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"Use of optimal experimental design principles to design experiments on the intuitive value of information"

Careful choice of what information to acquire is required in many situations where perfect information is not available, from medical diagnosis to scientific inference. Optimal experimental design principles (utility functions) provide a principled framework, within Bayesian decision theory, to assess possible experiments' expected usefulness. Do these principles also explain what information people choose to acquire? Early research on hypothesis testing, medical diagnosis, and other tasks suggested that human information-seeking behavior was biased. Most research, however, is limited by experiments that poorly differentiate competing models' predictions. I report work to automatically optimize design of behavioral experiments, so that competing theoretical models make maximally contradictory predictions about the features that subjects will view, in a categorization task. Results suggest that optimal models describe subjects' behavior better than biased heuristic strategies. Among the optimal models, probability gain (error minimization) describes human behavior better than information gain (entropy minimization), KL distance, impact, or Bayesian diagnosticity. I will discuss extensions to models of human eye movement, and parallel neuroimaging studies of the value of information.