

# Holographic Information Dynamics Operating System (HID-OS)

A Computational Ontology of the Universe

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## **Abstract**

This thesis presents HID-OS v1.0, a unified computational ontology treating the universe as a holographic operating system. It integrates holography, persistent homology, Fisher-Rao geometry, and ledger-based resource management. A full reference simulation, mathematical derivations, and falsifiable predictions are included.

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# Chapter 1

## Introduction

The universe operates as a self-managing Holographic Information Dynamics Operating System (HID-OS). Physics is the executive kernel of a computational ledger.

The central **Master Equation** is:

$$\Omega(t) + A(t) + D(t) = \Omega_0$$

## Chapter 2

# The Kernel — Transition & Symmetry Engine

The Kernel uses a  $4 \times 4$  density matrix and the lower-triangular Scheduler  $T^\wedge$ , enforcing the No-Exit Theorem and the arrow of time.

## Chapter 3

# Hardware Abstraction Layer

Reality is projected from 2D null future light-sheets. The ultraviolet cutoff  $\Lambda_{UV}$  scales with horizon size  $L$ .

## Chapter 4

# Resource Management & The 3/2 Law

Structural Debt ( $D \approx 0.146$ ) is serviced by Dark Energy (manifold expansion). The Fisher-Rao gradient flow acts as the Garbage Collector. Error correction follows the 3/2 Law, leading to the Coordination Tax  $R \approx kE^{3/2}$  for consciousness.

## Chapter 5

# The File System — Persistent Homology

Particles and structures are Persistent Spectral Graph harmonics identified by Betti numbers. Simulations show  $\beta_1$  declining as debt is amortized.



## Chapter 6

# Observer Congruences & Consciousness

Observers are localized timelike congruences. The Forward-Only Flag creates causality.

## Chapter 7

# System Shutdown — Lloyd Bound

Recursive Closure is projected at  $\sim 214$  Gyr.

## Chapter 8

# Conclusions & Predictions

Key predictions include debt-modulated Betti signatures in cosmology, dynamical dark energy features, and  $E^{3/2}$  scaling in neural data.

### 8.1 Reference Simulation (v1.0)

### 8.2 Bibliography

# Bibliography

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