Spatial Generalization in Operant Learning:
Lessons from Professional Basketball

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Tal, Neiman, and Yonatan Loewenstein. 2014.

Abstract:

In operant learning, behaviors are reinforced or inhibited in response to the consequences of similar actions taken in the past. However, because in natural environments the same situation never recurs, it is essential for the learner to decide what similar is so that he can generalize from experience in one state of the world to future actions in different states of the world. The computational principles underlying this generalization are poorly understood, in particular because natural environments are typically too complex to study quantitatively. In this paper we study the principles underlying generalization in operant learning of professional basketball players. In particular, we utilize detailed information about the spatial organization of shot locations to study how players adapt their attacking strategy in real time according to recent events in the game. To quantify this learning, we study how a make \ miss from one location in the court affects the probabilities of shooting from different locations. We show that generalization is not a spatially-local process, nor is governed by the difficulty of the shot. Rather, to a first approximation, players use a simplified binary representation of the court into 2 pt and 3 pt zones. This result indicates that rather than using low-level features, generalization is determined by high-level cognitive processes that incorporate the abstract rules of the game.

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