

## Symbols and Notation

## Core Active Inference Notation

Symbol	Description	Domain
$\mathcal{F}(\pi)$	Expected Free Energy for policy $\pi$	$\mathbb{R}$
$G(\pi)$	Pragmatic value of policy $\pi$	$\mathbb{R}$
$H[Q(\pi)]$	Epistemic affordance (information gain)	$\mathbb{R}$
$q(s)$	Posterior beliefs over hidden states	$\mathbb{R}^n$
$p(s)$	Prior beliefs over hidden states	$\mathbb{R}^n$
$A$	Observation likelihood matrix $P(o \mid s)$	$\mathbb{R}^{m \times n}$
$B$	State transition matrix $P(s' \mid s, a)$	$\mathbb{R}^{n \times n \times k}$
$C$	Preference matrix (log priors over observations)	$\mathbb{R}^m$
$D$	Prior beliefs over initial	$\mathbb{R}^n$

# Meta-Cognitive Extensions

Symbol	Description	Domain
$c$	Confidence score	$[0, 1]$
$\lambda$	Meta-cognitive weighting factor	$\mathbb{R}^+$
$\Theta$	Framework parameters	$\mathbb{R}^d$
$w(m)$	Meta-data weighting function	$\mathbb{R}^+$

# Free Energy Principle

Symbol	Description	Domain
$\mathcal{F}$	Variational free energy	$\mathbb{R}$
$\mathcal{S}$	Surprise (-log evidence)	$\mathbb{R}$
$\phi$	System parameters	$\mathbb{R}^p$
$p(o, s)$	Joint distribution over observations and states	Probability space

## Quadrant Framework

Symbol	Description	Domain
$Q1$	Data processing (cognitive) quadrant	Framework element
$Q2$	Meta-data organization (cognitive) quadrant	Framework element
$Q3$	Reflective processing (meta-cognitive) quadrant	Framework element
$Q4$	Higher-order reasoning (meta-cognitive) quadrant	Framework element

# Statistical Notation

Symbol	Description	Domain
$\mathbb{E}[\cdot]$	Expectation operator	Functional
$KL[p\ q]$	Kullback-Leibler divergence	$\mathbb{R}^+$
$\sigma(\cdot)$	Softmax function	Mapping to probabilities
$\nabla$	Gradient operator	Functional

# Implementation Variables

Symbol	Description	Domain
$t$	Time step	$\mathbb{N}$
$\tau$	Temporal horizon	$\mathbb{N}$
$\eta$	Learning rate	$\mathbb{R}^+$
$\alpha$	Adaptation rate	$\mathbb{R}^+$
$\beta$	Feedback strength	$\mathbb{R}^+$