Uncertainty and decision in perception, action, and cognition

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The key difficulty in making decisions is the uncertainty about the outcomes that could result from any particular decision. In classical decision making under risk the uncertainty is explicitly given as probabilities: a 50% chance of $100 or else nothing. In a wide range of biologically important tasks, though, the organism must estimate the uncertainties associated with outcomes. The sources of uncertainty can be perceptual, motor, or environmental. Estimation can be based on simple frequency counts or explicit models – as when we assume that a coin is fair despite never having tossed it. There is considerable evidence that humans systematically distort estimates of uncertainty in making decisions and any complete description of how we estimate uncertainty must explain such errors. I'll present a model that captures how we represent and distort frequency in decision tasks as well as experimental tests of the model. I will describe parallel work concerning how we represent visuo-motor uncertainty.

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