

# Natural Language Processing (NLP)

## Introduction

- Humans communicate through some form of language either by text or speech.
- To make interactions between computers and humans, computers need to understand natural languages used by humans.
- Natural language processing is all about making computers learn, understand, analyze, manipulate and interpret natural(human) languages.
- NLP stands for Natural Language Processing, which is a part of Computer Science, Human languages or Linguistics, and Artificial Intelligence.
- Processing of Natural Language is required when you want an intelligent system like robot to perform as per your instructions, when you want to hear decision from a dialogue based clinical expert system, etc.
- The ability of machines to interpret human language is now at the core of many applications that we use every day - chatbots, Email classification and spam filters, search engines, grammar checkers, voice assistants, and social language translators.
- The input and output of an NLP system can be Speech or Written Text.

## 2. Applications of NLP or Use cases of NLP

### 1. SENTIMENT ANALYSIS:

- Sentiment analysis, also referred to as opinion mining, is an approach to natural language processing (NLP) that identifies the emotional tone behind a body of text.
- This is a popular way for organizations to determine and categorize opinions about a product, service or idea.
- Sentiment analysis systems help organizations gather insights into real-time customer sentiment, customer experience and brand reputation.
- Generally, these tools use text analytics to analyze online sources such as emails, blog posts, online reviews, news articles, survey responses, case studies, web chats, tweets, forums and comments.
- Sentiment analysis uses machine learning models to perform text analysis of human language. The metrics used are designed to detect whether the overall sentiment of a piece of text is positive, negative or neutral.

### 2. MACHINE TRANSLATION:

- Machine translation, sometimes referred to by the abbreviation MT, is a sub-field of computational linguistics that investigates the use of software to translate text or speech from one language to another.

- On a basic level, MT performs mechanical substitution of words in one language for words in another, but that alone rarely produces a good translation because recognition of whole phrases and their closest counterparts in the target language is needed.
- Not all words in one language have equivalent words in another language, and many words have more than one meaning.
- Solving this problem with corpus statistical and neural techniques is a rapidly growing field that is leading to better translations, handling differences in linguistic typology, translation of idioms, and the isolation of anomalies.
- **Corpus:** A collection of written texts, especially the entire works of a particular author.

### 3. TEXT EXTRACTION

- There are several natural language processing techniques that can be used to extract information from text or unstructured data.
- These techniques can be used to extract information such as entity names, locations, quantities, and more.
- With the help of natural language processing, computers can make sense of the vast amount of unstructured text data that is generated every day, and humans can reap the benefits of having this information readily available.
- Industries such as healthcare, finance, and e-commerce are already using natural language processing techniques to extract information and improve business processes.
- As the machine learning technology continues to develop, we will only see more and more information extraction use cases covered.

### 4. TEXT CLASSIFICATION

- Unstructured text is everywhere, such as emails, chat conversations, websites, and social media. Nevertheless, it's hard to extract value from this data unless it's organized in a certain way.
- Text classification also known as text tagging or text categorization is the process of categorizing text into organized groups. By using Natural Language Processing (NLP), text classifiers can automatically analyze text and then assign a set of pre-defined tags or categories based on its content.
- Text classification is becoming an increasingly important part of businesses as it allows to easily get insights from data and automate business processes.

### 5. SPEECH RECOGNITION

- Speech recognition is an interdisciplinary subfield of computer science and computational linguistics that develops methodologies and technologies that enable the recognition and translation of spoken language into text by computers.

- It is also known as automatic speech recognition (ASR), computer speech recognition or speech to text (STT).
- It incorporates knowledge and research in the computer science, linguistics and computer engineering fields. The reverse process is speech synthesis.

## USE CASES

- A wide number of industries are utilizing different applications of speech technology today, helping businesses and consumers save time and even lives. Some examples include:
- **Automotive:** Speech recognizers improves driver safety by enabling voice-activated navigation systems and search capabilities in car radios.
- **Technology:** Virtual agents are increasingly becoming integrated within our daily lives, particularly on our mobile devices. We use voice commands to access them through our smartphones, such as through Google Assistant or Apple's Siri, for tasks, such as voice search, or through our speakers, via Amazon's Alexa or Microsoft's Cortana, to play music. They'll only continue to integrate into the everyday products that we use, fueling the "Internet of Things" movement.
- **Healthcare:** Doctors and nurses leverage dictation applications to capture and log patient diagnoses and treatment notes.
- **Sales:** Speech recognition technology has a couple of applications in sales. It can help a call center transcribe thousands of phone calls between customers and agents to identify common call patterns and issues. AI chatbots can also talk to people via a webpage, answering common queries and solving basic requests without needing to wait for a contact center agent to be available. In both instances speech recognition systems help reduce time to resolution for consumer issues.

## 6. CHATBOT

- Chatbots are computer programs that conduct automatic conversations with people. They are mainly used in customer service for information acquisition. As the name implies, these are bots designed with the purpose of chatting and are also simply referred to as "bots."
- You'll come across chatbots on business websites or messengers that give pre-scripted replies to your questions. As the entire process is automated, bots can provide quick assistance 24/7 without human intervention.

## 7. EMAIL FILTER

- One of the most fundamental and essential applications of NLP online is email filtering. It began with spam filters, which identified specific words or phrases that indicate a spam message. But, like early NLP adaptations, filtering has been improved.
- Gmail's email categorization is one of the more common, newer implementations of NLP. Based on the contents of emails, the algorithm determines whether they belong in one of three categories (main, social, or promotional).

- This maintains your inbox manageable for all Gmail users, with critical, relevant emails you want to see and reply to fast.

## **8. SEARCH AUTOCORRECT AND AUTOCOMPLETE**

- When you type 2-3 letters into Google to search for anything, it displays a list of probable search keywords. Alternatively, if you search for anything with mistakes, it corrects them for you while still returning relevant results. Isn't it incredible?
- Everyone uses Google search autocorrect autocomplete on a regular basis but seldom gives it any thought. It's a fantastic illustration of how natural language processing is touching millions of people across the world, including you and me.
- Both, search autocomplete and autocorrect make it much easier to locate accurate results