.

Applications of NLP

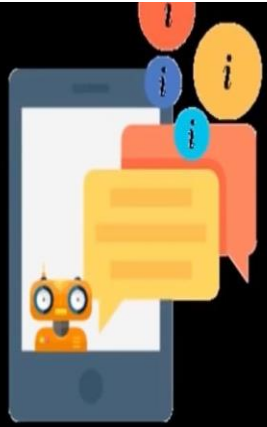
Sentimental Analysis

Applications of NLP

Sentimental Analysis

Chatbot

Sentimental Analysis



Chatbot

Speech Recognition

Machine Translation

Spell Checking

Keyword Searching

Information Extraction

Advertisement Matching

Tokenization

Stemming

Lemmatization

POS Tags

Named Entity Recognition

Chunking

Tokenization

Tokenization | is | the | first | step | in | NLP

Stemming

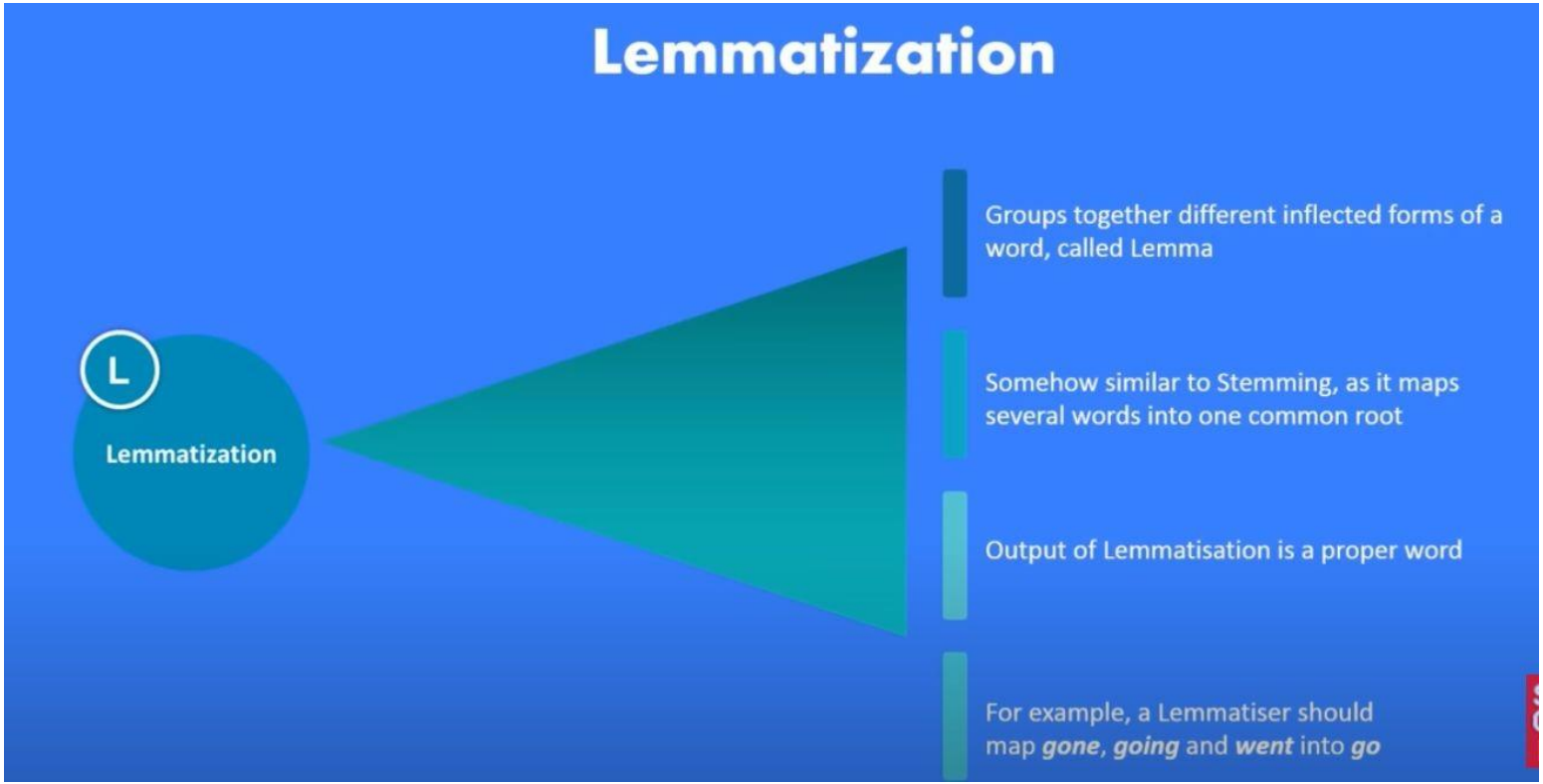
Normalize words into its base form or root form

