Machine learning applications in experimental psychology: a study of the perception of time

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Abstract

Experimental psychology is an established field whose main interest is the study of psychological phenomena by empirical means. One of those phenomena is the perception of time in the seconds to minutes range, which has attracted a great deal of research, and several mathematical models have been proposed. Most current studies have been done in the framework of one theory or other, and their data is often summarized in a few measures and then analyzed by classical statistical methods. We think that the richness of the data can be exploted more with the help of other approaches, like those in the machine learning literature. Here we present an experiment of time perception using a procedure on which the animals (rats) must learn when to respond in order to obtain a reward, and then we alter the rats uncertainty of this trained interval by inserting a delay beween the rats responses and the delivery of the reward. We applied some ML techniques to gain insights about how animals learn when to start and stop responding, and how the uncertainty affects their estimation of the trained interval. Among the problems explored are density ratio estimation, distributional change detection, mutual information estimation and change-point detection.

Keywords— time perception, experimental psychology, mutual information, changepoint detection

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