The predictive power of intrinsic brain activity: theoretical perspectives, current investigations, and future goals

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One of the most prominent theories in cognitive neuroscience states that brains are foretelling machines. In other words, in contrast to the classic view of the brain as a passive stimulus-response machine, it constantly generates predictions about future events. This is achieved through a generative process of inference based on the statistical regularities of the environment. By continuously sampling common information patterns throughout development, the brain's generative models can build and update prior knowledge(i.e., *priors*) and deal with noisy and ambiguous sensory input. Here, we present a new theoretical hypothesis on how these models are implemented in the intrinsic activity of the brain through spatio-temporal dynamics and connectivity patterns. In this view, the regime of intrinsic activity has a two-fold objective. First, to optimize priors during rest and second, to support the retrieval of relevant priors during perceptual performance. Although this theory has received preliminary validation by both human and animal studies, it remains largely untested. We will describe experimental paradigms to study the formation of intrinsic priors by combining behavioural and electrophysiological techniques, and we will discuss future goals and open questions.

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