Special thanks to Virginia de Sa, Gedeon Deák, Marta Kutas, Lawrence Saul and Sanjoy Dasgupta for feedback on this work.

Stimuli were presented white-on-black, but are displayed here black-on-white for clarity.

Humans Use At Least Two Distinct Strategies to Choose k

Why Measure Visual Grouping?

Choosing k has all the hallmarks of a difficult computer science problem. For most data there is no one right answer for what k should be and thus k is an inherently ambiguous quantity. Some of this ambiguity comes from multiple possible hierarchical interpretations of data—does one want to focus on the details or the broad trend? Some comes from decision criteria— is one counting Gaussians or counting disconnected groups of points? To make things even more difficult, k = 1 + 1 will always fit data better than k clusters based on naive measures.

The challenges presented in choosing k might lead one to wonder whether humans are accomplishing the task. Humans are adept at navigating ambiguous and hierarchical situations, after all. There is a distinct (and often implicit) trend in the clustering literature to use the human visual system as a standard against which the performance of clustering algorithms should be judged. In one prominent spectral clustering paper (1), the authors state, “The results are surprisingly good...the algorithm reliably finds clusterings consistent with what a human would choose.” However, these determinations are usually made based on author intuition, rather than experimental verification.

In this poster I describe research aimed at better understanding the visual grouping decisions humans make. I solicited thousands of grouping judgments on abstract light point displays (see figure below) from human subjects and compared the results to current methods in machine learning (top right panel). With a better understanding of human behavior, I modified an existing algorithm to fit the human data more closely (bottom center panel). With a better understanding of human behavior, I modified an existing algorithm to fit the human data more closely (bottom center panel).

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