

## Overview of NLP

Natural language processing (NLP) allows computers to understand written or spoken language from a user. This allows things like ChatGPT, Siri, Alexa, and others to understand a request from a user and perform the needed functions. NLP is a branch of Artificial Intelligence.

Natural language understanding (NLU) and natural language generation (NLG) are slightly self-explanatory terms. When a group is having a conversation it, all people involved likely understand what another person said (NLU) and then create a response (NLG) to the person that initially spoke. They work together to allow fluid conversation between individuals and are necessary parts of Natural Language Processing. Without these two ideas working together, programs wouldn't be able to understand requests from users and respond in ways that would make sense to the user. To be able to create programs that use NLP there are three main approaches used: Rules-based approaches, statistical and probabilistic approaches, and deep learning.

Rules-based approaches are some of the oldest approaches natural language processing and helped create basic spell checkers. This approach makes a list of rules for a program to follow when processing language, allowing a program to check spelling, grammar, and even simulate conversation by mirroring points in the conversation a user is trying to have with a program (Eliza). The intricacies of language are not easy or truly possible to condense into a set of rules. This can work for a simple project, but it has many limitations.

Statistical and probabilistic approaches count words to determine the likelihood of words and sequences of words so that the models could estimate translations between languages or to predict what someone is typing into a search bar. This approach can use classic machine learning algorithms to complete whatever task a program is attempting to solve. This works well when there is a large base of training data.

Deep Learning used neural networks and huge amounts of data to create NLP programs. These take large amounts of space, so in most applications a smaller-scale deep learning approach is used. This approach may be able to create interactions that sound more natural and human-like.