iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VIII **Month of publication:** August 2021

DOI: https://doi.org/10.22214/ijraset.2021.37293

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VIII Aug 2021- Available at www.ijraset.com

AI-Natural Language Processing (NLP)

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Abstract: ***Natural Language Processing (NLP) could be a branch of Artificial Intelligence (AI) that allows machines to know the human language. Its goal is to form systems that can make sense of text and automatically perform tasks like translation, spell check, or topic classification.***
Natural language processing (NLP) has recently gained much attention for representing and analysing human language computationally. It's spread its applications in various fields like computational linguistics, email spam detection, information extraction, summarization, medical, and question answering etc. The goal of the Natural Language Processing is to style and build software system which will analyze, understand, and generate languages that humans use naturally, so as that you just could also be ready to address your computer as if you were addressing another person. Because it's one amongst the oldest area of research in machine learning it's employed in major fields like artificial intelligence speech recognition and text processing. Natural language processing has brought major breakthrough within the sector of COMPUTATION AND AI.
KEYWORDS: NLP, machine translation, artificial intelligence computational techniques, neural network.

I. INTRODUCTION

Natural Language Processing (NLP) is an area of research and application that explores how computers may be want to understand and manipulate natural language text or speech to try and do useful things. NLP researchers aim to assemble knowledge on how human beings understand and use language in order that appropriate tools and techniques can be developtasks. Create computer systems understand and manipulate natural languages to perform the specified tasks.

Nowadays artificial intelligence is widely discussed buzzword and it is evolving very rapidly. Mainly artificial intelligence, it is computer program that may do something smart like a human, it's actually machine mimicking human to perform task in his absence and sometimes in better also as efficient way. makes it possible for computers to grasp the human language. Behind the scenes, NLP analyzes the grammatical structure of sentences and therefore individual meaning of words, then uses algorithms to understand meaning and deliver outputs. In other words, it is smart of human language in order that it can automatically perform different tasks.

Probably, the foremost popular samples of NLP in action are virtual assistants, like Google Assist, Siri, and Alexa. NLP understands written and spoken text like "Hey Siri, where is that the nearest gas station?" and transforms it into numbers, making it easy for machines to grasp. Another well-known application of NLP is Chabot's.

There are many other everyday apps you employ, where you've probably encountered NLP without even noticing. Text recommendations when writing an email, offering to translate a Facebook post written in an exceedingly different language, or filtering unwanted promotional emails into your spam folder.

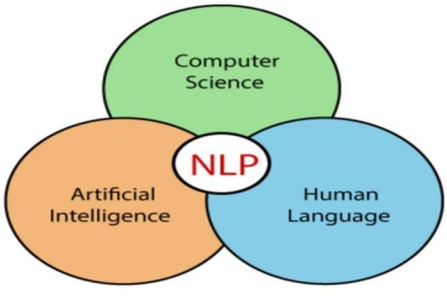

Fig.1. Introduction to NLP

Applications of NLP include a variety of fields of studies, like machine translation, natural language text processing and summarization, user interfaces, multilingual and cross language information retrieval (CLIR), speech recognition, AI and expert systems, and so on.

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II. PROCESS OF NATURAL LANGUAGE PROCESSING

In case the text is consists of speech, the speech-to-text conversion is performed. The mechanism of Natural Language Processing involves two processes -

A. Natural Language Understanding

NLU or Natural Language to grasp the meaning of the given text. The character and structure of every word inside text must be known for NLU. For understanding structure, NLU attempting to resolve following ambiguity present in natural language -

1) *Lexical Ambiguity:* Words have multiple meanings
2) *Syntactic Ambiguity:* Sentence has multiple parse trees.
3) *Semantic Ambiguity:* Sentence having multiple meanings
4) *Anaphoric Ambiguity:* Phrase or word which is previously mentioned but features a different meaning.

