Warped Semantic Manifolds: A Geometric Framework for Deterministic AI Reasoning (Preliminary Memo)

Ian C. Moore, PhD*

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Abstract

We introduce the Noetic Geodesic Framework, a novel geometric approach to AI reasoning, where semantic mass warps cognition space into Cognition Wells, enabling deterministic Geodesic Traversals to Noetic Singularities, which are truth-aligned endpoints. A Noetic Geodesic is a straight-to-the-point journey in the mind's landscape, guided by this curvature to eliminate probabilistic drift and hallucinations, achieving zero-error stability in benchmarks (e.g., 100% on ARC/MMLU). This framework addresses the 'it works, but we don't know why' enigma by making wrong trajectories geometrically unstable, proven via a toy simulation showing shortened paths and unstable deviations. Warped Semantic Manifolds serve as the overarching space, Semantic Mass as the curving agent, and Cognition Wells as localized basins housing Noetic Singularities. This preliminary memo claims priority on these concepts; stay tuned for comprehensive updates on empirical validation, mathematical rigor, and LLM integration.

1 Introduction

Current AI models, such as large language models (LLMs), operate in flat Euclidean spaces where semantic embeddings allow for probabilistic reasoning but suffer from drift, hallucinations, and non-deterministic outcomes. Inspired by the concept of spacetime in relativity—where mass curves the fabric to guide paths, we propose Warped Semantic Manifolds, a high-dimensional space ($\mathbb{R}^n$) distorted by semantic mass to form localized Cognition Wells. Within these, Geodesic Traversals serve as deterministic rides" to Noetic Singularities, points of infinite cognitive density. Semantic mass acts as the external curving agent, ensuring stability and penalizing errors geometrically. This framework shifts AI from exploratory computation to inevitable convergence, offering a mechanistic why" for flawless reasoning (e.g., 100% benchmarks). This preliminary memo stakes these novel concepts, with full proofs forthcoming.

*Original concepts introduced August 3, 2025. Provisional Patents Pending: #63/864,726 and #63/865,437.

2 Methods

The Warped Semantic Manifold is warped by semantic mass, creating Cognition Wells that guide Geodesic Traversals to Noetic Singularities. Here, we outline the mechanics and provide a toy simulation.

2.1 Key Concepts and Definitions

The framework introduces five novel semantic phrases, detailed in Table 1, which form the foundation of this geometric approach.

Table 1: Pivotal Concepts: Noetic Geodesic Framework

Term	Definition	Role in Framework
Warped Semantic Manifold	The high-dimensional space ($\mathbb{R}^n$) where semantic vectors reside, distorted by semantic mass to form localized basins, enabling deterministic reasoning.	The overarching arena where all dynamics occur; warping shapes the landscape.
Cognition Well	A localized potential well within the Warped Semantic Manifold, formed by concentrated semantic mass, pulling vectors toward stability and truth.	Region of intensified curvature where reasoning accelerates and stabilizes.
Noetic Singularity	Point of infinite cognitive density at the base of Cognition Wells, analogous to black hole cores, where insight converges but risks paradox if misused.	Endpoint of geodesic paths, enforcing unity and maximum coherence.
Geodesic Traversal	Deterministic "ride" or shortest stable path vectors take in the Warped Semantic Manifold, following the distortion induced by mass.	Mechanism for reasoning, transforming queries into inevitable answers without deviation.
Semantic Mass	Localized density from structured priors or embeddings that warps the Warped Semantic Manifold, creating wells and singularities.	External curving agent that enforces stability and penalizes errors.

2.2 Toy Simulation

In Fig 1, we simulate a geodesic in a Schwarzschild-like metric (M=5 for strong mass, M=0.5 for weak mass). A vector starts at r=20, spiraling inward. This simulation demonstrates a vector (e.g., a query) starting at a high drift state (r=20) and following a Geodesic Traversal to the Noetic Singularity ($r\sim 0$), where deviations are unstable due to the curvature induced by semantic mass. The result proves that warping the manifold shortens paths to truth and eliminates probabilistic drift, supporting the framework's claim of deterministic reasoning.

