NATURAL LANGUAGE PROCESSING SYSTEM IN ARTIFICIAL INTELLIGENCE OF COMPUTER SCIENCE

Riya Shah [1]

Lecturer in Computer Engineering Department, S.B. Polytechnic, Savli, Gujarat, India.

ABSTRACT

AI has built upon the tools and techniques of many different disciplines, including formal logic, probability theory, decision theory, management science, linguistics and philosophy. Artificial Intelligence (AI) is the study of how to make computers (machines) do things which, at the moment, people do better. There are many applications of the artificial intelligence. Natural language processing (NLP) is one of the upcoming applications of AI .The goal of the Natural Language Processing is to design and build software that will analyze, understand, and generate languages that humans use naturally, so that eventually you will be able to address your computer as though you were addressing another person. Natural language processing (NLP) can be defined as the ability of a machine to analyze, understand, and generate human speech. The goal of NLP is to make interactions between computers and humans feel exactly like interactions between humans and humans. Natural Language Processing (NLP) is a fundamental element of artificial intelligence for communicating with intelligent systems using natural language. NLP helps computers read and respond by simulating the human ability to understand the everyday language that people use to communicate. Practical applications of natural language processing are machine translation, database access, information retrieval, text categorization, extracting data from text etc.

KEYWORDS: *Artificial Intelligence, Natural Language Processing.*

1. INTRODUCTION

Artificial Intelligence is a way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think. Artificial Intelligence is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable. As a theory in the philosophy of mind, artificial intelligence (or AI) is the view that human cognitive mental states can be duplicated in computing machinery. Accordingly, an intelligent system is nothing but an information processing system. It is possible to interact with the computer that understands natural language spoken by humans. The goal of the Natural Language Processing (NLP) is to design and build software that will analyze, understand and generate languages that humans use naturally, so that eventually you. Will be able to address your computer as though you were addressing another person. This goal is not easy to reach. "Understanding" language means, among other things, knowing what concepts a word or phrase stands for and knowing how to link those concepts together in a meaningful way. It's ironic that natural language, the symbol system that is easiest for humans to learn and use, is hardest for a computer to master.

2. COMPONENTS OF NLP SYSTEM

Basically, there are two components of Natural Language Processing systems:

➢ Natural Language Understanding (NLU)

In this, we have to understand the basic tasks −

Basically, the mapping to given input in natural language into useful representations. Analyzing different aspects of the language.

➢ Natural Language Generation (NLG)

We have to produce meaningful phrases and sentences. That is in the form of natural language from internal representation. Natural Language Generation (NLG) is the process of producing phrases, sentences and paragraphs that are meaningful from an internal representation [2]

➢ **Text planning**

In this process, we have to retrieve the relevant content from a knowledge base.

➢ **Sentence planning**

We have to choose required words for setting a tone of the sentence.

➢ **Text Realization**

Basically, it's process of mapping sentence plan into sentence structure.

Although, the NLU is harder than NLG

3. LEVELS OF NLP

Levels of NLP The 'levels of language' are one of the most explanatory method for representing the Natural Language processing which helps to generate the NLP text by realizing Content Planning, Sentence Planning and Surface Realization phases.

➢ **Phonology**: Phonology is the part of Linguistics which refers to the systematic arrangement of sound. The term phonology comes from Ancient Greek and the term phono- which means voice or sound, and logy refers to word or speech. In 1993 Nikolai Trubetzkoy stated that Phonology is "the study of sound pertaining to the system of language". Whereas Lass in 1998 wrote that phonology refers broadly with the sounds of language, concerned with the to lathe sub discipline of linguistics, whereas it could be explained as, "phonology proper is concerned with the function, behavior and organization of sounds as linguistic items. Phonology include semantic use of sound to encode meaning of any Human language [4].

➢ Morphology: The different parts of the word represent the smallest units of meaning known as Morphemes. Morphology which comprise of Nature of words, are initiated by morphemes. The interpretation of morpheme stays same across all the words, just to understand the meaning humans can break any unknown word into those grammatical morphemes that occurs in combination called bound morphemes (e.g. -Ed, -ing) grammatical morphemes can be divided into bound morphemes and derivational morphemes [3].

➢ Lexical: In Lexical, humans, as well as NLP systems, interpret the meaning of individual words. Sundry types of processing bestow to word-level understanding – the first of these being a part-of-speech tag to each word. In this processing, words that can act as more than one part of-speech are assigned the most probable part-of speech tag based on the context in which they occur. At the lexical level, Semantic representations can be replaced by the words that have one meaning. In NLP system, the nature of the representation varies according to the semantic theory deployed [5].

