Distributed semantics in a neural network model of human speech recognition

Kevin Brown
Oregon State University, Corvallis, Oregon, United States

Nicholas Monto
University of Connecticut, Storrs, Connecticut, United States

Jay Rueckl
University of Connecticut, Storrs, Connecticut, United States

James Magnuson
University of Connecticut, Storrs, Connecticut, United States

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.