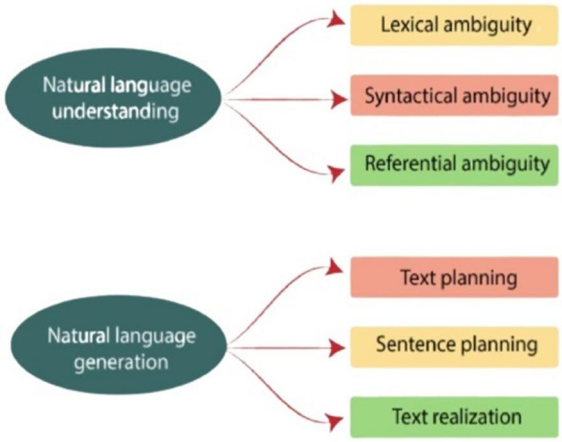

Fig.2 - Process of Natural Language Processing

Next, the sense of every word is known by using lexicons (vocabulary) and set of grammatical rules. However, certain different words are having similar meaning (synonyms) and words having quite one meaning (polysemy). [1]

B. Natural Language Generation

It is the method of automatically producing text from structured data in a very readable format with meaningful phrases and sentences. The matter of natural language generation is difficult to handle. It's a subset of NLP Natural language generation categories into three proposed stages -

1) Text Planning - Ordering of the first content in structured data is finished.
2) Sentence Planning - The sentences are accompanied with structured data to represent the flow of dats.
3) Realization - Grammatically correct sentences are generated lastly to represent text. [2]

III. PHASES OF NATURAL LANGUAGE PROCESSING

There are the following five phases of NLP:

A. Lexical Analysis and Morphological

The first phase of NLP is that the Lexical Analysis. This phase ASCII text file as a stream of characters and converts it into meaningful lexemes. It divides the entire text into paragraphs, sentences, and words.

B. Syntactic Analysis (Parsing)

Syntactic Analysis is emplyed to test grammar, word arrangements, and shows the link among the words.
Example: Amravati goes to the Vaishnavi
In the real world, Amravati goes to the Vaishnavi, does not make any sense, so this sentence is rejected by the Syntactic analyser.

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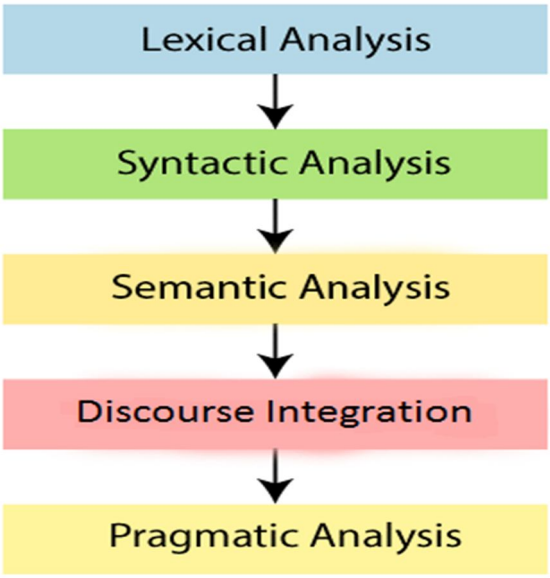

Fig.3.- Phases of Natural Language Processing

C. Semantic Analysis

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

D. Discourse Integration

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

E. Pragmatic Analysis

Pragmatic is that the last phase of NLP. It helps you to discover the intended effect by applying a collection of rules that characterize cooperative dialogues. [4]

For Example: "Open the door" is interpreted as a letter of invitation rather than an order.

IV. ADVANTAGES OF NATURAL LANGUAGE PROCESSING

1) NLP helps users to ask questions about any subject and find an aon the spot response within seconds.
2) NLP offers accurate answers to the question means it does't proposed unessential and undesired information.
3) NLP helps computers to speak with humans in their languages.
4) It is very time efficient.
5) Most of the businesses use NLP to improve the efficiency of documentation processes, accuracy of documentation, and identify the data from huge databases.

