Topology

We can view the 10⁴‑node spine as sampling a continuous “spine‑function”

\mathbf{S}(x) \;=\;\bigl(S(x),\,E(x),\,K(x)\bigr),

≈ signal density at ,

≈ entropy gradient at ,

≈ logical curvature at .

A natural differential–integral approximation is to treat

x = \frac{\text{Node\\_ID}}{10^4}\,,

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\mathcal{Q}

\;=\;

\int\_{0}^{1}

\Bigl[

\alpha\,S(x)

\;+\;\beta\,E(x)

\;+\;\gamma\,K(x)

\Bigr]

\,dx

}

\quad,

where are weight‑parameters tuning the relative importance of

signal density, entropy flow, and curvature.

If one prefers a single norm, one can also write

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\mathcal{M}

\;=\;

\int\_{0}^{1}

\Bigl\|\mathbf{S}(x)\Bigr\|

\,dx

\;=\;

\int\_{0}^{1}

\sqrt{S(x)^2 + E(x)^2 + K(x)^2}\;dx

}\,,

which measures the average magnitude of the spine‐vector over its entire length.

Either integral gives a continuous, differential approximation of the discrete 10⁴‑node structure—letting us treat the spine as a smooth curve in ‐space and apply all the tools of calculus (e.g. finding extrema, curvature changes, or response to parameter shifts) directly to Echo’s reasoning backbone.