

The Right Concept at the Right Time: How Concepts Emerge as Relevant in Response to Context-Dependent Pressures

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Abstract

A central question about cognition is how, faced with a situation, one explores possible ways of understanding and responding to it. In particular, how do concepts initially considered irrelevant, or not even considered at all, *become* relevant in response to pressures evoked by the understanding process itself? We describe a model of concepts and high-level perception in which concepts consist of a central region surrounded by a dynamic nondeterministic "halo" of potential associations, in which relevance and degree of association change as processing proceeds. As the representation of a situation is built, associations arise and are considered in a probabilistic fashion according to a *parallel terraced scan*, in which many routes toward understanding the situation are tested in parallel, each at a rate and to a depth reflecting ongoing evaluations of its promise. We describe a computer program that implements this model in the context of analogy-making, and illustrate, using screen dumps from a run, how the program's ability to flexibly bring in appropriate concepts for a given situation emerges from the mechanisms that we are proposing.

Suppose you invite your friend Greg to dinner, and he doesn't show up on time. What do you do? At first, simple, standard explanations and actions come to mind: he was briefly delayed; he ran into traffic; he had trouble parking. But as half an hour passes, then an hour, then two, the explanations and actions you think of become more and more out of the ordinary. The following might come to mind: call his office (no answer); call his apartment (no answer); check your calendar to make sure the dinner date is tonight (it is); rack your brains trying to remember if he warned you he might be late (no such memory); call friends of his to see if they know where he is (they don't); call his parents in Philadelphia (haven't heard from him in weeks); call the police (they suggest checking the hospital); call the hospital (not there); go to his apartment (not there); ask his neighbors if they've seen him lately (last saw him this morning); drive along routes he would likely have taken (he's nowhere to be seen); buy a megaphone and call out his name as you drive along; call several airlines to see if he's on a plane leaving town tonight; turn on the TV to see if you can spot him sitting in the audience of his favorite talk show; and so on. Though the last few are outlandish, most of these thoughts *did* occur to the authors when they were in such a situation. The point is: as time goes by and pressure builds up, one's thoughts go farther and farther out on a limb. One considers things one never would have