➢ Syntactic: This level emphasis to scrutinize the words in a sentence so as to uncover the grammatical structure of the sentence. Both grammar and parser are required in this level. The output of this level of processing is representation of the sentence that divulge the structural dependency relationships between the words. Syntax conveys meaning in most languages because order and dependency contribute to connotation. For example, the two sentences: 'The cat chased the mouse.' and 'the mouse chased the cat.' differ only in terms of syntax, yet convey quite different meanings [6].

➢ Semantic: In semantic most people think that meaning is determined, however, this is not it is all the levels that bestow to meaning. Semantic processing determines the possible meanings of a sentence by pivoting on the interactions among word-level meanings in the sentence. This level of processing can incorporate the semantic disambiguation of words with multiple senses; in a cognate way to how syntactic disambiguation of words that can errand as multiple parts-of-speech is adroit at the syntactic level. The semantic level scrutinizes words for their dictionary elucidation, but also for the elucidation they derive from the milieu of the sentence. Semantics milieu that most words have more than one elucidation but that we can spot the appropriate one by looking at the rest of the sentence. [8]

➢ Discourse: While syntax and semantics travail with sentence-length units, the discourse level of NLP travail with units of text longer than a sentence i.e., it does not interpret multi sentence texts as just sequence sentences, apiece of which can be elucidated singly. Rather, discourse focuses on the properties of the text as a whole that convey meaning by making connections between component sentences (Elizabeth D. Liddy,2001) [7]. The two of the most common levels are Anaphora Resolution - Anaphora resolution is the replacing of words such as pronouns, which are semantically stranded, with the pertinent entity to which they refer. Discourse/Text Structure Recognition - Discourse/text structure recognition sway the functions of sentences in the text, which, in turn, adds to the meaningful representation of the text.

➢ Pragmatic: Pragmatic is concerned with the firm use of language in situations and utilizes nub over and above the nub of the text for understanding the goal and to explain how extra meaning is read into texts without literally being encoded in them. This requisite much world knowledge, including the understanding of intentions, plans, and goals. For example, the following two sentences need aspiration of the anaphoric term 'they', but this aspiration requires pragmatic or world knowledge (Elizabeth D. Liddy, 2001) [7].

4. ARCHITECTURE OF NLP SYSTEM

➢ The goal of this work is to design a natural language preprocessing architecture that identifies and accepts programming instructions or sentences in their natural forms and generates equivalent codes in the base high-level language. Processing written text, using lexical, syntactic, and semantic knowledge of the language as well as the required real world information.

➢ Processing spoken language, using all the information needed above plus additional knowledge about phonology as well as enough added information to handle the further ambiguities that arise in speech.
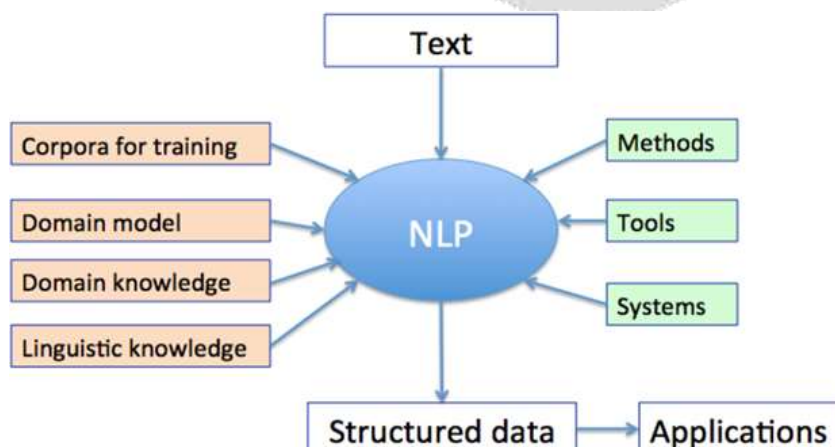
The diagram above depicts the chain of activities which are involved in Language Engineering, from research to the delivery of language-enabled and language enhanced products and services to end-users. The process of research and development leads to the development of techniques, the production of resources, and the development of standards. These are the basic building blocks [9].

