Research Highlights

Information Ontology: Rewriting the Foundations of Physics

Key Contributions

1. **Paradigm-Shifting Foundation**
   - Introduces information as the ontological primitive of reality, more fundamental than matter or energy
   - Establishes XOR and SHIFT as the basic operations from which all physical phenomena emerge
   - Provides a coherent alternative to both wave-particle and field-based ontologies
2. **Quantum Mechanics Reformulation**
   - Resolves the measurement problem by reframing observation as information extraction
   - Explains quantum superposition as information overlay without wave function collapse postulates
   - Derives quantum probabilities naturally from information principles
   - Clarifies quantum entanglement as information connection independent of spatial constraints
3. **Relativistic Physics Reinterpretation**
   - Derives spacetime as an emergent structure from information relationships
   - Reframes gravity as information density gradients rather than spacetime curvature
   - Provides a coherent explanation of black hole physics without information loss
4. **Unification Framework**
   - Bridges quantum mechanics and general relativity through common information principles
   - Derives a unified field equation incorporating both quantum and gravitational effects
   - Resolves long-standing theoretical incompatibilities through information-based approach
5. **Experimental Predictions**
   - Provides specific, quantitative predictions for quantum system behavior
   - Identifies measurable gravitational wave modifications
   - Proposes detectable signatures in black hole radiation spectra
   - Outlines laboratory tests feasible with current or near-future technology

Significance and Impact

This work represents a fundamental reconceptualization of physical reality, offering:

- **Theoretical Elegance:** Derives complex physical laws from just two primitive information operations
- **Explanatory Power:** Resolves long-standing paradoxes in quantum mechanics and black hole physics
- **Unification Potential:** Provides a pathway to reconcile quantum mechanics and general relativity
- **Empirical Testability:** Generates novel predictions that differ from conventional theories
- **Technological Applications:** Suggests new approaches to quantum computing and information processing

Visual Elements

The manuscript includes:

- Conceptual visualization of information operations versus conventional physical interpretations
- Mathematical formalism connecting information operations to standard physical equations
- Comparison of experimental predictions with conventional theories
- Simulation results supporting key theoretical claims