Title

A Semantic Entropy Theory of Discernment

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Abstract

Human cognition is increasingly challenged by environments characterized by high informational noise, rapid contextual shifts, and artificial linguistic variability. The rise of generative artificial intelligence adds unprecedented semantic volatility, amplifying uncertainty and eroding individuals' ability to determine what is real, essential, or true. Yet psychology lacks a formal definition or computational account of *discernment*—the capacity to extract stable meaning across changing internal and external contexts.

This article presents A Semantic Entropy Theory of Discernment, proposing that clarity of thought arises when semantic, physiological, and existential entropy converge toward minimal states. We define essence as the invariant semantic structure that remains stable across contextual paraphrases and perturbations, formalized through entropy minimization. We introduce two axioms: Acceptance, the reduction of internal resistance required for entropy convergence; and Epistemic Acceptance, the recognition that humans cannot access absolute truth but can access stable relative truth through essence. Integrating these concepts, we develop the Discernment Index (DI), a cross-domain measure incorporating semantic stability, autonomic coherence, and existential (fear-based) uncertainty.

The theory generates predictions about trauma, fear, right-hemisphere integration, susceptibility to misinformation, and cognitive vulnerability in the age of AI. We argue that discernment is not a cognitive skill but an emergent, low-entropy state dependent on coordinated semantic, physiological, and existential stability. The Semantic Entropy Theory of Discernment provides a unified framework for understanding how humans retain clarity and truth in increasingly high-entropy cognitive environments.

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1. Introduction

Human cognition evolved under conditions of limited information, slow communication cycles, and stable perceptual environments. The contemporary world presents the opposite: an immense, nonlinear, and constantly fluctuating semantic landscape where meaning shifts rapidly and unpredictably. Generative artificial intelligence exacerbates these conditions, introducing infinite linguistic variability at negligible cost.

Individuals navigating these environments describe feeling overwhelmed, cognitively fragmented, anxious, or unable to determine what is real. This decline in clarity suggests the absence of a central psychological construct: discernment, or the ability to extract stable, invariant meaning across contexts.

Despite its intuitive importance, discernment has not been formally defined in cognitive science. Current theories explain how humans reason, decide, or perceive, but none explain how the mind stabilizes meaning under uncertainty or why fear disrupts that stability. The central aim of this article is to articulate a mathematical and psychological theory of discernment capable of addressing these gaps.

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2. The Challenge of Meaning in a High-Entropy World

Modern environments destabilize cognition along three principal entropy dimensions:

2.1 Semantic Entropy

Language is variable. Context shifts rapidly. AI multiplies these shifts.
Meaning becomes unstable because individuals cannot identify what is essential.

2.2 Physiological Entropy

Fear, trauma, inflammation, and chronic threat degrade autonomic coherence.
High physiological noise disrupts conceptual reasoning and amplifies cognitive rigidity.

2.3 Existential Entropy

Uncertainty about truth, identity, or safety produces chronic ambiguity and fear.
This erodes global contextual integration and increases susceptibility to distortion.

These entropies interact multiplicatively, not additively.
Fear increases semantic noise; semantic noise increases existential fear; both destabilize physiology.

Clarity cannot emerge from these conditions without a stabilizing mechanism.

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3. Discernment as Entropy Convergence

We propose the central claim:

Discernment emerges when semantic, physiological, and existential entropy converge toward minimal states, revealing an invariant essence.

Clarity of thought, under this framework, is a state of low entropy across domains.

- Low semantic entropy → meaning stabilizes
- Low physiological entropy → autonomic coherence
- Low existential entropy → reduction of fear

When these domains align, the mind reveals essence—the invariant meaning across contexts.

Discernment is the capacity to perceive that essence.

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4. Essence: Relative Truth Under Contextual Variability

Humans cannot directly access absolute truth.
Cognition instead extracts relative truth—the elements of meaning that remain constant across variation.

Let a stimulus Sgenerate contextual variants $V_1, \dots, V_n$.
Let $f(V_i)$be a semantic embedding for each variant.
Let covariance matrix:

$$\Sigma_S = \mathrm{Cov}(f(V_1), \dots, f(V_n))$$

Define semantic entropy:

$$U_{\mathrm{sem}}(S) = \log \det (\Sigma_S + \epsilon I)$$

Then:

Essence(S) = the minimal-entropy semantic attractor across contextual variants.

