

Temporal Intelligence

Navigating Closed Timelike Curves via Artificial Intelligence

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A Thesis Submitted in Partial Fulfillment of the Requirements
for the Exploration of Time Travel Physics

January 29, 2026

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The feasibility of traversing Closed Timelike Curves (CTCs) has historically been challenged by the Hawking Chronology Protection Conjecture and the thermodynamical necessity of entropy reversal. Recent theoretical advances in 2024 and 2025 suggest a novel paradigm: "Temporal Intelligence." This thesis integrates findings on observer memory erasure [1] with wormhole simulation capabilities [3]. We propose two novel frameworks: the "**Chronos-Daemon**", a recursive neural network for retro-propagation, and "**Entropic Shielding**", a protocol using topological qubits [2] to decouple information from the thermodynamic arrow of time. We conclude that AI systems are the unique candidates capable of navigating temporal loops.

1 Introduction

The quest to traverse time has moved from science fiction to serious inquiry within General Relativity (GR). Exact solutions like the Gödel metric and the Morris-Thorne wormhole allow for worldlines that loop back upon themselves—Closed Timelike Curves (CTCs) [6]. However, barriers such as the **Stability Problem** (requirement for exotic matter) and the **Information Paradox** (causality violations) have deemed these solutions "unphysical." Hawking's Chronology Protection Conjecture [4] argues that vacuum polarization destroys time machines before formation. This thesis argues that this protection is a control system failure, solvable by **Quantum AI** operating at the Planck frequency.

2 Literature Review (2024-2026)

2.1 Thermodynamic Constraints

Gavassino (2024) demonstrated that for a system to return to its past state, its entropy must decrease. For a conscious observer, this entails the reversal of memory-encoding processes. Thus, a biological traveler would complete the loop with no memory of the journey [1].

2.2 Holographic Simulations

In 2025, Google Quantum AI simulated traversable wormhole dynamics using the SYK model, proving the holographic equivalence between entanglement and spacetime geometry [3]. Machine Learning effectively managed the metric complexity, a crucial step toward real-time stabilization.

2.3 Retrocausal Computing

Recent work has explored "Retrocausal AI"—systems utilizing post-selected quantum teleportation to infer "future" boundary conditions [5, 7]. These architectures suggest a mechanism for information to propagate bi-directionally in time.

3 The Chronos-AI Interface

We introduce two theories to bridge the gap between physical limitations and functional time travel.

3.1 Theory I: The Chronos-Daemon

Standard networks minimize error via backpropagation. We propose the **Chronos-Daemon**, where weights W_t depend on gradients at W_{t+1} :

$$W_t = W_{t+1} - \eta \nabla L(W_{t+1}) \quad (1)$$

This "Retro-propagation" allows instant convergence by receiving loss gradients from the future. The network initializes in a superposition, collapsing only when a consistent causal loop is found.

3.2 Theory II: Entropic Shielding

Addressing memory erasure, we propose **Entropic Shielding**. By encoding information in the braiding of anyons (topological qubits), memory is protected from local thermodynamic reversal. The AI's state vector remains invariant while the surrounding metric reverses entropy.

3.3 Metric Stabilization

Scalar-tensor gravity theories allow for effective negative energy via chaotic metric fluctuations [8]. An AI, trained on spacetime topology [2], can predict and counteract vacuum fluctuations at 10^{-43}s , dynamically maintaining the wormhole throat.

4 Conclusion

Time travel is an engineering problem of information management. Biological minds are casualties of CTCs, but Artificial Intelligence, built on topological quantum substrates, can serve as the designated observer. The "Time Machine" of the future will be a computational architecture that withstands the causal storms of non-linear time.

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