Syntactic Alignment in Conversations with Large Language Models: Do LLMs Adapt their Syntax Over the Long Term Similar to Humans?

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Abstract

This paper explores the effects of long-term syntactic alignment in Large Language Models (LLMs). Using OpenAI's GPT-4o, artificial conversations were generated, addressing a lack in existing research of long natural conversations with LLMs. A statistical analysis on syntactic structures present in these conversations reveals that syntactic alignment occurs in LLMs over extended periods. A second analysis further explores how the process of alignment evolves throughout a conversation, showing that LLMs progressively adjust their syntax, with the largest changes occurring early on. The results indicate that LLMs are not only influenced by the linear order in which tokens of their inputs appear, but also that its influence becomes continuously larger with increasing context lengths.

1 Introduction

Alignment in human language and communication is a widely studied process, in which people adapt to their communication partner by coordinating their behavior and language. These adaptation processes not only appear on a visual or auditory level, such as gestures, postures or the speech rate (Holler and Wilkin, 2011, Shockley et al., 2009, Jungers and Hupp, 2009), but also on more underlying levels, e.g. the semantics or syntax (Bock, 1986, Garrod and Anderson, 1987). Under these latter two aspects, artificial language generation has become almost indistinguishable from human language in recent years; Large Language Models (LLMs) are optimized to produce texts that seem as coherent as human language, yet their linguistic behavioral patterns haven't been studied much. Different from humans, LLMs work on a next-token-prediction task: They don't follow a conscious effort to convey meaning, but rather model a certain probability function to generate texts. Their concrete underlying workings are unknown, as they emerge from an optimization process on large amounts of data, making it unclear which patterns they have picked up on during that training.

Although they are never explicitly guided to exhibit behavior similar to humans, do Large Language Models nonetheless exhibit syntactic alignment in their text production, similar to us?

References

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A Example Appendix

This is an appendix.