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Information and the Unknown

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in voce **a.Shannon**

> **Abstract**
>
> Shannon entropy as a measure of residual uncertainty: how much observation is required to resolve hidden hazards, with links to DWMB-style navigation under risk.

Introduction

Claude Shannon gave us a precise sense in which **information reduces uncertainty**. This essay connects entropy and mutual information to **hidden-state resolution** in sequential tasks: each observation is a question put to the environment.

Bits, hazards, and safe policies

Information-theoretic quantities bound **how much must be learned** before a policy can be safe—not merely successful—when traps are statistically ambiguous until probed. DWMB-style benchmarks reward agents that acquire bits **before** stepping into irreversible loss.

Rate-distortion and abstraction

Rate-distortion theory explains why coarse world models can outperform fine ones under bounded computation: compression is not laziness but **resource allocation**. Shannon's lens clarifies when "ignoring detail" is optimal versus when it courts disaster.

Statistical versus strategic concealment

Not all hiddenness is entropic. Adversaries hide structure strategically; markets hide information contractually. Shannon's framework must pair with game theory when models face **malicious** partial observability.

Conclusion

Shannon's legacy is not a reduction of meaning to bits but a discipline: quantify what you do not yet know, then design sensing and action to shrink that ignorance before the world charges interest.

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