

Matching Exact Posterior Probabilities in the Multinomial Interactive Activation Model

Pranav Khaitan
Stanford University

James L. McClelland
Stanford University

Abstract: Interactive activation models of context effects in perception ((McClelland & Rumelhart, 1981; McClelland & Elman, 1986) have been criticized for failing to combine stimulus and context information in a Bayes-optimal way, leading to a rejection of interactive approaches (Norris & McQueen, 2008). We show that interactive activation can compute correct Bayesian posterior probabilities. We present a variant of the interactive activation model that produces outputs exactly corresponding to the correct posterior probabilities of letters given specified letter feature and context information. In the new variant of the model, inhibition between units within pools is replaced by selection of a single unit to be active, using the softmax function to assign probabilities to candidate alternatives. The model is fully interactive, yet the probability of a letter unit being activated is both provably and demonstrably equal to the posterior probability given the presented feature and context information.