Do information-theoretic measures of word-processing difficulty explain psycholinguistic phenomena?

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Abstract: It has been proposed that cognitive processing effort at each word in a sentence depends on the amount of information conveyed by the word. Indeed, two formal measures of word information (surprisal and entropy reduction) correlate with reading times on words in general texts. If word information also accounts for psycholinguistic phenomena that have been taken as evidence for particular cognitive processes, these phenomena may need to be reinterpreted.

A range of simple recurrent networks and phrase-structure grammars was used to estimate surprisal and entropy-reduction scores for the parts-of-speech of sentence stimuli from five experiments, concerning relative clause processing, local ambiguity, digging-in effects, and grammaticality illusions. None of the information measures predicted any critical experimental result, except for the SRN-based surprisals, which predicted the grammaticality illusion. This shows that many psycholinguistic findings are indeed indicative of cognitive effects beyond 'mere' information-based processing difficulty.