Overview of NLP

By: Aditi Chaudhari

Natural Language Processing (NLP) is a branch of computer science that allows for computers to understand text and spoken words in a way similar to how human beings can. More specifically, NLP is a branch of artificial intelligence, which is the use of computers to understand and replicate human intelligence. Human-to-human language involves two things: natural language understanding and natural language generation. Natural language understanding involves each party understanding what the other party said, whereas natural language generation involves the formation of spoken responses. Some modern examples of NLP applications include search results, translation, smart assistants, and chatbots.

There are three approaches to NLP: rules-based approaches, statistical and probabilistic approaches, and deep learning. With rules-based approaches, the plural version of a word can be converted to the singular version using regular expressions and a couple of exceptions. Another example of a rules-based approach involves using context-free grammar, which creates a list of production rules for grammar. Context-free grammar can be used to generate syntactically correct sentences or they can check whether a sentence is correct. An example of an NLP application that used rules-based approaches is ELIZA, which used regular expressions to discuss talking points with the user and mimicked a patient-therapist conversation. Many early NLP applications were created with rules-based approaches, but as NLP applications grew larger, rules-based approaches became difficult to scale since not everything can be encapsulated with rules.

The next set of approaches to NLP are statistical and probabilistic approaches. After rules-based approaches became difficult to scale, statistical and probabilistic became incredibly popular. Counting words and finding the probabilities of words and sequencing of words unlocked new paths in NLP. Many traditional machine learning algorithms, such as Naive Bayes, Logistic Regression, SVMs, Decision Trees, and small Neural Networks, are useful in solving various NLP problems. An example of a NLP application that takes the statistical and probabilistic approach is predictive text, such as a search query predicting what the user wants to type next in their search.

The third approach to NLP is deep learning. Different deep learning algorithms include: recurrent neural networks, convolutional neural networks, long short term memory networks, and more. Deep learning became more widely used with the arrival of huge amounts of data and increase in processing power. It seeks to make more and more human-sounding interactions possible in NLP. An example of a NLP application that uses deep learning is ChatGPT, a complex chatbot.

NLP is fascinating to me because I love exploring the intersection between computers and the human brain in order to make machines more intelligent. I believe that NLP helps make

our day-to-day life more convenient. Google searching, voice assistants, chatbots, translators, and more are all examples of this. Currently, the application of NLP that I am the most interested in is Chat GPT. Chat GPT has been incredibly useful for me for learning since it can break down complex topics in a way that is easy to understand. I hope to build a chatbot with what I learn from this course so that I can have a better understanding of the inner workings of complex NLP applications, such as Chat GPT.