V. DISADVANTAGES OF NATURAL LANGUAGE PROCESSING

A list of disadvantages of Natural Language Processing (NLP) is given below:

1) NLP might not show context.
2) NLP is unpredictable
3) NLP may require more keystrokes.
4) NLP is unable to adapt to the new domain, and it's a limited function that's why NLP is made for a single and specific task only.

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VI. APPLICATIONS OF NATURAL LANGUAGE PROCESSING

There are subsequent applications of NLP –

A. Question Answering

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

Fig.3.:- Question Answering

B. Machine Translation

Machine translation is employed to translate text or speech from one natural language tto ddifferent natural language.

C. Sentiment Analysis

Sentiment Analysis is additionally referred to as **opinion mining**. It's utilised on the web to analyse the attitude, behaviour, and emotion of the sender. This application is illustrated through a combination of NLP (Natural Language Processing) and statistics by assigning the values to the text (positive, negative, or natural), identify the mood of the context (happy, sad, angry, etc.)

Fig.4:- Sentiment Analysis

D. Spam Detection

Spam detection is an employed to detect unwanted e-mails reaching to a user's inbox.

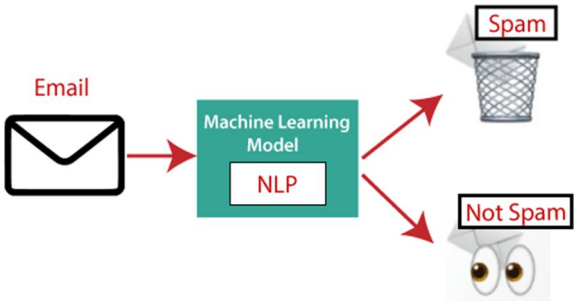

Fig.4:- Spam Detection

E. Information Extraction

Information extraction is one among the foremost important applications of NLP. It's employed for extracting structured information from unstructured or semi-structured machine-machine-understandable documents.

F. Chatbot

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

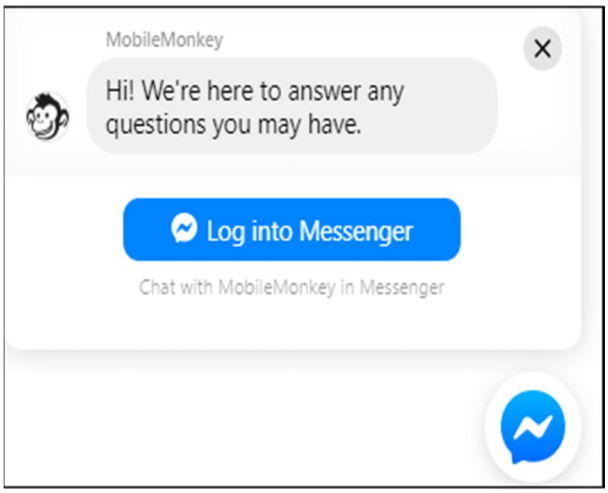

Fig.4:- Chabot

G. Speech Recognition

Speech recognition is employed for converting spoken words into text. It's employed in applications, like home automation, mobile, voice biometrics, video recovery, dictating to Microsoft Word, voice user interface, and so on.

VII. CONCLUSION

As a computerized approach of analysing text, NLP is continually striving forward. Researchers are continually trying to collect knowledge on how human beings understand and use various languages. This aid within the development of appropriate tools and techniques which make computer systems understand and manipulate natural languages to perform the assorted tasks.

Natural language processing has close ties with AI. Some problems in NLP are solved by AI and vice-versa. Lastly, Natural language processing is a stream of computer science and AI that concentrait mainly on the interaction between computers and human beings. Whereas in speech processing problem is nowhere near solved but it's improved to a great extensively in past decade. Neural and deep learning is employed in text processing and speech processing to give a more efficient output. Some real life application of Natural language processing include Apple's Siri and Microsoft's Cortana.

VIII. ACKNOWLEDGEMENT

First and foremost, I would like to express my sincere gratitude to my guide Dr. V. k. Shandilya who has in the literal sense, guided and supervised me. I am indebted with a deep sense of gratitude for the constant inspiration and valuable guidance throughout the work.

