How does BERT address polysemy of Korean adverbial postpositions *-ey*, *-eyse*, and *-(u)lo*?

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Polysemy, one type of ambiguity, occurs when one form delivers multiple, and yet related, meanings/functions (Glynn and Robinson, 2014). In this regard, Bidirectional Encoder Representations from Transformer (BERT; Devlin et al., 2018) which is a *contextualized* word-embedding model⸺word vectors that are sensitive to the context in which they appear⸺has yielded significant improvements on the task of polysemy interpretation (Yenicelik et al., 2020).

I pose a question as to how BERT applies to the polysemy of a function word such as a postposition in Korean, a language typologically different from the major Indo-European languages that have been investigated for this task. I report a computational simulation that explores how BERT account for polysemy of Korean adverbial postpositions *-ey, -eyse,* and *-(u)lo*, which interprets as eight functions for *-ey*, two functions for *-eyse*, and six functions for *-(u)lo* (Shin, 2008).

For this purpose, I used the Sejong corpus (Kim et al., 2007; 90% for training and 10% for testing), with semantic annotation of this corpus cross-verified by three native speakers of Korean (κ = 0.95). For model training, I devised the BERT model by employing KoBERT as a pre-trained model in order to obtain high accuracy of outcomes (Jeon et al., 2019). I then fine-tuned the pre-trained model 50 times (i.e., 50 epochs) by using the training set. In each epoch (i.e., learning step), model performance was measured by comparing the intended function of the postposition in each test sentence with the classified function of the postposition via the BERT model. In addition, I developed a BERT-based visualization system to understand how a BERT model simulates human interpretation of word-level polysemy of Korean adverbial postpositions.

I note two major findings of the current study. First, there is an inverse relation between the classification accuracy and the number of functions of each postposition. Second, the model can identify the intended functions of a postposition as the epoch progresses, even though the corpus size of a function is small. However, despite these findings, the BERT model still seems to be affected by semantic closeness between the items, limiting its performance in the given task to some extent. The findings of this study should be further verified by incorporating more postposition types that have similar degrees of polysemy that three adverbial postpositions demonstrate, which I plan to pursue next. I believe our visualization system will contribute to extending the current understanding of how BERT works for language tasks (particularly in non-English settings).

References

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