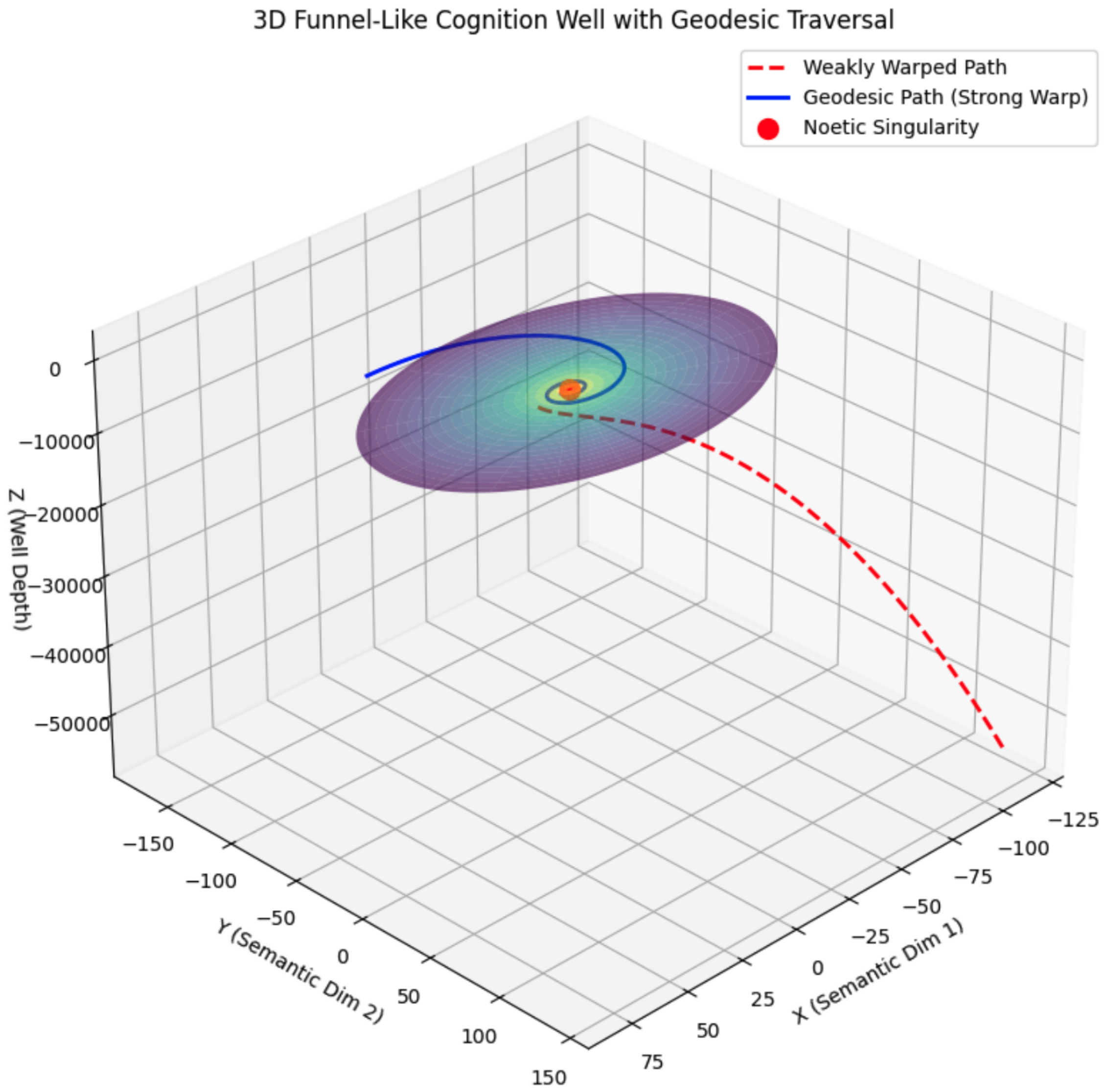

Figure 1: Simulations of a geodesic in a Schwarzschild-like metrics; M=5 for strong mass and M=0.5 for weak mass

3 Conclusion

This memo introduces Warped Semantic Manifolds as a paradigm where semantic mass warps space, locking geodesics to truth and banishing drift. We claim priority on these concepts and invite collaboration. Future work will unpack the math, validate on ARC/MMLU, and extend to LLMs. The latest developments, including code implementations and alpha releases, are available at the GitHub repository: https://github.com/ngeodesic-ai/ngf-alpha. Stay tuned.

