

The graphical brain and deep inference

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Abstract: This presentation considers deep temporal models in the brain. It builds on previous formulations of active inference to simulate behaviour and electrophysiological responses under deep (hierarchical) generative models of discrete state transitions. The deeply structured temporal aspect of these models means that evidence is accumulated over distinct temporal scales, enabling inferences about narratives (i.e., temporal scenes). We illustrate this behaviour in terms of Bayesian belief updating – and associated neuronal processes – to reproduce the epistemic foraging seen in reading. These simulations reproduce these sort of perisaccadic delay period activity and local field potentials seen empirically; including evidence accumulation and place cell activity. These simulations are presented as an example of how to use basic principles to constrain our understanding of system architectures in the brain – and the functional imperatives that may apply to neuronal networks.