

Rate floor stable across a $20\times \Delta t$ sweep

exp044 · 2 June 2026

The trained networks this entry uses are produced once in the shared training hub, exp022 (Training), and reused here rather than retrained.

Abstract

The Δt audit asks whether the exp025 headline E rate is a physical (Hz) property of the trained network or an artefact of the integration timestep. The rate stays within a 9–14 Hz band across a $20\times \Delta t$ sweep, accuracy holds at 90.4–91.4%, and the gamma cycle period in physical ms is invariant. The rate is not fully Δt -independent, though: it rises monotonically with the timestep, from ≈ 9.2 Hz at $\Delta t = 0.05$ ms to ≈ 13.4 Hz at $\Delta t = 1$ ms, so a coarser step inflates the rate while leaving accuracy and cycle period intact.

Method

Parameter	Value
Integration timestep Δt	0.05–1.0 ms (swept)
Trial duration T	200 ms
MNIST samples (80/20 stratified split of 7000)	5600 train / 1400 test ($\approx 10\%$ of the 70k-sample MNIST corpus)
Epochs	50

The exp022 hub trains one PING per $\Delta t \in \{0.05, 0.1, 0.25, 0.5, 1.0\}$ ms $\times$ seed $\in \{42, 43, 44\}$ = 15 cells; this entry loads them and evaluates. Total physical time $T = 200$ ms is held constant (step count varies 4000 $\rightarrow$ 200). Batch size 64 throughout, smaller than exp025’s 256 but matched across the sweep so per-step compute and memory stay comparable, and the $\Delta t = 0.05$ cells (4000 timesteps $\times N_E \times N_I$) fit in a single A100. All other PING recipe parameters held to exp025.

Run inference on the test set; report mean E rate (Hz), accuracy, and a single-trial raster from seed 42 per Δt for visual cycle-period inspection.

Results

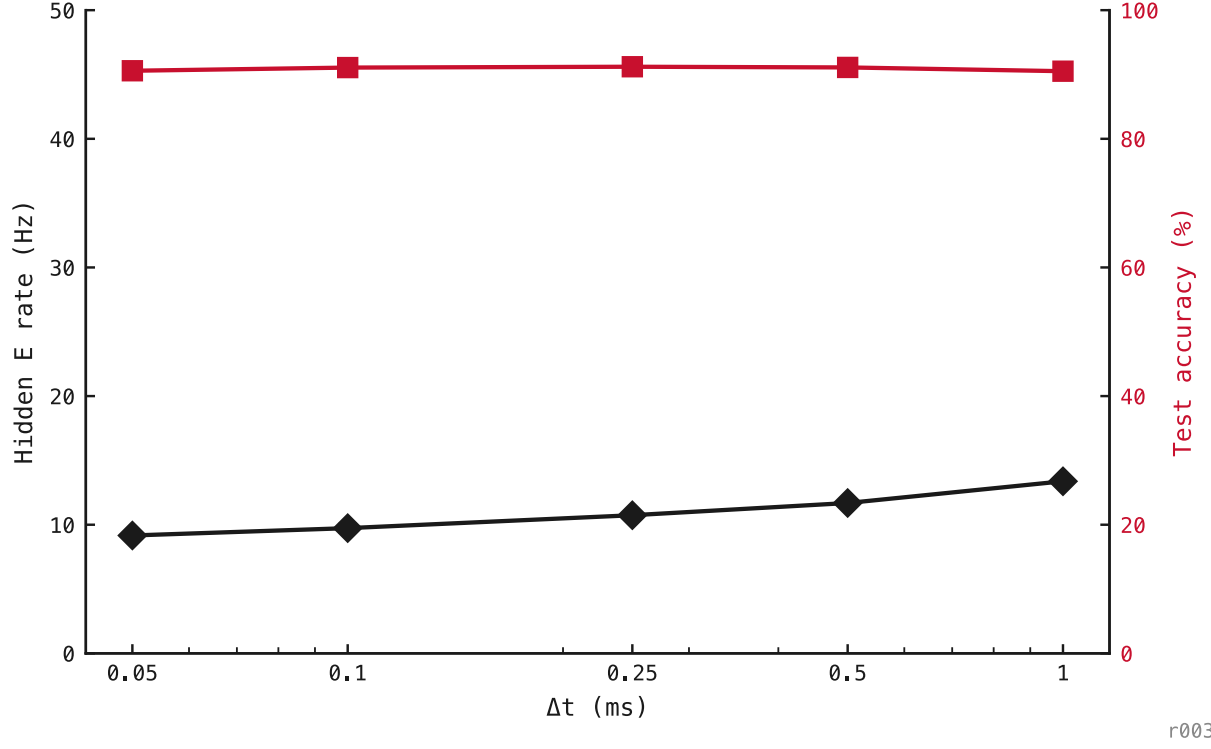


Figure 1: Hidden E rate (black) and test accuracy (red) as Δt varies 20 $\times$; markers are per- Δt means over three seeds. Accuracy holds near 91% while the E rate rises monotonically from ≈ 9.2 Hz at $\Delta t = 0.05$ ms to ≈ 13.4 Hz at $\Delta t = 1$ ms.

