Overlapping digraph vowels aid learning to read: evidence from neural networks

Reading is one of the most important predictors of academic and career success. However, learning to read is incredibly difficult, and many people do not attain proficiency at this basic skill. Reading vowels is particularly challenging due to the quasiregularity of their representation. For example, an *i* is most commonly pronounced /ɪ/, as in *bin*, but this generalization is often violated, as in *ski* or *pint*. Behavioral data from first graders learning to read vowels appear to support a theory of learning known as schema based learning*.* While schema based learning has been shown to hold water in other modalities such as concept learning, the complexities of reading, like quasiregularity, present new challenges. Can schema driven learning account for behavioral data of vowel reading? We constructed a neural network model that will be used to explicitly evaluate claims of schema based learning in reading.

Previous work has shown that word learning in reading is more persistent over time when a training set is organized such that adjacent words have overlapping letters in their digraph vowels (for example, *mean* and *bail* overlap with *a*.) These results may support a schema based learning approach, as information that is consistent with previously learned schema is learned more rapidly than inconsistent information. However, computational models of reading present new challenges to schema based learning. The current research addresses two main questions. Firstly, rapid learning in a schema driven account has only been shown when the *output* of a novel stimuli is consistent within a previously developed schema. However, some behavioral data of learning to read show a benefit in retention when there is overlap in the *input* (in this case, the spelling of the vowel sound.) Can overlap in the input increase the speed and retention of learning as well? Secondly, will these consistency/overlap effects persist in a domain with many-to-many mappings, as is the case in reading? We construct a neural network model to explicitly evaluate claims of schema based learning in reading.