Abstract:

Bayesian decision theory (BDT) is a method for computing optimal decision rules. It is the mathematical framework for modeling economic decision making under risk. It is also an appropriate model for modeling how organisms compensate for their motor uncertainty in planning movement. I'll first describe recent experiments that explore how human subjects plan movements in tasks where good performance requires that the subject take into account his own motor uncertainty. Subjects’ performance in these experiments was typically close to the performance that would maximize expected gain as predicted by BDT.

This outcome is surprising since these tasks are mathematically equivalent to decision making under risk and subjects in economic decision making experiments typically fail to maximize expected gain. In particular, they show characteristic distortions of probability information, exaggerating small probabilities. People are bad.

I’ll describe two final experiments that allow direct comparison of decision making under risk and planning of movement in equivalent tasks. As shown in the accompanying figure, probability information $w(p)$ is distorted in both decision making and movement planning but the patterns of distortion are very different in the two kinds of tasks. I’ll discuss the implications of these differences for modeling how the nervous system compensates for uncertainty in perception, action, and cognition.

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