



University of
Zurich^{UZH}

Department of Economics – Neuroeconomics Seminar

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The brain is a mixture of experts: how the brain allocates control as a function of the reliability of predictions.

It has long been suggested that human behavior can be understood as reflecting the contributions of multiple systems that cooperate or compete for the control of behavior. Here we suggest that the brain can be thought of as a “Mixture of Experts” in which multiple different expert systems propose strategies for action. I will consider how the brain determines which system should control behavior at any one moment in time. It will be argued that this is accomplished by keeping track of the reliability of the predictions within each system, and by allocating control over behavior in a manner that is proportional to the relative reliability of those predictions. I will present behavioral evidence for the existence of a reliability-based control mechanism operating over multiple experts in humans. These include model-based and model-free reinforcement-learning strategies that learn to select actions on the basis of direct experience, experts that learn to select actions through observing the behavior of other agents, as well as a system that reflexively takes actions based solely on visual affordances. Results from the study of different expert systems in both experiential and social-learning domains hints at the possibility that this reliability-based control mechanism is domain general, exerting control over many different expert systems simultaneously in order to yield sophisticated and adaptive behavior.