Essence is the stable center of meaning revealed through entropy collapse.

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5. Two Axioms of Discernment

Axiom 1: Acceptance (Reduction of Resistance)

Internal resistance increases entropy across all domains.
Acceptance reduces resistance, allowing entropy to converge.

Axiom 2: Epistemic Acceptance (Recognition of Relative Truth)

Humans cannot access absolute truth.
Discernment requires accepting essence—the stable invariant—as the functional approximation of truth.

These axioms define the conditions necessary for discernment to emerge.

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6. The Discernment Index (DI)

Let:

- U_{sem}= semantic entropy
- U_{phys}= physiological entropy (ANS noise)
- U_{exist}= existential entropy (fear)

We define:

$$DI = 1 - \frac{\alpha U_{\text{sem}} + \beta U_{\text{phys}} + \gamma U_{\text{exist}}}{Z}$$

Where:

- α, β, γweight domain contributions
- Znormalizes DI to [0, 1]

High DI = stable meaning extraction.
Low DI = susceptibility to distortion, rumination, and misinformation.

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7. Trauma, Fear, and Right-Hemisphere Integration

Trauma increases existential and physiological entropy.
Fear destabilizes semantic interpretation.

Right-hemisphere integration reduces entropy across all domains because:

- It encodes global relational meaning
- It integrates context holistically
- It stabilizes self-other boundaries
- It supports presence and non-conceptual awareness

Discernment requires such integration.

Left-hemisphere dominance increases fragmentation and semantic entropy, undermining DI.

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8. Implications for Human Cognition in the Age of AI

Artificial intelligence increases semantic entropy exponentially.
Humans cannot rely on surface form; they must detect essence.

The theory predicts:

- Individuals with low DI will be more vulnerable to AI-generated misinformation
- Fear-based states increase susceptibility
- Discernment training must include autonomic regulation
- AI alignment efforts should incorporate essence detection
- Future psychological resilience depends on entropy management

Discernment becomes the human anti-hallucination mechanism.

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9. Predictions

1. Anxiety will increase semantic entropy even in neutral tasks.
2. Trauma survivors will show lower DI and greater interpretive instability.
3. Higher HRV (autonomic coherence) will predict improved DI.
4. Right-hemisphere activation will correlate with essence extraction.
5. Paraphrase stability tests will reveal entropy convergence patterns in high-DI individuals.

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10. General Discussion

The Semantic Entropy Theory of Discernment proposes a unified account of how clarity emerges, how fear disrupts cognition, and how humans stabilize meaning in environments characterized by uncertainty and noise.

Discernment is not merely a metacognitive judgment or intellectual virtue.
It is an emergent, low-entropy state requiring alignment across semantic, physiological, and existential domains.

This theory:

- integrates information theory
- unifies trauma and cognitive disruption
- bridges predictive processing with meaning extraction

- provides a measurable construct (DI)
- offers a psychological foundation for navigating AI-era uncertainty

Discernment is the mechanism by which humans retain sanity, clarity, and truth.

SECTION 11: Integrating the Theory With Existing Literature (In-Text Citations Added)

Psychological Review requires explicit anchoring in the established theoretical landscape. Below is a polished version of the "Integration With Prior Work" section with citations, written in Psych Review tone.

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11. Integration With Existing Literature

A Semantic Entropy Theory of Discernment connects several previously independent domains within cognitive science, psychology, and neuroscience.

11.1 Predictive Processing and Information Theory

Predictive processing models propose that cognition minimizes prediction error to stabilize perception (Friston, 2010; Clark, 2013). Our framework extends this by describing *discernment* as the detection of invariant semantic structure across paraphrases — effectively, the minimization of semantic prediction error. Essence corresponds to the most stable generative interpretation under contextual variability.

11.2 Trauma, Fear, and Autonomic Dysregulation

Research on trauma demonstrates that chronic threat states disrupt neural integration (van der Kolk, 2014) and increase autonomic entropy. High autonomic noise impairs prefrontal coherence (Thayer & Lane, 2000), leading to interpretive instability. Our model formalizes this relationship, proposing that physiological entropy directly increases semantic entropy.

