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How does mental sorting scale?

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Abstract

Human cognition can tackle a wide range of problems, producing scalable results within a manageable timeframe. Many cognitive models can predict human behavior but lack such scalability, resulting in rapidly increasing processing times for more complex inputs. We present a task where participants mentally sort sequences of rectangles by size while we measure reaction times (RTs) and accuracy. By manipulating the size of the input and the presence of latent structure in the sequences, we investigate i) how mental sorting scales with input complexity, ii) how latent structure influences scaling, and iii) how mental computations can be captured by plausible cognitive models. Our results reveal RTs scale linearly with sequence length, and participants can learn and actively use latent structure to sort faster. This behavior is in line with a noisy sorting algorithm, which sequentially rules out potential hypotheses about the latent structure, thus reducing complexity while retaining accuracy.