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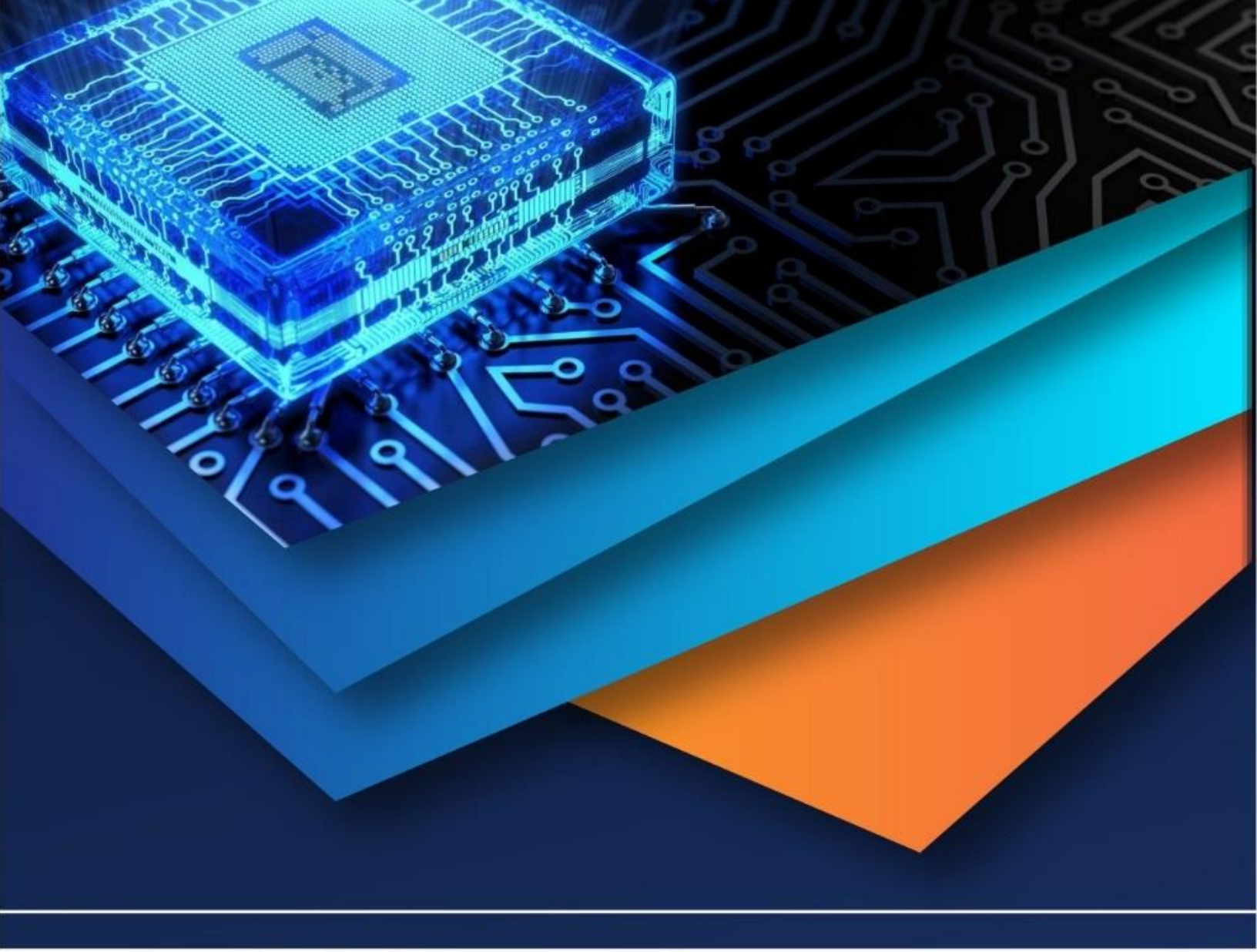

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