

Exploring spatial and temporal dynamics of language comprehension in the brain with CCG

Shinnosuke Isono

University of Tokyo, Meguro-ku, Tokyo, Japan

Kohei Kajikawa

The University of Tokyo, Tokyo, Japan

Yushi Sugimoto

Osaka University, Osaka, Japan

Masayuki Asahara

National Institute for Japanese Language and Linguistics, Tachikawa, Tokyo, Japan

Yohei Oseki

University of Tokyo, Tokyo, Japan

Abstract

In computational psycho/neurolinguistics, it has been investigated how the human incremental sentence processing is reflected in behavioral/neural data. Previous studies have been using a metric called node count, the number of the syntactic nodes from the represented trees, which predicts neural activity that presumably deals with the structural complexity in the sentence processing. However, node count does not dissociate different operations that derive the syntactic structures, and these distinct operations and other metrics derived from a grammar haven't been fully investigated for human neural data. In this respect, Combinatory Categorical Grammar (CCG), a linguistically well-motivated theory, was employed in this study. This work explores CCG-derived metrics to investigate whether these metrics contribute to predict the neural data (EEG and fMRI). The results revealed that these metrics improved the fit in relevant ERP components and the language-related regions.