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Voice Recognition

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I. INTRODUCTION

Voice recognition software is a computer program that can understand human speech and convert it into easy-to-read text. Speech recognition software cannot only understand human voice, but also use human voice information to perform tasks more accurately. Daily Speech Recognition software application includes voice activation assistants such as Alexa and Siri that perform simple tasks according to voice commands, and that automatically interprets the voice response and routes the customer to the appropriate service or support function. Includes phone bots. Speech recognition scheme recognize spoken words and then either conclude a task or interpret the spoken word into text. If you have ever recited anything to your phone or your vehicle (such as instructing it to 'Call Mom or Dad'), then you've used a form of speech recognition technology

Speech recognition isn't a new technology. It has been used for many years. However, it is now trouble free to use, more affordable and more accurate. Thanks to these advancements, speech recognition is now a more well-founded tool to use in the healthcare field with the potential to modify the way healthcare contributors perform daily tasks.

A. Working Of Voice Recognition

In general, speech recognition software follows four main steps to convert speech to text.
1) First, an analog-to-digital converter converts the analog waves emitted by voice into computer-understandable digital data.
2) This data is then split into smaller sound snippets and compared to the phonemes of each language.
3) The software analyzes the strings of the selected phonemes and compares them to a database of known words, phrases, and sentences.
4) After this comparison process, the computer makes inferences about what you say and uses this information to translate it into text or execute commands.

B. What is Natural Language Processing?

Natural language processing (NLP) is the ability of a computer program to understand human language as it is spoken and written -- referred to as natural language.
It is a component of artificial intelligence
Businesses use massive quantities of unstructured, text-heavy data and need a way to efficiently process it.
A lot of the information created online and stored in databases is natural human language, and until recently, businesses could not effectively analyze this data. This is where natural language processing is useful.

## II. WORKING OF NATURAL LANGUAGE PROCESSOR

NLP enables computers to understand natural language as humans do. Whether the language is spoken or written, natural language processing uses artificial intelligence to take real-world input, process it, and make sense of it in a way a computer can understand. Just as humans have different sensors -- such as ears to hear and eyes to see -- computers have programs to read and microphones to collect audio. And just as humans have a brain to process that input, computers have a program to process their respective inputs. At some point in processing, the input is converted to code that the computer can understand.

There are two main phases to natural language processing:
- Data Preprocessing
- Algorithm development.

1) *Data Pre-Processing:* Data preprocessing involves preparing and "cleaning" text data for machines to be able to analyze it. preprocessing puts data in workable form and highlights features in the text that an algorithm can work with. There are several ways this can be done, including:

2) *Tokenization:* This is when text is broken down into smaller units to work with.

3) *Stop Word Removal:* This is when common words are removed from text so unique words that offer the most information about the text remain.

4) *Lemmatization and Stemming:* This is when words are reduced to their root forms to process.

5) *Part-of-speech Tagging:* This is when words are marked based on the part-of speech they are -- such as nouns, verbs and adjectives. Once the data has been preprocessed, an algorithm is developed to process it. There are many different natural language processing algorithms, but two main types are commonly used:

6) *Rules-based System:* This system uses carefully designed linguistic rules. This approach was used early on in the development of natural language processing, and is still used.

7) *Machine Learning-based System:* Machine learning algorithms use statistical methods. They learn to perform tasks based on training data they are fed, and adjust their methods as more data is processed. Using a combination of machine learning, deep learning and neural networks, natural language processing algorithms hone their own rules through repeated processing and learning.
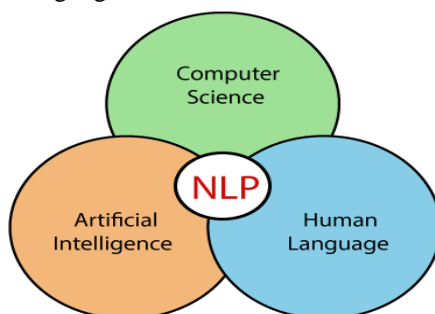
III. NLP IS USED FOR

1) *Text Classification:* This involves assigning tags to texts to put them in categories. This can be useful for sentiment analysis, which helps the natural language processing algorithm determine the sentiment, or emotion behind a text. For example, when brand A is mentioned in X number of texts, the algorithm can determine how many of those mentions were positive and how many were negative. It can also be useful for intent detection, which helps predict what the speaker or writer may do based on the text they are producing.

