EDITORIAL

Active learning and decision making: an introduction to the collection [version 1; peer review: not peer reviewed]

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Abstract

The importance of exploratory behaviors by which agents actively sample information has been long appreciated in a range of disciplines. However, because of their complexity and cognitive nature, these behaviors have been difficult to characterize. In recent years, a resurgence of interest in this question has been based on a confluence of ideas from multiple fields, including machine learning, development, perceptual learning and attention and decision making. This collection of articles in *F1000Research* aims to provide a home for a broad range of studies addressing this topic. We welcome full length research articles, brief communications, single figure studies, and review/opinion articles, and studies using computational, behavioral or neural approaches. Here, we provide an introduction to the collection which we hope will grow and become a valuable resource for the researchers exploring this topic.

This article is included in the **Active learning and decision making** collection.

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Editorial

Most of our decisions are made under uncertainty, and many of our actions are geared toward reducing this uncertainty. Information seeking actions take many shapes and forms that span the gamut of cognitive function. At one end of the range are simple orienting acts whereby we use our sensory receptors to sample task-relevant information – such as *looking* at a relevant stimulus or *listening* for a relevant sound. At the other end are elaborate behaviors such as scientific research, which systematically search for information over extended time scales. And at an intermediate level there are exploration/exploitation tradeoffs, whereby we may temporarily forego a valuable action in order to learn about more uncertain but potentially more lucrative paths.

Understanding how the brain regulates its information seeking behaviors is significant for understanding core cognitive functions. It is key for understanding the control of attention, which is our main information selection mechanism and is implicated in a range of psychiatric disorders¹. It is critical for understanding the active control of learning and memory – how a neural system determines which ones of our experiences will leave a lasting trace². It is critical for understanding development and the ways in which infants and children actively choose which task they wish to learn or investigate³. Last but not least, it is critical for understanding curiosity, the drive to know.

Addressing these questions requires us to tackle a number of difficult questions⁴. One question is how subjects build explanatory models of their environment, and how these models further constrain the sampling of additional information. A related question is how the brain generates the intrinsic motivation to seek information when physical rewards are absent or unknown, and how this impacts cognitive development in the long term. At the level of neuronal systems, a key question concerns the relationship between neural processes encoding uncertainty and risk⁵, and cognitive mechanisms of learning, memory and attention.

The goal of this collection is to provide a home for papers on these and related topics. We accept studies using a range of methodologies including computations, behavioral, cognitive and neural systems investigations, and a broad range of format including full research articles, brief communications and review/opinion or correspondence articles.

Competing interests

No competing interests were disclosed.

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