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Overview of NLP

a. NLP, or, Natural Language Processing, describes exactly what its name entails: processing natural language. The entity doing the processing is a computer, and the natural language it's processing is our spoken human languages. It's an entire field in and of itself because the objective, rigid structure of a computer and how it learns is vastly different from the subjective, context-based structure of the way humans communicate.

b. This is where AI comes in; AI is meant to replicate human learning as best as possible, and it works in conjunction with and facilitates the development of NLP. AI tries to learn like a human, and NLP tries to learn human languages. They work hand in hand.

c. Natural language understanding and natural language generation both deal with natural language, and natural language generation in particular relies on natural language understanding. Where they differ further is in the way they do completely separate things: Natural language understanding is in parsing through an input and processing it. Natural language generation takes a preexisting

understanding of a language and generates a new sentence based on this understanding.

d. Some examples of modern NLP applications are ChatGPT, Google translate, Apple IOS text autocomplete.

e. The three main approaches to NLP are rule based NLP, machine learning based NLP, and deep learning based NLP. Rule based NLP is exactly as it sounds, it processes text and generates output based on a set of rules defined by the programmer. It is now outdated, because rules are both very restrictive and hard to maintain, though simpler tasks that only need a few predefined rules can do well with this format. For example, part of the preprocessing for machine learning based NLP, involving tokenizing and tagging parts of speech, can be done by rule based NLP.

   Machine learning based NLP works with AI that tries to learn and analyze data as a machine would, hence the name: machine learning. It analyzes existing data, parses through it, and from it, it understands how to generate a realistic output. Ideally, it learns from a large enough data set where it can account for a large amount of variety, however, because there is so much nuance in approaching even the smallest of tasks, machine learning NLP is usually used for very specific tasks. These tasks include suggesting words and phrases when crafting an email, or in automatically translating from one language to another.

   Finally, deep learning based NLP works with AI that tries to learn and analyze data like a human, mimicking the patterns of human neural networks. Trained on

extremely large data sets, deep learning based NLP takes advantage of the most recent technological advancements to craft extremely precise and accurate outputs based on a given input. Some examples of the usage include a Google Home or Alexa parsing human vocal input, or the brains behind self driving cars.

f. Personally, I find NLP very interesting as someone who really enjoys language and the breakdowns of it, understanding why a word came to be and how it was intended to be used initially, and how the word is used now. As such, its very interesting to me to learn about how a machine does the same thing–analyzing language as we humans use it, and trying to mimic it to understand our meaning. Theres so much to learn about the structure of language and the etymology of it, and I'm very intrigued to learn personally. Despite my interest, I'm not very familiar with the subject matter, so I'm not sure how I'd use NLP for personal projects or professional applications, but I'm welcome to learn.