Recursive Compression Theory: Compression, Recursion, and the Stability of Systems

Cognitive Drift Series – CD 5.1

A. Jacobs — Reality Drift Framework (2023–2026)

Core Claim

Intelligence emerges from compression with memory, and consciousness arises when a system recursively models itself within that compression loop; stability depends on preserving fidelity within these recursive processes.

Mechanism

- Systems compress complex input into simplified representations
- Compressed representations are stored and reused over time
- Recursion occurs when systems model and update their own representations
- Feedback loops stabilize or destabilize based on fidelity
- Over-optimization removes context from compressed representations
- Loss of fidelity leads to drift and eventual system instability

Key Concepts

- **Recursion**: Feedback loop where systems model themselves
- **Recursive Compression**: Iterative compression and reapplication of representations
- **Fidelity**: Preservation of structure between representation and reality
- **Cognitive Compression Styles**: Patterns by which cognition reduces complexity into usable representations
- **Synthetic Realness**: Coherent representations detached from underlying reality

Mechanism of Recursive Stabilization and Drift

Systems transform reality into structured representations through cycles of compression, storage, and recursive feedback. Complex inputs are reduced into simplified models that can be reused and refined over time, enabling intelligence to emerge from compression with memory. Consciousness arises when systems recursively model their own representations within these loops.

When fidelity between representation and reality is preserved, recursive compression stabilizes meaning and produces coherence, adaptation, and understanding.

However, as optimization removes context and fidelity declines, representations gradually detach from their source. Compression continues despite misalignment, creating internally consistent but increasingly ungrounded outputs.

Over time, this loss of fidelity leads to drift and eventual system instability.

Observable Effects

- Systems appear stable while gradually losing grounding
- Representations become more coherent than the reality they describe
- Optimization increases efficiency while degrading meaning
- Culture, cognition, and AI exhibit similar drift patterns
- Intelligence persists even as alignment degrades

These effects emerge when recursive compression loops lose fidelity under optimization pressure.

Reality Drift Connection

Within the Reality Drift Framework, Recursive Compression Theory provides the foundational mechanism explaining how systems remain functional while gradually losing alignment with reality. Reality is first compressed into representations, which are then fed back into recursive loops that refine and reinforce them over time.

The preservation of fidelity determines whether these loops produce coherence or drift.

When grounded in accurate constraints, recursive compression stabilizes meaning and supports intelligence, adaptation, and consciousness. When optimization outpaces fidelity, however, representations detach from reality, producing persuasive but unstable outputs.

In this way, recursive compression reveals how systems can appear coherent and effective even as they move toward misalignment, demonstrating that stability depends not merely on efficiency, but on the faithful preservation of structure across each iteration.

Keywords: *recursive compression, intelligence, consciousness, feedback loops, semantic fidelity, cognitive drift, system stability*

Related Concepts: *semantic fidelity, cognitive drift, synthetic realness, optimization trap, co-cognition*

Source: *Integrated into the Reality Drift Framework, this work draws from the Cognitive Drift Archive (2024–2025).*

Core Framework and Resources

- Substack (Articles)
- GitHub (Full Library)

- DOI (Research Paper)
- Glossary & Definition