



PATH DEGENERACY

Below Landauer: stabilizing a reusable record requires $\geq k_B T \ln 2$ per order bit

Exponentially many micro-trajectories map to same macro-outcome

Digital: pay per bit | Continuous: pay at projection

$$E_{\min}^{\text{time}} \geq k_B T \ln 2 \cdot \log_2(M!)$$

Temporal Registration Bound