Overview of NLP

This document is a summary of the historical context of Natural Language Processing (NLP) as well as a breif overview of my interests and understanding of NLP.

Definition

NLP is the ability of computers to process the natural human language either through the **generation** or **understanding** of said natural language.

Relationship to Artificial Intelligence

Artificial intelligence (AI) serves as an umbrella term for many sub-fields such as **machine learing (ML)** and NLP, that all relate to computers acting to simulate human intelligence in some way. NLP can be seen as an application of AI focused on the processing of natural language using ML algorithms to process and extrapolate input data.

Natural Language Generation vs Understanding

Natural Language Generation (NLG) can be undestood as the formation of a spoken response, and **Natural Language Understanding (NLU)** is known to be the understaning or processing of a response. The two make up what we know as NLP, and while their simplistic definitions lack the nuance of human-to-human conversation they serve as a good basis for processing natural language.

Modern NLP Applications

There are many modern applications of NLP that appear in everyday life, such as:
1. Sentiment analysis of reviews
2. Automated phone assistants
3. Translation systems like Google Translate
4. Automated email and text reply suggestions
5. Key word serach recommenders for products

Three Main Approaches of NLP

There are three main approaches to NLP
1. Rules-based
2. Statistics and Probability
3. Deep Learning

Each of them can be used to learn and understand the basics of natural language such as words, sentences, and even whole documents. The first and oldest technique is the **Rule-based** approach to NLP. This approach proposes a set of rules that a computer can use to generate syntactically correct sentences and phrases. The approach is limited in its scope though, as the natural human language continues to evolve the base of the ruleset becomes more and more limited and can no longer encapsulate the complexities of natural language. And so this system is best when working with a fast and simple problem, such as text processing. Examples of this approach would be spell check systems, context free grammar, and the Eliza chatbot from the 1960s.

The second approach developed in the 1980s is known as the **Statistics and Probability** appraoch, which also encompasses many classic ML algorithms. Counting the frequencies and probabilities of words led to useful language models that helped to further translation systems. And as data became more readily available ML algorithms such as Naive Bayes, Logistical Regression, and Neural Networks became more popular in NLP fields.

The thrid and final approach is referred to as **Deep Learning** which evolved from neural networks and came about thanks to improved data storage and access as well as huge improvements in processig power. The vast amounts of data allow for complex neural networks and fuel the goal for more human-sounding interations between machines and man. Nowadays many NLP projects will involve some combination of the three approaches rather than only utilizing just one.

Personal Interest in NLP

Personally I don't have much experience with NLP or even ML, so this course is an introduction for me to the concepts. The idea of a computer being able to adapt speech and recognize natural laguage is such a cool concept. I would love to learn more about NLP and the concepts behind it by working with systems and code that utilizes the structures of NLP in neat ways. The dream is to build a robot that understands common phrases (and maybe even complex ones) to do mundane tasks or to automate menial behaviors for me, but I'm a bit far out from that for now.