

Overview of NLP

Defining NLP

Natural Language Processing, abbreviated as NLP, is the field that deals with creating computer algorithms to process human language. NLP deals with both understanding and generating natural language. Understanding natural language means getting the meaning behind the words. There are an infinite amount of use cases for this, but some examples are getting the tone of a text, translating a spoken request into program directives, identifying spam emails, and many more.

Relationship between AI and NLP

Artificial Intelligence, abbreviated as AI, is the overarching field that encompasses the field of NLP. AI systems are concerned with informed decision making and intelligent problem solving, and NLP is a specific subset that deals with understanding and generating natural language.

Natural Language Understanding vs Natural Language Generation

Natural language understanding and generation are the two main pillars that make up NLP. Natural language understanding means deciphering the meaning behind a piece of text, such as the message that it is trying to convey. Natural language generation is the process of making responses.

Examples of Modern NLP Applications

NLP applications are infinite. One example is Siri, which is an assistant that acts as an interface to a computer. It is not hard to imagine a system whose entire human interface is based on spoken directions. Such a system could ditch the traditional paradigms of interacting through a screen and keyboard. Another big use case for NLP is in translation. Tools like Google Translate have gained immense popularity. Another use case is text summarization. Instead of reading a very long and verbose book, we could get concise reports that contain all the needed information.

Main Approaches to NLP

There are three main approaches to NLP: rules-based, statistical and probabilistic, and deep learning.

Rules-based approaches first came about in the 1960s, they were the earliest forms of NLP. They are faster than other types of approaches and best suited for simple applications. Rules-based approaches consist of traditional hardcoding of rules into a program, such as defining production rules for grammatically correct sentences. Defining production rules can be used to check whether sentences are grammatically correct. The drawback of rules-based approaches is that they do not scale up to complex problems, but they are more than enough for many use cases.

Another approach to NLP, which first came about in the 1980s, are statistical and probabilistic approaches. These approaches are based on mathematics, and could be as simple as counting word frequencies. Counting word frequencies could be used for generating word clouds, guessing the tone of a document, or even breaking some encryption algorithms. Finding probabilities of words and word sequences can help in translating between languages, as more common words or sequences are more likely to be the result of translations. Machine Learning algorithms fall under the category of probabilistic and statistical approaches, such as Logistic Regression. The drawback of these approaches is that they require large amounts of data.

Finally, the latest approach to NLP are deep learning algorithms, which first surfaced around the 2010s. These algorithms use complex neural networks that are trained to perform specific tasks. Training the models requires significant amounts of data and computing power, but once trained, models can be relatively lightweight and applied in a wide variety of environments. Deep learning approaches allow us to do more complex things like taking context into account and remembering past conversations. An example of deep learning is ChatGPT, which uses a deep learning model to generate responses that could pass the Turing Test (depending on the circumstances).

My Personal Interest in NLP

My personal interest in NLP stems from a wider interest in Artificial Intelligence. There is a book I read a while back called *Life 3.0*, which talks about some very interesting aspects of Artificial Intelligence and does a comprehensive speculation of the possible outcomes of a singularity and Artificial General Intelligence. I am also very interested in Linguistics and Etymology. I am fluent in French, English, and Spanish, and find it very interesting to look for similarities between these languages and the historical causes for those similarities. On top of all this, I believe that we are in the middle of an Artificial Intelligence revolution, which is the latest phase of the larger information revolution that has been going since Alan Turing made his machine during the Second World War. All of these factors combined make me interested in NLP and make me believe that learning about this field will be beneficial for my career in Software Engineering. A personal project that I have been wanting to do for some time is to create something that could understand my friend Atmin's speech. He has cerebral palsy and his speech can be hard to understand sometimes, especially if you are not used to it. I think that such a system could be greatly beneficial for him and many others like him around the world.