

A Neuronal Theory of the Decision Process

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Abstract

We develop a biologically realistic theory of the decision process, and compare its predictions to existing data on choice and single neuron recording in monkeys. The model identifies a network of neurons of three types, each type with a distinct role in the process, and shows how their interaction produces choice.

The theory provides insights into three classical problems in decision theory: stochastic choice, reference point, existence of an ordinal utility. The model describes how stochastic choice is implemented by the network, and how the technology of the network imposes constraints on the error rate. Since neurons adapt their response to the distribution of offers in the environment, the choice made depends in a systematic way on this distribution and not just on the currently available options. Finally, no single group in the network codes ordinal utility before the choice; instead ordinal utility is expressed after choice.

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