Theoretical Foundations

The mathematics of self. This section reviews the formal apparatus of the Free Energy Principle and Active Inference. We present the core formalisms—variational free energy, Markov blankets, hierarchical generative models, precision weighting, prediction error, expected free energy, and multi-agent extensions—that the subsequent synthesis will bring into structural alignment with Blake's prophetic phenomenology.

The Free Energy Principle

Self-organizing systems persist by minimizing surprise (realism), or at least can be viewed as if they do (instrumentalism). Friston's Free Energy Principle (FEP) formalizes this imperative [@friston2010free; @friston2006free], now comprehensively synthesized in Parr, Pezzulo, and Friston's canonical textbook [@parr2022active].

Variational free energy provides a tractable upper bound on surprise (negative log model evidence):

$$F = \mathbb{E}_{q}[\ln q(\theta) - \ln p(o, \theta)] \tag{1}$$