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Overview of Natural Language Processing

The concept of natural language processing (NLP) is, simply put, the use of algorithms to allow machines to process and interpret human language as a whole. It encompasses a machine's ability to understand a message communicated to it in a natural human language and put together an appropriate response. While NLP isn't itself a direct subset of artificial intelligence (AI), it is a mere branch of it similar to machine learning. NLP generally uses concepts of AI in its implementations, but this is not always true for all projects that involve NLP. In conversation, natural language can be broken down into two concepts: understanding and generation. The former obviously referring to correctly interpreting what was said and intended to be communicated, and the latter referring to putting together a sensible response to what was communicated to it. Rule-based, statistical & probabilistic, and deep learning approaches are most commonly used to carry out NLP.

The rule-based approach is the oldest technique, but don't let that distract you from the effectiveness of this approach. It's a decent approach in that it is fast, despite its lack of scalability. It's an approach that is exactly how it sounds – rules are created in an if-then fashion to understand or generate natural language. It's capable of doing things such as, determining the grammatical correctness of a sentence, or generating sentences that are correct within the syntax of the language. Real-world examples can be seen in older chatbots, which often utilized this approach.

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The statistical & probabilistic approach involves utilizing mathematical concepts to understand and develop sentences of natural language. The point of the approach is to calculate probabilities of words and sequences of words via counting and developing language models from those calculations. These language models allow for systems such as predictive text, translation between languages, machine learning algorithms, and so on to be developed. Chatbots developed sometime in the late 80s and during the 90s started to gravitate towards using this approach.

The deep learning approach rose as a result of data becoming more and more available. It encompasses numerous neural network algorithms, which include recurrent & convolutional neural networks, LSTMs, and so on, that extend the capabilities of a basic neural network. The most notable examples of deep learning's usage in the modern day are in Gmail's "Smart Compose" feature, which gives the user suggestions on what to write based on any context it can understand, if any, of the email. But deep learning can be used, and is often used, in a smaller scale in smaller projects.

Personally, I'm interested in natural language processing largely because of recent strides in the field, most notably ChatGPT. I'm interested to learn how computers are programmed to interpret natural language in such a way that they're able to give such appropriate and believable responses. Obviously, I'm curious what implications that has for the industry's future as a whole, but also curious what I can learn to possibly contribute to this future.