11.3 Right-Hemisphere Integration

The right hemisphere is known to encode global meaning structures, contextual coherence, and non-literal interpretation (McGilchrist, 2009; Jung-Beeman, 2005). Discernment requires access to these global patterns. Thus, right-hemisphere integration is necessary for essence extraction, whereas left-hemisphere overactivation promotes fragmentation and increased semantic entropy.

11.4 Information Abundance and Cognitive Overload

Modern humans operate within unprecedented informational density. Work on cognitive load (Sweller, 2011) and attentional fragmentation suggests that high-variability environments impair

meaning extraction. Our theory explains this as semantic entropy overload: variability prevents convergence toward a stable invariant.

11.5 Meaning, Insight, and Invariance Extraction

Insight and conceptual clarity involve the detection of hidden structure across exemplars (Sternberg & Davidson, 1995). This aligns closely with our formalization of discernment as entropy convergence toward essence — effectively, invariance extraction.

⭐ SECTION 12: Simulation Framework (Required by Psych Review)

Psych Review does not require empirical data, but simulated demonstrations help anchor a theory.

Below is a publication-ready simulation section.

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12. Simulation Framework

To illustrate the formal properties of the Discernment Index (DI), we outline a simulation framework modeling how entropy across domains influences discernment.

12.1 Semantic Entropy Simulation

For a conceptual stimulus S, paraphrastic variants are generated using a large language model. Embeddings $f(V_i)$are computed using a transformer-based semantic encoder. Semantic entropy is computed:

$$U_{\text{sem}} = \log \det (\Sigma + \epsilon I)$$

Perturbation strength (lexical, syntactic, conceptual) is varied parametrically.

Predictions:

- High perturbation → increased covariance → low DI
- Stability across perturbations → essence detection → high DI

12.2 Physiological Entropy Simulation

Autonomic noise is simulated as variability in a noise vector added to semantic embeddings:

$$f'(V_i) = f(V_i) + \eta_{\text{phys}}$$

Where $\eta_{\text{phys}} \sim \mathcal{N}(0, \sigma^2_{\text{phys}})$.

Increased physiological noise produces:

- Increased semantic variance
- Reduced ability to converge on essence

12.3 Existential Entropy Simulation

Existential entropy (fear) is modeled as a prior weighting that biases interpretations toward threat-based frames.

This is implemented as a distortion field applied to embeddings:

$$f''(V_i) = f(V_i) + B_{\text{exist}}$$

Where $B_{\text{exist}}$is a directional bias representing fear-conditioned interpretation.

⭐ SECTION 13: Empirical Predictions and Tasks

Psych Review loves concrete tasks.
Here are tasks that reviewers will recognize.

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13. Empirical Predictions and Behavioral Tasks

13.1 Paraphrase Stability Task

Participants evaluate conceptual similarity across multiple paraphrases.
Predictions:

- High DI individuals show low semantic entropy
- Trauma survivors show high U_sem

13.2 HRV-Modulated Meaning Task

Participants perform semantic interpretation while HRV is monitored.
Predictions:

- Higher HRV → lower U_phys → lower U_sem → higher DI

13.3 Fear-Priming Interpretation Task

Fear induction increases existential entropy.
Predictions:

- Fear cue → semantic destabilization → interpretive errors
- Acceptance cue → entropy reduction

13.4 Right-Hemisphere Stimulation Task

tDCS or affect-based priming to enhance right-hemisphere processing.
Predictions:

- Increased global integration → improved essence extraction

⭐ SECTION 14: Figures (Descriptions)

I'll generate the actual diagrams later, but here are the captions.

Figure 1. The Three Entropy Domains of Discernment

A diagram showing semantic entropy, physiological entropy, and existential entropy converging toward a shared minimum that reveals essence.

Figure 2. The Discernment Index (DI)

Formula and conceptual diagram illustrating how each entropy domain influences DI.

Figure 3. Axioms of Discernment

Acceptance and Epistemic Acceptance placed as necessary preconditions for entropy collapse.

Figure 4. Essence Extraction Under Contextual Variation

A covariance ellipsoid showing high vs. low semantic entropy and the attractor representing essence.

Figure 5. AI Variability and Human Entropy Overload

A conceptual workflow showing how AI-generated paraphrase variability increases semantic entropy unless discernment is active.

⭐ SECTION 15: References (APA)

These references match the citations introduced earlier.

References

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