

a) Natural language processing (NLP) is the method of creating, testing and applying algorithms to further contextualize a sample of human language. A more coherent goal is to have computational understanding of language become comparable to the way humans understand natural languages.

b) NLP, like machine learning, is a branch of AI that borrows from linguistics in order to understand human language computationally. AI is typically said to be concerned with human based actions based on perception, NLP is solely focused on processing human language.

c) In a human conversation, two actions are being done. Natural language understanding and natural language generation. These two actions are relatively self explanatory, in natural language understanding, the goal is for both parties to comprehend what was being said by one party and in natural language generation the goal is to generate a graspable message.

d) Some modern day NLP applications include predictive text suggestions that pop up on your email or text messaging system, (which take a statistical/probabilistic approach to text generation) sentiment analysis, (an approach which I believe utilizes neural networks) and chatbots. (Which would use a rules based approach for the earlier chatbots, though I suspect that might've changed in more modern times.)

e) There are three main approaches to developing NLP solutions, these are a rules based, probabilistic/statistical approach and a deep learning based approach. In a rules based approach, we follow the general conventions of human language. Things like plurals have well defined rules, so processing those rules to process language is pretty fast and simple, which is most likely why this approach was used in the early days of NLP. The issue with a strict rules based approach is that human language tends to break rules in everyday speech and is hard to scale as a result. (As an example, if you check Merriam Webster's dictionary entry for "literally", you'll find that the secondary definition contradicts the primary definition.)

The second approach is a statistical/probabilistic approach, which had its beginnings by making models by counting words and determining the probability of word or word sequences. Approaches like these would include certain machine learning algorithms, but of course for those to be truly useful one would need an extensive dataset to train on. Statistical approaches are useful in language translation and predictive text solutions.

The final approach I will discuss is a deep learning approach. Deep learning is computational intensive, due to the need for huge amounts of data and processing power to process all that data. Deep learning is done through algorithmic tweaks on the standard neural network such as recurrent neural networks and convolutional neural networks among others. Large scale deep learning is inaccessible due to the data and processing demands, so smaller scale deep learning approaches are more common to find.

f) My personal interest in NLP came from a pragmatic/selfish origin. When I complete my bachelor's degree, I'd like to spend time outside work learning languages so I can better communicate with my family. (Being a second-generation immigrant is much easier when you can speak your heritage's tongue fluently.) I figured that the closest intersection with life-long language learning and work in software is NLP. Rather naively, I haven't thought too much of NLP applications across languages, especially languages that have completely different alphabets from the latin alphabet. (Other than language translation, but I don't think I'll ever beat Google Translate or even want to do much with language translation.) However, one application of NLP I've seen and have taken an interest in is sentiment analysis. I think that could be a powerful tool in making some predictive model for analyzing what the public thinks of a certain company on social media for a stock trading tool for example.