

## Appendix

This appendix provides technical details, mathematical derivations, extended examples, and implementation specifications supporting the main text.

### Mathematical Foundations

#### Expected Free Energy Complete Derivation

The Expected Free Energy combines epistemic and pragmatic components (see Equation (??)):

$$\mathcal{F}(\pi) = \mathbb{E}_{q(s_\tau)}[\log q(s_\tau) - \log p(s_\tau | \pi)] + \mathbb{E}_{q(o_\tau)}[\log p(o_\tau | s_\tau) + \log p(s_\tau) - \dots] \quad (1)$$

Using the generative model, the pragmatic component becomes:

$$G(\pi) = \mathbb{E}_{q(o_\tau)}[\log \sigma(C) + \log A - \log q(s_\tau)] \quad (2)$$

Where  $\sigma(C)$  represents the softmax normalization of preferences.

#### Generative Model Complete Specifications