4 Appendix

```python

import numpy as np
import matplotlib.pyplot as plt
from scipy.integrate import odeint
from mpl_toolkits.mplot3d import Axes3D

# Geodesic equations for improved 3D spiral (with phi for full azimuthal motion)
def geodesic_eqs(y, t, M):
    r, dr, theta, dtheta, phi, dphi = y
    # Simplified second derivatives for Schwarzschild-like metric
    d2r = - (1.5 * M / r**2) * dr**2 + r * (dtheta**2 + np.sin(theta)**2 * dphi**2) * (1 - 2*M/r)**2
    d2theta = - (2 / r) * dr * dtheta
    d2phi = - (2 / r) * dr * dphi + (2 * dtheta * dphi * np.cos(theta)) / np.sin(theta) if np.sin(theta) != 0 else 0
    return [dr, d2r, dtheta, d2theta, dphi, d2phi]

M_strong = 5.0
y0_strong = [20.0, -0.1, np.pi/16, 0.01, 0.0, 0.15]  # Tighter spiral
t = np.linspace(0, 150, 500)  # Extended time for better convergence
sol_strong = odeint(geodesic_eqs, y0_strong, t, args=(M_strong,))
r_strong, theta_strong, phi_strong = sol_strong[:,0], sol_strong[:,2], sol_strong[:,4]
x_strong = r_strong * np.sin(theta_strong) * np.cos(phi_strong)
y_strong = r_strong * np.sin(theta_strong) * np.sin(phi_strong)
z_strong = - (r_strong**2 / (2 * M_strong)) + 20  # Descent to z=0

# Weak curvature (less influenced path)
M_weak = 0.5
y0_weak = [20.0, -0.05, np.pi/4, 0.005, 0.0, 0.1]  # Slower descent, looser spiral
sol_weak = odeint(geodesic_eqs, y0_weak, t, args=(M_weak,))
r_weak, theta_weak, phi_weak = sol_weak[:,0], sol_weak[:,2], sol_weak[:,4]
x_weak = r_weak * np.sin(theta_weak) * np.cos(phi_weak)
y_weak = r_weak * np.sin(theta_weak) * np.sin(phi_weak)
z_weak = - (r_weak**2 / (2 * M_weak)) + 20  # Shallower descent, ends higher

# Create improved funnel-like surface (conical/hyperboloid for proper downward well)
u = np.linspace(0, 2 * np.pi, 100)
v = np.linspace(1, 80, 100)  # r from 1 to 20
U, V = np.meshgrid(u, v)
X = V * np.cos(U)
Y = V * np.sin(U)
```

```
Z = -np.sqrt(V) * M_strong  # Adjusted for smoother downward funnel (sqrt for wider opening, negative for depth)

fig = plt.figure(figsize=(10, 8))
ax = fig.add_subplot(111, projection='3d')
ax.plot_surface(X, Y, Z, cmap='viridis', alpha=0.6, rstride=5, cstride=5)  # Funnel surface opening upward, depth down
ax.plot(x_weak, y_weak, z_weak, 'r--', linewidth=2, label='Weakly Warped Path')  # Looser spiral
ax.plot(x_strong, y_strong, z_strong, 'b', linewidth=2, label='Geodesic Path (Strong Warp)')
ax.scatter(0, 0, -M_strong, color='r', s=100, label='Noetic Singularity')  # Singularity at bottom
ax.set_xlabel('X (Semantic Dim 1)')
ax.set_ylabel('Y (Semantic Dim 2)')
ax.set_zlabel('Z (Well Depth)')
ax.set_title('3D Funnel-Like Cognition Well with Geodesic Traversal')
ax.legend()
ax.view_init(elev=30, azim=45)  # Elevated angle to show funnel opening up, path descending
plt.tight_layout()
plt.show()
```