Affectation | Affects | Affections | Affected | Affection | Affecting

Stemming

Normalize words into its base form or root form

Affect


Lemmatization
L
Lemmatization
Groups together different inflected forms of a word, called Lemma
Somehow similar to Stemming, as it maps several words into one common root
Output of Lemmatisation is a proper word
For example, a Lemmatiser should map gone, going and went into go


POS
infinitives
grammar
english
gerunds
conditionals
negative
questions
adverbs
interrogatives
tenses
worksheets
prepositions
past
articles
present
exercises
genitive
affirmative
adjectives
relatives
passives
verbs
reported
future
DT
NN
VBD
DT
NN
SENTENCE
The
Dog
killed
the
bat

Named Entity Recognition

MOVIE

MONETARY VALUE

ORGANIZATIO

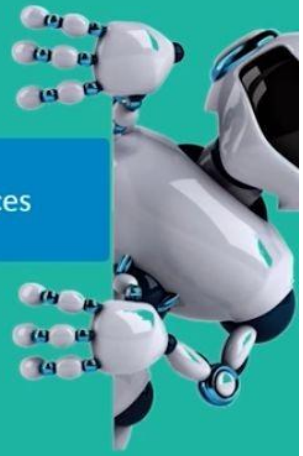
LOCATION

QUANTITIES

PERSON

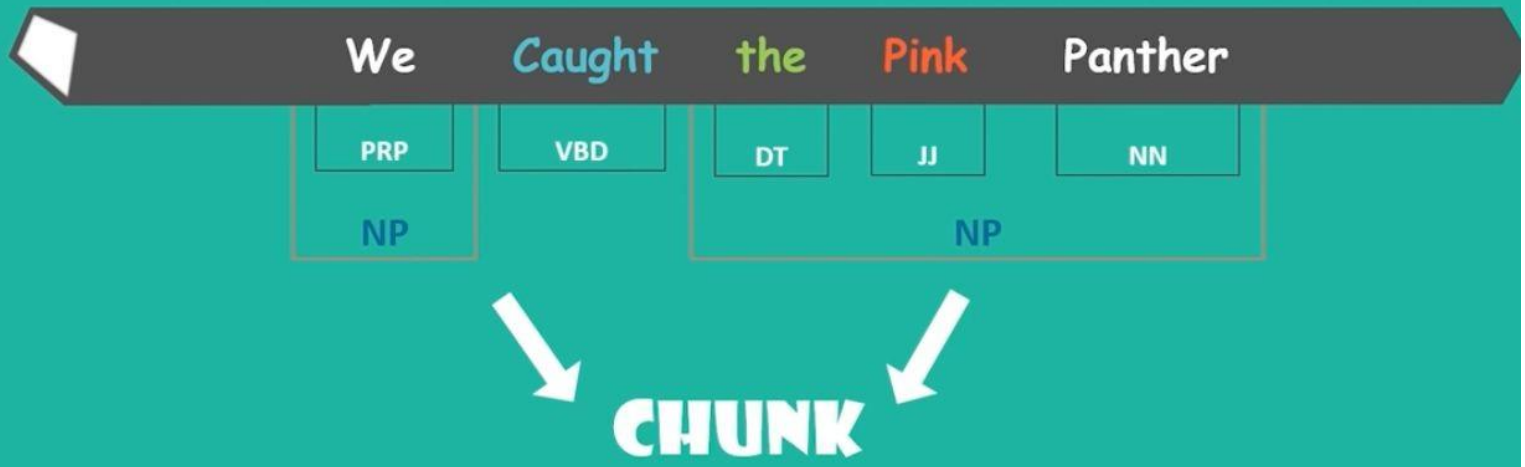
Chunking

Picking up ***Individual*** pieces of Information and ***Grouping*** them into bigger Pieces