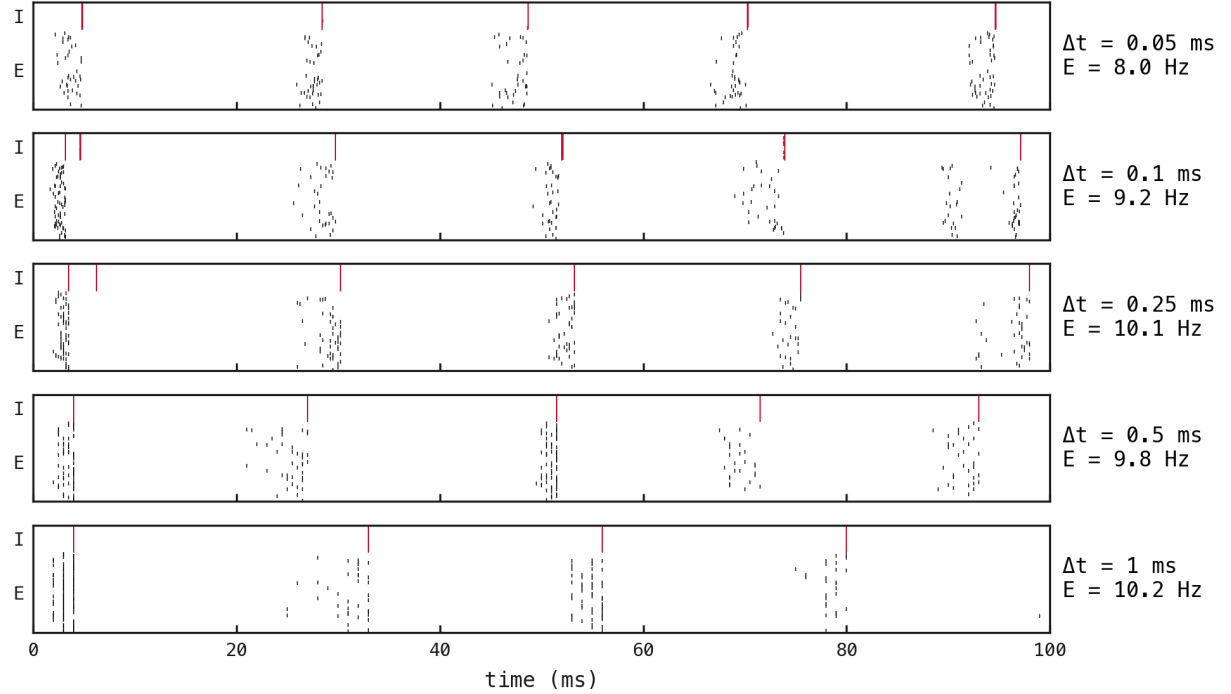
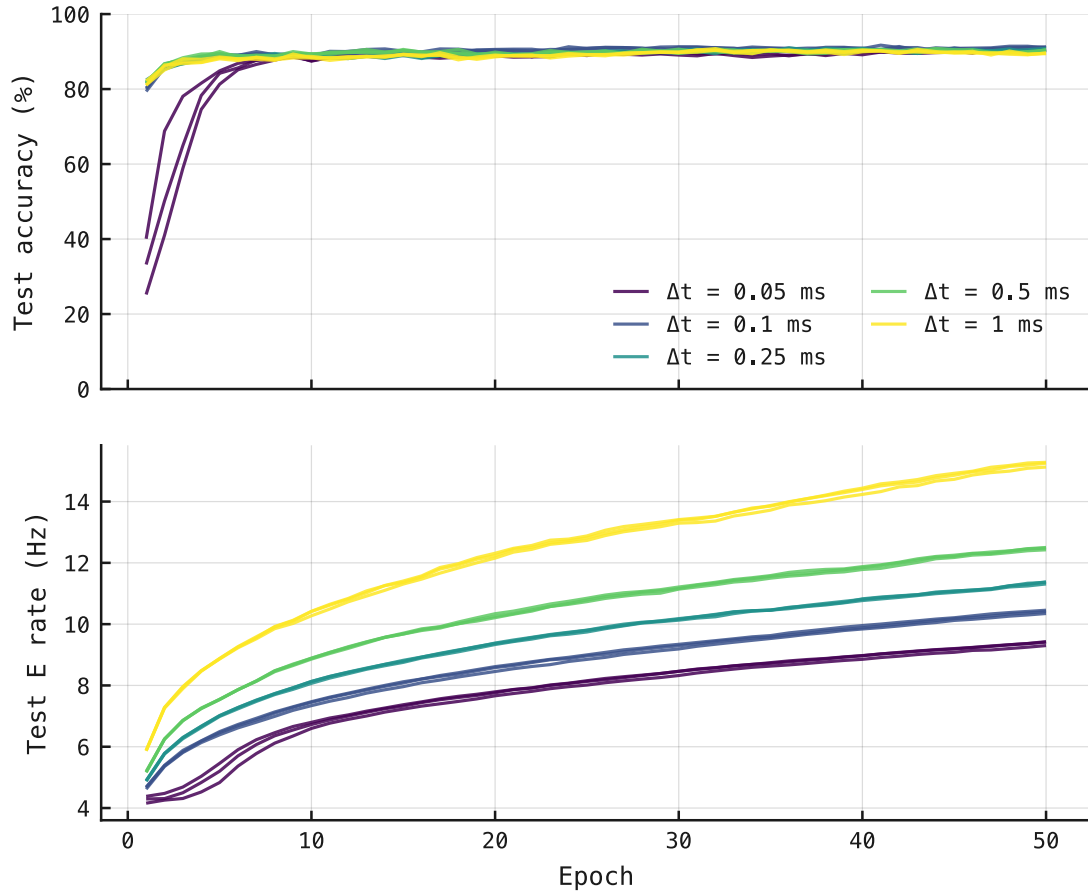


Figure 2: Single-trial rasters at each Δt , x-axis in *physical* ms (not steps). All five panels show E (black) and I (red) bursts locked to the same gamma cadence. The cycle physics is Δt -invariant.



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Figure 3: Top: test accuracy converges by epoch ≈ 10 –15 across all Δt . Bottom: test E rate has *not* converged at epoch 50; every curve is still rising, ordered by Δt . The Δt -dependent rate is a snapshot at epoch 50, not a fixed-point ceiling.