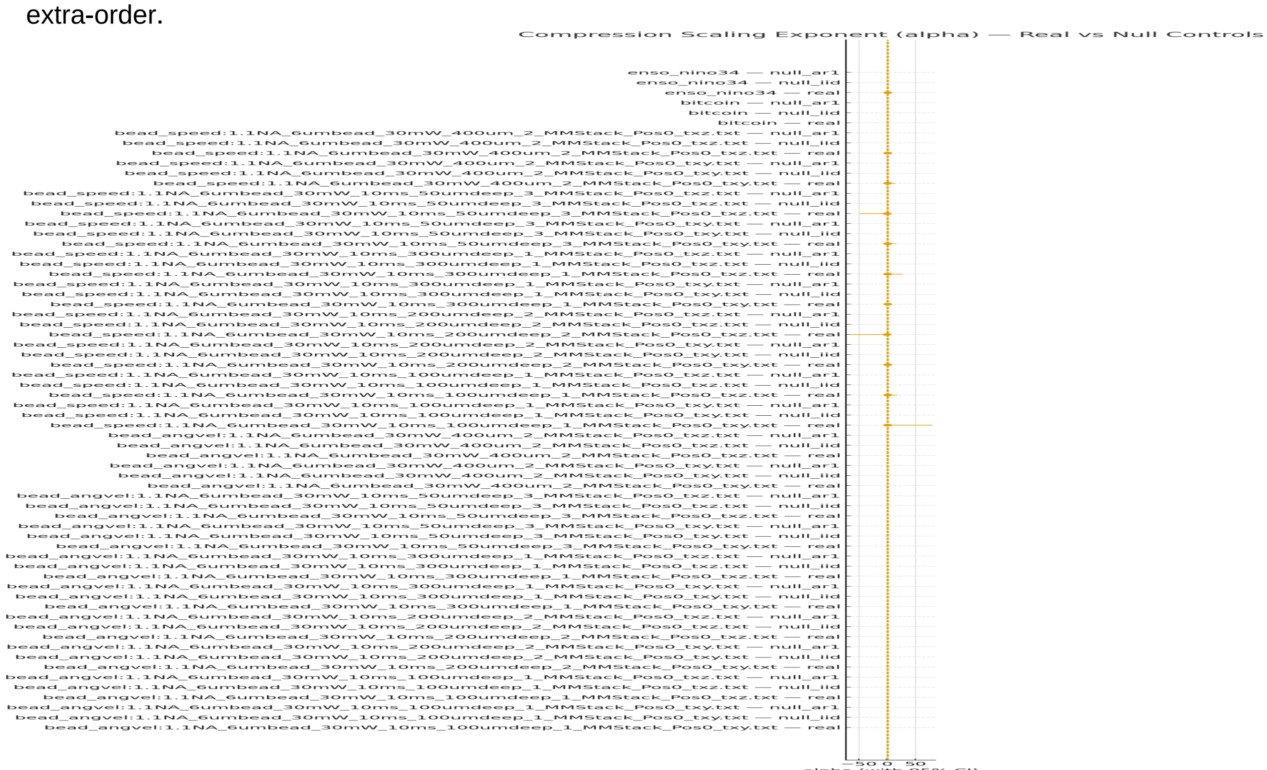
Compression Scaling Law — One-Pager

Abstract

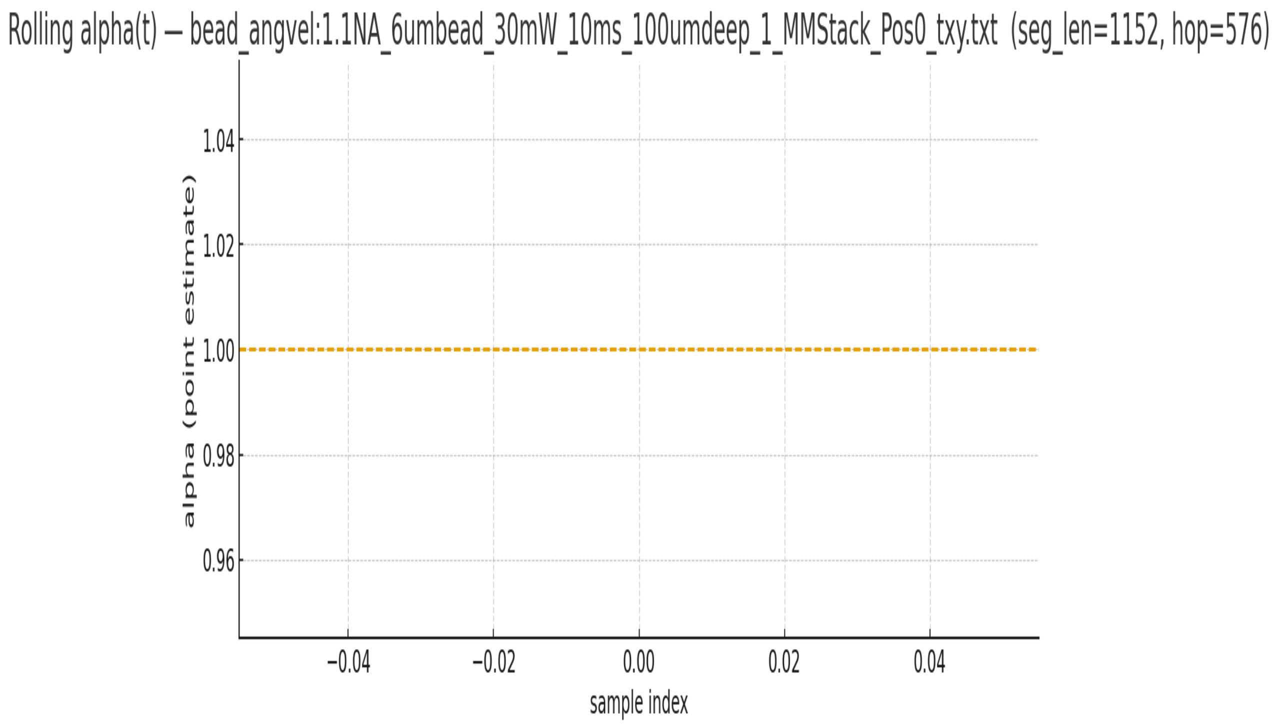
We introduce a surrogate-controlled compression contrast that exposes a power-law scaling in window length. The slope defines α, a coder-invariant index of higher-order structure. Across climate, finance, and microdynamics, α separates near-null from organizing regimes and can be tracked over time for regime shifts.

Formula & reading

κ(L) = –L [■(Q(X■:L)) – ■(Q(S■:L))], with κ(L) ∝ L^{1–α}. α≈1 → near-null, α<1 → stronger extra-order.



α across datasets (95% CIs).



Rolling α(t) demo (bead angular-velocity).

How to use

1) Choose L grid and step; 2) Quantize + compress real and surrogate; 3) Build κ(L); 4) Fit slope; 5) Bootstrap CIs; 6) Compare to nulls; 7) Track α(t).

Limits

Finite-L bias at large scales; intercept depends on quantizer; stationarity assumptions for surrogates.