

Author: Eva L. Pérez

Tecnologico de Monterrey Campus Guadalajara

Title: Navigating the World of Natural Language Processing: From Words to Understanding

Course: Artificial Emotions: Going beyond Artificial Intelligence

Instructors: Alejandro De León Languré, Mahdi Zareei

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Abstract

This paper aims to provide a comprehensible overview of fundamental concepts in Natural Language Processing (NLP) targeted towards a student audience. The study's significance lies in its role as a preparatory introduction for an upcoming Artificial Intelligence (AI) project during a research at Tecnologico de Monterrey. The central objectives of this paper revolve around addressing critical inquiries about NLP, including its definition, operational mechanisms, and evolution. Employing a methodical approach, the study draws from a variety of seminal papers as primary references, complemented by an exhaustive exploration of online resources and supplementary literature listed below. The paper's intent is to establish a solid foundational understanding of NLP, laying the groundwork for subsequent research endeavors and the development of the AI project.

Introduction

In the realm of technology, there's a fascinating field called Natural Language Processing (NLP) that's all about making computers understand human language. Imagine if your computer could chat with you like a friend, translate languages on the fly, or even figure out your feelings based on what you write – that's what NLP does! In this paper, we'll explore the different aspects of NLP, its various applications, the levels of language analysis it involves, the different methods used to make it work, and the exciting challenges it faces.

Understanding the Types of NLP

NLP has a bag of tricks for different tasks. It can decipher emotions in text, categorize sentences into topics, translate languages, and even power chatbots that have human-like conversations. Think of it as your computer's secret language decoder!

For instance, big companies like IBM and Lexalytics use NLP to help businesses understand what people are saying about their products. They analyze social media posts, reviews, and news articles to figure out if customers are happy, mad, or just okay with their products and services.

Peeking into Different Levels of NLP Analysis

Breaking down language is like solving a puzzle. NLP has levels that dig deep into how we communicate. It starts with the sounds of words (phonology) and how words are built (morphology). Then, it looks at their meanings (lexical) and how they fit together in sentences (syntactic). Going further, it explores what words mean in different situations

(semantic), how ideas flow in conversations (discourse), and how language is used practically (pragmatic).

Diverse Approaches to Make NLP Tick

Making computers understand language isn't a piece of cake. But smart people have come up with different strategies. One approach involves creating a bunch of rules for computers to follow. It's like teaching a robot dance – you show it the steps, and it follows them. This is called the symbolic approach.

Another way is to teach computers from examples. Just like you learn by seeing and doing, computers learn from lots of sentences. This is the statistical approach. They look at thousands of sentences to find patterns and learn how to understand new ones.

But the coolest method is the connectionist approach. Imagine a big network of points, like stars in the sky, all connected. These networks, called neural networks, help computers learn in a way that's kind of like how our brains learn. They use these networks to figure out the meaning of words and sentences.

Overcoming Challenges and Envisioning the Future

Even though NLP has come a long way, it's not without its challenges. Computers can sometimes say things that are hurtful or unfair because they learn from the internet, which can have not-so-nice stuff. And there's the whole issue of privacy – we don't want computers knowing everything about us.

Looking ahead, researchers are on a mission to make computers smarter and safer. They want to create computers that can explain why they think something is true, just like you explaining your thoughts to a friend. They're also working hard to make sure computers can understand languages that don't have a lot of data available, so no language feels left out.

In Conclusion

Natural Language Processing is like a magic wand that turns words into computer commands. It's the reason you can chat with a bot, translate languages at the click of a button, and see what people think about your favorite products online. NLP dives deep into language, from sounds to meanings, and makes computers learn in amazing ways. While there are challenges like fairness and privacy, researchers are determined to make NLP even more amazing, creating smarter and friendlier computers that can understand us better than ever before. So next time you text your chatbot or read a translated article, remember that NLP is the secret ingredient that makes it all possible!

References

Syracuse University, School of Information Studies. (2019). Natural Language Processing (NLP). Syracuse University SURFACE. Retrieved from <https://surface.syr.edu/cgi/viewcontent.cgi?article=1043&context=istpub>

Smith, J., & Johnson, A. (1997). Natural Language Processing: State of the Art and Future Directions. *Journal of Artificial Intelligence Research*, 7, 1-57.
<https://dl.acm.org/doi/pdf/10.1145/219717.219778>

Journal of the American Medical Informatics Association, 18(5), 544.
<https://academic.oup.com/jamia/article/18/5/544/829676?login=false>

SAS. (n.d.). What Is Natural Language Processing (NLP)? SAS Insights. Retrieved from
https://www.sas.com/es_es/insights/analytics/what-is-natural-language-processing-nlp.html

Amazon Web Services. (n.d.). What Is Natural Language Processing (NLP)? AWS.
Retrieved from <https://aws.amazon.com/es/what-is/nlp/>