University of Zurich[UZH]

Department of Economics – Neuroeconomics Seminar

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Linking levels of analysis from brain to behavior in computational modeling of decision making

Computational modeling can formally adjudicate between theories and affords quantitative fits to behavioral/brain data. This talk has two parts: in the first I describe an example of how simplified models of brain function can be useful for linking neural circuits to decision making functions. The models provide a mechanistic interpretation of changes in decision making in patient populations. However, for quantitative fitting purposes, the space of plausible generative models considered is dramatically limited by the set of models with known likelihood functions. For many models, the lack of a closed-form likelihood typically impedes Bayesian inference methods. As a result, standard models like the drift diffusion model are often fit to data for convenience even when other models might be superior. In the second part of the talk I will present a new method using artificial neural networks that learn approximate likelihoods for arbitrary generative models, allowing fast posterior sampling with only a one-off cost for model simulations that is amortized for future inference. We show that these methods can accurately recover posterior parameter distributions for a variety of neurocognitive process models. We provide code allowing users to deploy these methods for arbitrary hierarchical model instantiations linking brain mechanisms to behavior and for interrogating alterations in patient populations.