Projected Heterogeneity of Homogeneous Signals: Information Emergence and the AP Axes

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Abstract

Homogeneous signals are traditionally considered informationally minimal, yet when projected into interpretive environments they yield heterogeneous outcomes. This article formulates heterogeneity as the informational surplus generated when spatial, contextual, or cognitive boundaries disrupt Absolute Purity. The AP axes (A–P manifold) are introduced to formalize this transformation geometrically.

1. Introduction

Pure repetition, absolute invariance, and symbolic uniformity constitute a homogeneous signal. Yet the moment such a signal is observed, interpreted, transmitted, or embodied in a non-ideal medium, its received form deviates from its emitted self. Heterogeneity thus arises *not because a signal fails* but because it enters *reality*, where boundaries transform.

Principle:

> *Heterogeneity is the informational surplus arising from uniformity encountering a boundary.*

In this work, we articulate: (1) the generative role of interpretation, (2) the information gain associated with deviation from absolute purity, and (3) the trajectories of signal transformation in the AP coordinate system.

2. Projected Heterogeneity

A fully homogeneous signal has zero entropy and communicates no difference. Its uniformity is latent potential, an unspent informational capacity. Upon projection through boundary conditions — physical media, cognitive receivers, noise vectors — interpretations diversify.

As illustrated in Fig. 1, information grows as purity degrades under projection.

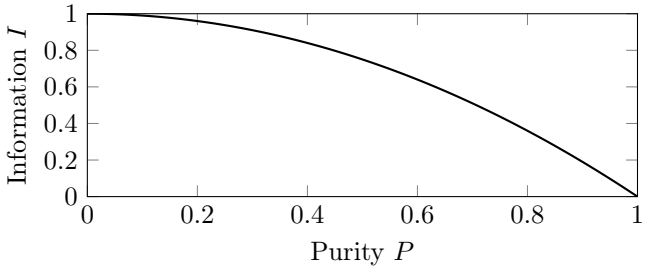

Figure 1: Informational emergence: a perfectly pure signal carries zero usable information; information increases as purity decreases.

3. AP Axes: y-Absolute and x-Purity

Let the vertical axis represent **Absolute** (A): stability of interpretation. Let the horizontal axis represent **Purity** (P): inherent uniformity. Together, these form the AP-plane, mapping idealized signals onto their interaction with reality.

- High A, High P: absolute perfection, zero information
- High A, Low P: rigid chaos, unstable semantics
- Low A, High P: fragile purity, low interpretability
- Low A, Low P: maximal semantic bloom and contextual richness

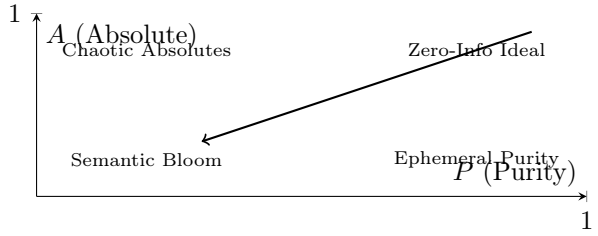

Figure 2: AP-plane: information increases as a signal drifts away from absolute purity through contextual projection.

This downward-left vector indicates heterogeneity increasing during real-world signal processing.

4. Conclusion

Purity without interpretation is silence. Absoluteness without reception is latent. Informational value materi-

alizes through difference, emergence, and boundary interaction. Projection is transformation: the pure becomes plural.

The AP-plane models this metamorphosis algebraically and geometrically, revealing heterogeneity as the very mechanism by which meaning becomes real.