Cognitive Decision Theory

Exploring the cognitive limitations of human rationality

Objective

To **understand** the cognitive processes involved with probability judgment, decision making, and choice, to **explore** the implications these processes for understanding real-world decision making, and to **develop** computational models of judgment that merge the traditional fields of cognitive psychology and behavioral decision theory.

Background & Motivation

Research on cognitive decision theory is directed at understanding the cognitive processes underlying diagnostic hypothesis generation and human judgment. Specifically, research examines how errors and biases in memory processes cascade into errors and biases in what hypotheses people generate in response to data, and how these processes feed into the processes involved in probability judgment and information search. Other research examines the memory basis of overconfidence and perceptions of risk. Research on cognitive decision theory is informed by computational models, including HyGene and Minerva-DM.

Research Questions

>> **What is the relationship between working memory processes and overestimation biases in probability judgment?** Our research examines how working memory constraints affect the absolute and relative accuracy of probability judgments.

>> **How do basic recall processes influence the generation of hypotheses and perceptions of probability?** Our research examines how the basic processes involved in long-term memory recall affect inductive inference and perceived probability.

>> **When does the hypothesis generation process lead to biases in information search, hypothesis testing, and the deployment of visual attention?** Our research explores how the hypotheses (causal explanations) maintained in working memory influence the deployment of visual attention in information search and hypothesis testing situations.

Implications

✓ Obtain a greater understanding of the relationship between lower-level cognitive processes and higher-level decision processes.

✓ Develop theoretical framework to understand and describe hypothesis generation processes in professional settings.

✓ Inform the development of artificial intelligence and decision support systems in applied domains such as medical diagnosis.
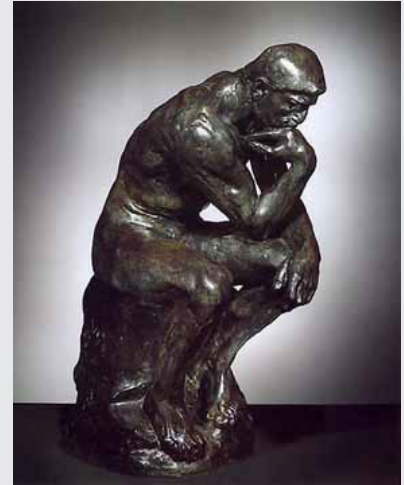
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