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How to use observable responses and hidden states of recurrent neural networks to reason about cognitive aspects of language?

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Poster

How to use observable responses and hidden states of recurrent neural networks to reason about cognitive aspects of language?

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Abstract

The proposal of formal models to study psychological processes underlying language comprehension and production has long been a central concern in Cognitive Science. One of the main aims of this research line is to uncover the internal representations involved in language processing and the operations that transform these representations within contextual constraints because context and representation dynamically interact to create meaning. Neural network models have provided formal mechanisms for this purpose. These computational models allow for a precise characterization of the representations and operations hypothesized in cognitive theories. Among them, recurrent neural networks (RNNs) with long short-term memory (LSTM) mechanisms have emerged as a particularly useful tool to model the sequential contextual dependencies of language. Here, we illustrate the formalization of expectation shifts through an RNN model and align it with insights from experimental studies. To do so, we present a mental experiment analyzing both the external expressions (model outputs) and internal representations (hidden states) of RNNs.

Keywords

neural networks; recurrent neural networks

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