

Notation, Abbreviations, and Hypothesis Definitions

Mathematical Symbols and Notation

Symbol	Description
\mathcal{F}	Variational free energy
\mathbf{F}	Expected free energy (for policy selection)
D_{KL}	Kullback–Leibler divergence
$q(\cdot)$	Approximate posterior (recognition density)
$p(\cdot)$	Generative model (prior and likelihood)
\mathbf{s}	Hidden states
\mathbf{o}	Observations
π	Policy (sequence of actions)
\mathbf{A}	Likelihood mapping (observation model)
\mathbf{B}	Transition model (state dynamics)
\mathbf{C}	Prior preferences over observations

Abbreviations and Acronyms Used

Abbreviation	Definition
AIF	Active Inference
API	Application Programming Interface
CAGR	Compound Annual Growth Rate
CI	Confidence Interval
DCM	Dynamic Causal Modelling
DOI	Digital Object Identifier
DPI	Dots Per Inch (figure resolution)
EEG	Electroencephalography
FFE	Expected Free Energy
ERP	Event-Related Potential
FEP	Free Energy Principle
fMRI	Functional Magnetic Resonance Imaging
GML	Graph Modelling Language (network serialization format)
JSON	JavaScript Object Notation
JSONL	JSON Lines (newline-delimited JSON)
KG	Knowledge Graph
KI	Kullback–Leibler (divergence)

Standard Hypothesis Definitions and Identifiers

ID	Hypothesis	Scope
H1	FEP Universality: The Free Energy Principle applies universally to all self-organizing systems	A (Core Theory)
H2	AIF Optimality: Active Inference agents achieve optimal decision-making under uncertainty	B (Tools)
H3	Markov Blanket Realism: Markov blankets correspond to real physical boundaries	A (Core Theory)

Glossary of Key Terms

Term	Definition
Active Inference	A framework in which agents minimize expected free energy to select actions, unifying perception, learning, and decision-making under the Free Energy Principle.
Assertion	A directed, confidence-scored claim linking a paper to a hypothesis (supports, contradicts, or neutral). The basic unit of evidence in the knowledge graph.
Canonical ID	The unique identifier assigned to each paper during deduplication, following the priority scheme: DOI > arXiv ID > Semantic Scholar ID >