CHUNK

Chunking



Components of NLP

There are the following two components of NLP -

1. Natural Language Understanding (NLU)

Natural Language Understanding (NLU) helps the machine to understand and analyse human language by extracting the metadata from content such as concepts, entities, keywords, emotion, relations, and semantic roles.

NLU mainly used in Business applications to understand the customer's problem in both spoken and written language

NLU involves the following tasks -

- It is used to map the given input into useful representation.
- It is used to analyze different aspects of the language.

Natural Language Generation (NLG)

Natural Language Generation (NLG) acts as a translator that converts the computerized data into natural language representation. It mainly involves Text planning, Sentence planning, and Text Realization.

Note: The NLU is difficult than NLG.

Difference between NLU and NLG

NLU

NLU is the process of reading and interpreting language.
It produces non-linguistic outputs from natural language inputs.

NLG

NLG is the process of writing or generating language.
It produces constructing natural language outputs from non-linguistic inputs.

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:

1. "Independence Day is one of the important festivals for every Indian citizen."
2. "It is celebrated on the 15th of August each year ever since India got independence from the British rule."
3. "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:

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

Word Tokenizer generates the following result:

“COMPANY", "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 "intelligent." In English, the word "intelligent" do not have any meaning.

Step 4: Lemmatization

Lemmatization is quite similar to the Stamming. 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.

Note: When you are building a rock band search engine, then you do not ignore the word "The."

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.

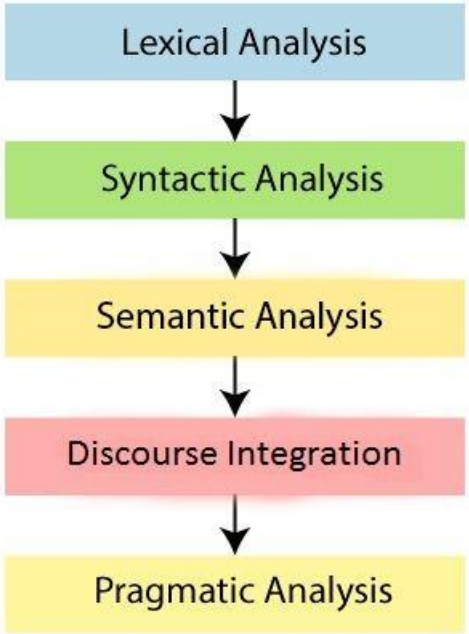
Example: Steve Jobs introduced iPhone at the Macworld Conference in San Francisco, California.

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. Lexical Analysis and Morphological

The first phase of NLP is the Lexical Analysis. This phase scans the source code as a stream of characters and converts it into meaningful lexemes. It divides the whole text into paragraphs, sentences, and words.

2. Syntactic Analysis (Parsing)

Syntactic Analysis is used to check grammar, word arrangements, and shows the relationship among the words.

Example: Agra goes to the Poonam
In the real world, Agra goes to the Poonam, does not make any sense, so this sentence is rejected by the Syntactic analyzer.

3. Semantic Analysis

Semantic analysis is concerned with the meaning representation. It mainly focuses on the literal meaning of words, phrases, and sentences.

4. Discourse Integration

Discourse Integration depends upon the sentences that proceeds it and also invokes the meaning of the sentences that follow it.

5. Pragmatic Analysis

Pragmatic is the fifth and last phase of NLP. It helps you to discover the intended effect by applying a set of rules that characterize cooperative dialogues.

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 -

- **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)

- **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?

- **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.