Optimality of visual search under ambiguous stimuli

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Abstract: A hallmark of optimal decision making is that cues are weighted by their reliability. Previous studies have reported evidence for reliability weighting in several human perceptual decision-making tasks in which sensory noise was the only possible source of errors. Here we use a target detection task to test whether optimality generalizes to situations where stimulus ambiguity is an additional source of uncertainty. Target and distractor orientations were drawn from distributions with different means and the level of ambiguity was varied through the amount of overlap between the two distributions. In line with previous studies, we found clear evidence for sensory reliability-weighting, regardless of the level of ambiguity. However, using a richer set of models than before, we also found that the estimated weights deviated from the optimal ones. Finally, we found no effect of ambiguity level on task efficiency, which suggests that subjects optimally accounted for this source of uncertainty.