The Generalized Lotka-Volterra Interactive Activation Model of Word Recognition

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Abstract

Connectionist models like the Interactive Activation (IA, McClelland & Rumelhart, 1981) model serve an indispensable role in cognitive science by providing a concrete and testable framework for describing how percepts at different levels of abstraction might interact during cognitive processing. However, discontinuities in the governing equation for the IA model limits the set of analytical tools that can be used to understand the model's dynamics. We developed a novel model of word perception, gLoVIA (generalized Lotka-Volterra Interactive Activation model) which borrows the mathematical structure of a generalized Lotka-Volterra model. A robust method for initializing the community matrix yields a gLoVIA model with high word report accuracy, plausible lexical competition, and word superiority effects for vocabulary sizes up to 1000 words. Our results suggest that the gLoVIA model may be sufficient to explain empirically observed effects in word perception, while being more amenable to analytical methods for characterizing its dynamics.

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