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[← Back to Table of Contents](#)

Belief as Probability

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in voce **a.Laplace**

Abstract

Laplace as historical anchor for inverse probability: maintaining distributions over hidden states, updating with evidence, and linking to modern POMDP metrics such as preemptive inference.

Introduction

This essay voices Pierre-Simon Laplace as guide to **inverse probability**—reasoning from effects to causes under uncertainty. The aim is conceptual: to show how belief as **distribution over hidden states** became the backbone of modern sequential decision-making under partial observability.

From celestial mechanics to epistemic distributions

Laplace's determinism and his probability calculus are not contradictions but **layers**: lawful dynamics plus incomplete knowledge. His asymptotic results on estimation anticipate later frequentist reassurance while his Bayesian phrasing foregrounds **priors as commitments** one must defend.

Modern links

Bayesian filtering, POMDP solvers, and metrics that reward **preemptive inference** before catastrophe translate Laplace's questions into engineering: how fast should a belief tighten around a hazard you cannot yet see? Silver et al.'s (2016) Go work is a popular emblem of learned policies over belief states—far from Laplace's quill, yet haunted by the same mathematics.

Priors and objectivity

Philosophical disputes about “objective” priors mirror institutional disputes about default models in policy. The essay refuses both dogmatic uniqueness and lazy relativism: some priors are **better disciplined** by symmetries, frequencies, and consilience than others.

Conclusion

Belief as probability is not a picture of the world hung on the wall; it is a **procedure** for walking with partial maps—Laplace's enduring gift to anyone who must act before certainty arrives.

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