A Reverse Mad Libs Game

Natural Language Processing

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**Abstract**

Typically a game of Mad Libs involves the system asking the user to fill in a list of arbitrary words that represent a different part of speech, nouns, verbs adjectives, adverbs, prepositions, etc. The system substitutes these words using the appropriate parts of speech designation into a story. The story is then shown to the user. Everyone has a laugh when the completed story is read out loud.

What if you gave the game to a computer and asked it to not only substitute the correct parts of speech for each missing word but also to come up with a suitable word that matched the context of the story. So when the final story was read, fro the most part it would make sense. This represents the theme of this project. Given an arbitrary story with a series of missing words, the Reverse Mad Libs application uses the principles of Natural Language Processing to fill in each missing word with the ‘best’ candidate word.

**Introduction**

Do you commonly use that autocomplete facility on your favorite word processor? Have you ever used a chatbot on a web page? This is a picture of a human, typically clipart, that pops up and asks you if you would like to chat about your issue. I don’t need to ask whether you have ever pleaded desperately “representative” over the phone when a machine has answered. I believe just about the entire population has dealt with this situation. If you have had any of these experiences, you have been exposed to some form of Natural Language Processing.

 Natural Language Processing (NLP) is a branch of Artificial Intelligence that allows electronic devices to interpret human languages. It combines the fields of Linguistics, Computer Science, and Mathematics. NLP allows these devices to communicate with people, using a human language. NLP can read and interpret text and hear and interpret human speech. The discipline has been around for nearly 50 years. We are surrounded by language. We use it to speak, read talk and even think. We see words about us every day in signs, Signs, email, text, books, web pages, etc.

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**What is Natural Language Processing**

Natural Langage processing (NLP) an attempt to meld human language with computer language. It surrounds us today. From this point on in this discussion for the sake of brevity, NLP will refer to Natural Language Processing. When you use the auto-completed facility on a phone or computer application, you are using NLP. When you converse with a non-human voice on the phone, you are using NLP. It is not a new concept. It was actually thought about long before the inception of the modern day computer. As far back a sthe Fifteenth century

Each source should be discussed in a separate paragraph.

Rules-based vs. Mathematical Based Learning

The early forms of NLP were primarily rules-based. The computer would consult a ‘Knowledge Base’ which was a database of grammar. As the machine learned, the database had to be continually updated with new rules. While there were some significant advances in NLP achieved by rules-base machines, they were not that efficient and they did not mimic the way that humans utilize language. Infants learn language by recognizing and imitating observed patterns. What if machines could do the same thing. This is where mathematical based learning had its beginnings. With a mathematical base learning, machines are trained to recognize patterns. And just as humans learn and think, patterns are evaluated and either kept for futre reference or eliminated. This continual process of evaluation and dismissal is base upon statistical analysis. The latest NLP systems use neural network models to facilitate language learning. The ideal NLP system woul combine all of these systems. As the machine acquires knowledge , that knowledge could be stored in a database for quick retrieval later, rather than repeating the learning process. The knowledg base would no longer need to be externally updated

Reverse Madlibs

Typically a mad libs game is played as follows. Player one is asked to supply a series of words broken down as parts of speech. The Player one chooses arbitrary words. Player two substitutes these into a story. Player two reads the resulting story. The idea is that the story and the words have no connection with each other. In a reverse mad libs game, the machine sees the context of the story and uses NLP routines to substitute the best words into the story. My project uses BERT as the NLP mechanism to substitute the words.

BERT

BERT (Bidirectional Encoder Representations from Transformers)  is an NLP package supplied by a Google. Traditional NLP processes processed text in a left to the right direction as most human speakers. BERTuses both left to right and a right to left scanning procedure. Google engineers felt that would give a deeper analysis of the language. It may find aspects of the language not uncovered by a simple left to right scan. BERT does not rely on any directional scanning, it consumes the entire section of text in one access. The scanning process does not have a directional bias it evaluates the context of words based on their complete contextual surroundings.

This is accomplished by using a Google developed facility called a transformer

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# [BERT Explained](https://www.lyrn.ai/2018/11/07/explained-bert-state-of-the-art-language-model-for-nlp/): State of the art language model for NLP

<https://towardsdatascience.com/bert-explained-state-of-the-art-language-model-for-nlp-f8b21a9b6270>**Bibliography (this is bold) (start on a new page)**

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