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Overview of NLP

Define NLP

The main way that humans communicate with each other is through language, either through verbal, written, or signing methods. But how do we help computers understand the languages that us humans speak and write? We can face this challenge through the usage of NLP, or natural language processing. Natural language processing is used, so that machines, such as computers, can comprehend the language that is communicated by us humans. NLP is almost like an interpreter that decodes this human language, so that machines can also exhibit and use the same human language. Computer programs need instructions to have our human language translated, so that it can execute many different unique tasks. NLP can be used to translate languages, filter content, answer questions, recognize human speech, analyze the tone in a text, classify text, and so much more.

Relationship Between NLP and AI

AI, or Artificial Intelligence, is essentially giving the computer "a brain," so that it can execute human-like tasks, without needing the knowledge of a human. AI systems are built so that it can mimic similar tasks that humans could also perform. And this can be generated through the creation of algorithms and patterns, so that a system can inhibit artificial intelligence. AI has many branches, including machine learning, computer vision, etc. Specifically, NLP is "simply a branch of artificial intelligence." Therefore, natural language processing can use algorithms, within the AI umbrella, such as machine learning, in order to achieve its typical NLP use cases. NLP is able to analyze a large amount of data, so that applications that have artificial intelligence, can be able to analyze the language that we use as humans.

Natural Language Understanding vs. Natural Language Generation

"Natural Language Understanding" is the ability to "comprehend what another is saying, as in, there is mutual understanding between the communication or language that is being exchanged between one another." And "Natural Language Generation is when one produces responses in a language." The generation of a response can be through the means of written, verbal, and signage communication. These two terms are used to describe the interactions between humans who communicate with each other. And NLP can use these same two concepts, which humans use to communicate, in order to process, interpret and produce language.

Modern NLP Applications

There are many examples of NLP applications that humans and other systems use on a day-to-day basis. Some examples of NLP applications include grammar checkers, language translators, speech recognition, classification of texts, filtering text, and etc. Some real-life examples of NLP include chatbots or virtual assistants, such as Google Assistant, Siri, and Alexa. Banks, such as Citibank and Bank of America, are other examples of companies that have adopted NLP to their customer-service driven chatbots. Google uses NLP for many of their other products. For example, Gmail uses NLP to filter out spam, or to categorize specific emails as important. Google also uses NLP for their Google Translate service. Many social media platforms, such as Facebook, Instagram, and Twitter, use NLP in order to dictate what is trending, what should be personalized, and what should be filtered out as well. I have lately noticed that Instagram and Twitter will show ads or posts based on the keywords that I have searched for as well, in order to enhance that personalized experience, and these features utilize NLP algorithms.

Three Main Approaches to NLP

The first main approach to NLP is Rule-Based Approach, which is one of the "older methods that are used in NLP." This approach uses rules in order to analyze the language that humans use. Some of the problems with this approach include "not being able to measure up to the intricacy of the human language." For example, it can be difficult to find all the possible constraints and accurate rules that have to be defined, in the NLP model. Examples of this approach include, "a spell checker, grammar checker (which is used to check the syntax and grammar of sentences), and the Eliza chatbot from the 1960s (which utilized RegEx and code)."

The second main approach to NLP is the Statistical and Probabilistic Approach. This approach uses "math in order to analyze text." This approach uses statistics and probability in order to find the connections in the language, by analyzing words and sentences in a set of text. One of the issues of this approach is that it "requires an adequate and reasonable amount of text and high processing" in order to accurately work. This approach can use the Bayes network and conditional probabilities to determine the relationships between the words in a dataset. This approach is commonly used when trying to deduce the sentiment of words. For example, when analyzing restaurant reviews, this approach can be used to understand if a review is a good, average, or negative feedback, based on the words commonly used. Other examples include "traditional machine learning algorithms such as naïve bayes, decision trees, and neural networks, which use the same mathematical methods for predictions."

The third main approach to NLP is Deep Learning. Deep Learning is actually under the branch of Artificial Intelligence, and it uses "multiple processed layers of an algorithm in order to analyze a language." It utilizes patterns in order to make analyses on the language, except this approach is able to process a larger set of data in order to make predictions. Some examples of

this approach include “generating language, understanding language, and translating language.” As mentioned previously, the deep learning approach can be used in examples such as “Google auto-complete, where the remainder of a string can be predicted based on the first initial words.” Another example includes “summarizing text, chatbots, analyzing sentiments, and recognition of the named entities from a set of text.”

Personal Interest in NLP

Natural Language Processing interests me because there are many research opportunities and career opportunities in the field of Software Engineer, that deal with AI, Machine Learning and NLP. At my job, NLP is used in the website search Engine and the chatbot, so it would be extremely helpful to understand the intricacies of NLP, so that I can help make the internal system more intuitive, more intelligent, and more useful for customers. I would like to learn how to make a chatbot and virtual assistant for personal and instinctive, using NLP as well, since I use Alexa and Siri almost every day. NLP is an exciting and growing field, which can help solve real-world problems as well, so I am interested is using NLP as a means for good, especially in the finance and customer-service industry, since that is where I specialize in. I would love to learn about NLP for more of a professional application, but I know this course will inspire me to venture out and create more NLP-driven personal projects, that could potentially help solve real world problems, outside of the professional and corporate bubble. So far, I have experiences in machine learning and big data, from the courses I took in this Master’s program, thus adding NLP to my belt of knowledge, will help me to help others in this rapidly growing field of technology.

References Used

Mazidi, Karen “Exploring NLP with Python: Building Understanding Through Code.” 2020. Print. 979-8554553769.

"Artificial Intelligence (AI) vs. Natural Language Processing (NLP): Differences." The Enterprisers Project, 17 Feb. 2020, https://enterprisersproject.com/article/2020/2/artificial intelligence-ai-vs-natural-language-processing-nlp-differences.