High-Level Perception, Representation, and Analogy

Salient Sentence Strings: Fluid Concepts and Creative Analogies (p.169-p.193)

1. Perceptual processes form a spectrum, which for convenience we can divide into two components. Corresponding roughly to Kant's faculty of Sensibility, we have low-level perception, which involves the early processing of information from the various sensory modalities. High-level perception, on the other hand, involves taking a more global view of this information, extracting *meaning* from the raw material by accessing concepts, and making sense of situations a conceptual level.

2. The study of high-level perception leads us directly to the problem of mental *representation*. Representations are the fruits of perception. In order for raw data to be shaped into a coherent whole, they must go through a process of filtering, and organization, yielding a structured representation that can be used by the mind for any number of purposes.

3. The main thesis of this paper is that high-level perception is deeply interwoven with other cognitive processes, and that researchers in artificial intelligence must integrate perceptual processing into their modeling of cognition.

4. One of the most important properties of high-level perception is that it is extremely flexible. A given set of input data may be perceived in a number of different ways, depending on the context and the state of the perceiver. Due to this flexibility, it is a mistake to regard perception as a process that associates a fixed representation with a particular situation.

5. We may divide representations into two kinds: long-term knowledge representations that are stored passively somewhere in the system, and short-term representations that are active at a given moment in a particular mental or computational process.

6. BACON, in short, works only in a world of hand-picked, pre-structured data, a world completely devoid of the problems faced by Kepler or Galileo or Ohm when they made their original discoveries. Similar comments could be made about STAHL, GLAUBER, and other models of scientific discovery by the authors of BACON. In all of these models, the crucial role played by high-level perception in scientific discovery, through the filtering and organization of environmental stimuli, is ignore.

7. Analogical thought is dependent on high-level perception in a very direct way. When people make analogies, they are perceiving some aspects of the structures of two situations – the essences of those situations, in some sense – as identical. These structures, of course, are a product of the process of high-level perception.

8. Furthermore, not only is analogy-making dependent on high-level perception, but the reverse holds true as well: perception is often dependent analogy making itself. The high-level perception of one situation in terms of another is ubiquitous in human thought.

9. Analogies affect our perception all the time: in a love affair, for instance, it is difficult to stop parallels with past romances from modulating one's perception of the current situation. In the large or the small, such analogical perception – the grasping of one situation in terms of another – is so common that we tend to forget that what is going on is, in fact, analogy. Analogy and perception are tightly bound together.

10. By ignoring the problem of perception in this fashion, artificial intelligence researchers are making a implicit assumption – namely, that the processes of perception and of mapping are temporarily separable.

11. Our view, by contrast, is that analogy-making is going on constantly in the background of the mind, helping to shape our perceptions of everyday situations. In our view, analogy is not separate from perception: analogy-making itself is a perceptual process.

12. The great adaptability of high-level perception suggests that no module that produced a single context-independent representation could ever model the complexity of the process.

13. Organizing and representation in working memory would be another specific example of the action of the high-level perceptual process-filtering and organization- responsible for the formation of representations in general. And most importantly , this process would necessarily interact with the details of the task at hand.

14. For any model of high-level perception to get off the ground, it must be firmly founded on th based of low-level perception.

15. Cognition is infused with perception. This has been recognized in psychology for decades, and in philosophy for longer, but artificial-intelligence research has been slow to pay attention.

16. "Concepts without perception are empty". Research in artificial intelligence has often tried to model concepts while ignoring perception. But as we have seen, high-level perceptual processes lie at the heart of human cognitive abilities.