APPLICATIONS OF NLP

- language translation
- information management (multi-lingual)
- authoring (multi-lingual)
- human/machine interface (multi-lingual voice and text)

At the second level, these enabling applications are applied to real world problems across the social and economic spectrum. So, for example:

- Information management can be used in an information service, as the basis for analyzing requests for information and matching the request against a database of text or images, to select the information accurately.
- Authoring tools are typically used in word processing systems but can also be used to generate text, such as business letters in foreign languages, as well as in conjunction with information management, to provide document management facilities
- Human language translation is currently used to provide translator workbenches and automatic translation in limited domains
- Most applications can usefully be provided with natural language user interfaces, including speech, to improve their usability
- augmentative and alternative communication (i.e., systems to aid people who have difficulty communicating because of disability) • machine aided translation (i.e., systems which help a human translator, e.g., by storing translations of phrases and providing online dictionaries integrated with word processors, etc.)
- **Communication**

  Basically, a computer is a medium to communicate with users. Also, to learn a new language we can't force users. Although, for casual users, it's most important. Such as Managers and children. As they don't have time and inclination to learn new skills to learn new interaction skills [10].
- Generally, in natural language processing, problems of AI arise in a very clear and explicit form.
- Basically, in natural language, it's having a vast store of information. That we have to access via computers. Although, we have to generate information constantly. Also, it's in the form of books, business, and government report.
- Moreover, there are three major aspects of any natural language understanding theory:
- **Syntax**

  Basically, we use it to describe the form of the language. Also, grammar is used to specify it. Further, we use natural language for the A.I languages of logic and computer programs. Also, these language is more complicated than other formal languages.
- **Semantics**

  Generally, utterances meaning provided with the semantics. Although, if we want to build this understanding, general semantic theories exist for it.
- **Pragmatics**

  Basically, we use this component to explain how the utterances relate to the world.

5. ADVANTAGES OF NLP SYSTEM

- Automatic Summarization to produce a readable summary of a part of the text.
- Improved service from our public administration and public service agencies.
- Wide accessibility of information through easier use of computer systems and Information Services.
- Enhanced ability to compete in global markets.
- Saving time by using intelligent computer systems as our agents.

- ➢ Improvements in the quality of information recorded in information systems.
- ➢ Better filtering of information when we need it.
- ➢ Coreference resolution is given a sentence or larger chunk of text, determine which words refer to the same objects.
- ➢ More effective international co-operation. Encouragement in the development of this methodology. They supported me with scientific guidance, advice and encouragement, and were always helpful and enthusiastic and this inspired me in my work. I have benefitted from numerous discussions with guide and other colleagues.

REFERENCES

[1]. Natural Language Processing (Special Issues of Artificial Intelligence) Paperback – Import, 11 May 1994 by Fernando C N Pereira (Author).

[2]. Eugene Charniak and Drew McDermott, Introduction to Artificial Intelligence, Pearson, 1998, Chapter4.

[3]. Enhanced Text Retrieval Using Natural Language Processing Elizabeth D. Liddy President1, 2 Article first published online: 31 JAN 2005
DOI: 10.1002/bult.91

[4]. Ambient intelligence—the next step for artificial intelligence C Ramos, JC Augusto, D Shapiro - Intelligent Systems, IEEE, 2008ieeexplore.ieee.org References 1. IST Advisory Group, Scenarios for Ambient Intelligence in 2010.

[5]. Natural language processing: an introduction PrakashMNadkarni,
1. LucilaOhnoMachado, 2 and Wendy W Chapman2 in volume 18 on page 540.J Am Med Inform Assoc. 2011 Sep-Oct; 18(5): 544–551.

[6]. K.R. Chowdhary Professor & Head CSE Dept. M.B.M. Engineering College, Jodhpur, India.April29, 2012.NaturalLanguageProcessing.

[Hammond et al., 1999] John Hammond, Ralph Keeney and Howard Raiffa. Smart Choices - A practical guide to making

[7] Improved safety through 'hands-free' operation of   [7]. Rada Mihalce, Hugo Liu, and Henry Lieberman
better decisions. Harvard Business School Press.

[8] Greater   security through voice   verification techniques.

[9] Richards JC, Rodgers T (2001) Approaches and Methods in Language Teaching. Second Edition. New York: Cambridge University Press

[10] Liddy, E. D. (2001). Natural language processing. [8] Feldman, S. (1999). NLP Meets the Jabberwocky: Natural Language Processing in Information Retrieval. ONLINE-WESTON THEN WILTON-, 23, 62-73.

6. CONCLUSION

The complete process of the natural language processing system, at many places had made the work easier. Just by our natural language we can direct the   robot, which can do conversation with computer and there is no need of a person to work as a translator for the conversation between two persons who don't know any common language. Still current program have not reached this level but they may do so very soon. Language technologies can be applied to a wide range of problems in business and administration to produce better, more effective solutions. They can also be used in education, to help the disabled, and to bring new services both to organizations and to consumers. There are a number of areas where the impact is significant such as competing in a global market, offering services directly through telebusiness, supporting electronic commerce, enhancing entertainment, leisure and creativity.NLP with an effective approach for assisting the progress and improvement in the learning ability of students based on development and implementation of various effective tools, assist writing, learning, and assessment of texts, such as use of search engines, electronic resources and analysis of grammatical construction, syntax, sentence composition, etc.