2) *Text Extraction:* This involves automatically summarizing text and finding important pieces of data. One example of this is keyword extraction, which pulls the most important words from the text, which can be useful for search engine optimization. Doing this with natural language processing requires some programming -- it is not completely automated. However, there are plenty of simple keyword extraction tools that automate most of the process -- the user just has to set parameters within the program. For example, a tool might pull out the most frequently used words in the text. Another example is named entity recognition, which extracts the names of people, places and other entities from text.

3) *Machine Translation:* This is the process by which a computer translates text from one language, such as English, to another language, such as French, without human intervention.

4) *Natural Language Generation:* This involves using natural language processing algorithms to analyze unstructured data and automatically produce content based on that data. One example of this is in language models such as GPT3, which are able to analyze an unstructured text and then generate believable articles based on the text.
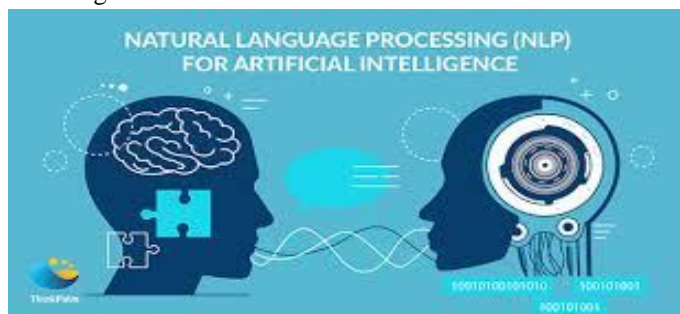
IV. NLP USED IN REAL WORLD APPLICATION

1) *Customer Feedback Analysis:* Where AI analyzes social media reviews.
2) *Customer Service Automation:* Where voice assistants on the other end of a customer service phone line are able to use speech recognition to understand what the customer is saying, so that it can direct the call correctly.
3) *Automatic Translation:* Using tools such as Google Translate, Bing Translator and Translate Me;
4) *Academic research and analysis:* Where AI is able to analyze huge amounts of academic material and research papers not just based on the metadata of the text, but the text itself.
5) *Analysis and Categorization of Medical Records:* Where AI uses insights to predict, and ideally prevent, disease.
6) *Word Processors used for Plagiarism and Proofreading:* Using tools such as Grammarly and Microsoft Word.
7) *Stock Forecasting and Insights into Financial Trading:* Using AI to analyze market history and 10-K documents, which contain comprehensive summaries about a company's financial performance.
8) *Talent Recruitment:* In human resources[2].

V. BENEFITS OF USING NLP

The main benefit of NLP is that it improves the way humans and computers communicate with each other. The most direct way to manipulate a computer is through code -- the computer's language. By enabling computers to understand human language, interacting with computers becomes much more intuitive for humans.

1) Improved accuracy and efficiency of documentation Ability to automatically make a readable summary of a larger, more complex original text.
2) Useful for personal assistants such as Alexa, by enabling it to understand spoken word.
3) Enables an organization to use chatbots for customer support.
4) Easier to perform sentiment analysis.
5) Provides advanced insights from analytics that were previously unreachable due to data volume.

VI. CHALLENGES OF NLP

There are a number of challenges of natural language processing and most of them boil down to the fact that natural language is ever-evolving and always somewhat ambiguous. They include:

1) *Precision:* Computers traditionally require humans to "speak" to them in a programming language that is precise, unambiguous and highly structured -- or through a limited number of clearly enunciated voice commands. Human speech, however, is not always precise; it is often ambiguous and the linguistic structure can depend on many complex variables, including slang, regional dialects and social context.
2) *Tone of Voice and Inflection:* Natural language processing has not yet been perfected. Difficulties include the fact that the abstract use of language is typically tricky for programs to understand. For instance, natural language processing does not pick up sarcasm easily. As another example, a sentence can change meaning depending on which word or syllable the speaker puts stress on. NLP algorithms may miss the subtle, but important, tone changes in a person's voice when performing speech recognition. The tone and inflection of speech may also vary between different accents, which can be challenging for an algorithm to parse.
3) *Evolving use of Language:* Natural language processing is also challenged by the fact that language -- and the way people use it -- is continually changing. Although there are rules to language, none are written in stone, and they are subject to change over time. Hard computational rules that work now may become obsolete as the characteristics of real-world language change over time[1].

VII. CONCLUSION

NLP supposedly makes the job easier but still demands a human interference. People and the industry fear NLP would start a trend of job snatching which is true to a certain sense but it certainly cannot function the way it does without human inputs. The will to work and cater to the loopholes or bugs in a machine is the task of a human who is handling it. Notwithstanding, the advantages of NLP may anger in the arena of jobs but right now it is the knight in the shining armor of the industry[3].

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