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Distributed semantics in a neural network model of human speech recognition

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Abstract

While there are interesting correspondences between form and meaning in many languages, psycholinguists conventionally consider them to be marginal, as they affect only a small subset of words. As such, a common simplification in computational models is to use empirically- or theoretically-motivated representations for form and random vectors for semantics. We recently introduced a novel model of human speech recognition, EARSHOT, which maps spectral slices (form) to pseudo-semantic patterns (sparse random vectors [SRVs]). Here, we replace SRVs with SkipGram vectors. Empirically-based semantics allow the model to learn more quickly and, surprisingly, exhibit more realistic form competition effects. These improved form competition effects do not depend on the particular form-to-meaning mapping in the training lexicon; rather, they arise as a result of the nontrivial output structure. These results suggest that while form-meaning mappings may be mainly arbitrary, realistic semantics afford important computational qualities that promote better fits to human behavior.