



**University of
Zurich** ^{UZH}

Department of Economics – Neuroeconomics Seminar

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Adaptive control and interoception: an active inference perspective

Recent theories in theoretical neuroscience have conceptualized homeostasis, allostasis and adaptive control in terms of Bayesian (active) inference. In this perspective, adaptive behaviour stems from a hierarchical architecture that supports multiple nested control loops. Lower hierarchical levels may use interoceptive signals (e.g., predictions and prediction errors about bodily variables) for homeostatic regulation, e.g., vasodilatation when it is too hot or one is running. At higher levels of the hierarchy, prediction of interoceptive signals may afford anticipatory, allostatic control, e.g., anticipatory vasodilatation to prepare for future effort. Finally, increasingly higher hierarchical levels may be crossmodal: they may progressively integrate interoceptive, exteroceptive and proprioceptive signals to steer goal-directed actions - for example, buying and consuming sports drinks prior to exercise - that resolve adaptive problems in more sophisticated and proactive ways.

This active inference scheme offers a novel perspective on how hierarchical (top-down and bottom-up) and crossmodal (e.g., interoceptive and exteroceptive) streams are integrated to support adaptive inference and control; and how failures of integrating (and precision-weighting) the streams may cause maladaptive behaviour and psychopathological conditions.

In this talk, I will introduce the active inference perspective on (hierarchical) control, focusing in particular on the importance of interoceptive processing. I will present a series of experiments and simulations to address the following research questions: (1) How do interoceptive streams affect cognitive processes such as perception and decision-making? (2) Does the brain form an "interoceptive schema" in the same way it builds a "body schema"? Can we "trick" it, to produce interoceptive illusions? (3) How can specific deficits of interoceptive processing cause maladaptive behaviour and psychopathological conditions?