University of Zurich[UZH]

Department of Economics – Neuroeconomics Seminar

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Apportioning information in model-based planning

A core aspect of planning involves maintaining an accurate model of an environment's dynamics: which actions take us to which locations? Yet even simple actions occur in different settings, each time we select them. Choosing whether to turn left or right at a junction, for example, can occur at different times of the day (e.g., morning or afternoon) under different modes of transport (e.g., bike or car). Being able to account for these nuances is important in cases where these help to make better predictions about the future; but it also increases memory demands and prevents generalising experiences from one case to the next. In the first part of this talk, I will show that the brain adapts how it represents an environment's dynamics, formally a Markov Decision Process (MDP), in the Medial Temporal Lobe (MTL). The results provide an algorithmic account of how the MTL can flexibly adjust the number of MDPs it maintains, in order to track these dynamics with different levels of granularity. In the second part of the talk, I will present a new computational model that nests a Model Based planning system underneath a statistical apportioning process, Causal Latent Inference. The model provides a plausible computational account of how individuals decide to cluster sequences of information, in order to track and update multiple MDPs over time. Simulations reveal that this model can generate choices that are insensitive to reward devaluation, behaviour previously thought to be a signature of Model Free (habitual) learning. These "ersatz habits" (just like laboratory ones) emerge after overtraining, interact with contextual cues and show preserved sensitivity to reinforcer devaluation in a consumption test (a standard control). Whilst these results do not rule out a contribution of Model Free learning *per se*, they highlight the need for caution in using devaluation procedures to rule them in (or out) and offer a new perspective on the neurocomputational substrates of repetitive harmful behaviours prevalent in clinical pathologies such as OCD and addiction.