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Perceived control in bounded-rational decision-making

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Abstract: The amount of control perceived by an agent governs their ability to learn. Bounded rationality, or the idea that we are limited by the amount cognitive work we can perform, provides an appealing framework within which perceived control could be formulated. When modeling the world, the bounded-rational agent balances the trade-off between the utility and complexity of this constructed model in order to choose an optimal policy. Here, we present a novel formulation of behavioral control, bounded inference, which explicitly models control as the perceived constraint experienced by an agent during the inference process, employing a version of the free energy functional with an additional boundedness parameter as the variational principle of this constrained optimization. The utility of bounded inference is demonstrated in simulations that capture various characteristics of dysfunctional behavioral patterns as observed in a range of psychiatric disorders for which control beliefs play a central role.