Respecting Einstein’s Constraints: Integrating an Informational Model Within Physical Reality

itzhexen

June 20, 2025
10:44 PM

Abstract

This paper addresses the necessity of ensuring that informational models of reality align with fundamental physical constraints established by Einstein’s theories of relativity. It argues that while informational structures offer a profound framework for understanding observation, dimensionality, and identity, they must operate within the bounds of physical invariants such as the speed of light, causality, and spacetime geometry. The paper proposes a layered ontology where informational flow underlies, but does not contradict, the physical substrate described by relativity. This approach maintains scientific rigor while expanding the conceptual basis for interpreting reality.

1. Introduction: The Role of Constraints in Modeling Reality

Any comprehensive model of reality must honor the empirical constraints verified by physics. Einstein’s theories of relativity represent some of the most robust and experimentally confirmed frameworks, placing firm limits on how spacetime and causality function.

An informational model, aiming to explain identity, observation, and dimensionality in terms of information flow and structure, must therefore ensure compatibility with these constraints.

2. Einstein’s Theories as Non-Negotiable Constraints

Key constraints from relativity include:

Invariant speed of light: No information or influence propagates faster than light.

Causality preservation: Effects cannot precede causes in any inertial frame.

Spacetime geometry: Mass-energy shapes spacetime curvature, affecting motion and time flow.

These constraints define a physical substrate that any abstract model must respect to remain plausible.

3. Informational Models Within Physical Boundaries

Informational models do not conflict with relativity if they:

Treat spacetime as the physical layer where information is instantiated and constrained.

View information flow as occurring within and respecting spacetime geometry and

causality.

Avoid assumptions of instantaneous or non-local information transfer that violate light-speed limits.

Thus, informational structure is an underlying framework that operates inside the bounds set by relativity, not outside or above them.

4. A Layered Ontology: Physical and Informational Substrates

Reality can be modeled as layered:

The physical substrate, governed by Einsteinian spacetime and fields.

The informational substrate, describing how data, resolution, and identity emerge from interactions within that physical substrate.

This layered approach enables new conceptual tools while preserving the integrity of physics.

5. Implications for Dimensionality and Observation

Dimensional imposition and entanglement occur within the informational substrate but cannot imply physical violations like faster-than-light signaling.

Observers, as structures processing information, operate in spacetime and must respect its constraints.

6. Conclusion: Integrating Rigor and Innovation

By acknowledging and integrating Einstein’s constraints, informational models gain scientific credibility and operational clarity. This synergy fosters a robust framework that bridges abstract informational theory and empirical physical reality without contradiction.