Mycelium Temporal Memory Analysis Report

EXPERIMENT OVERVIEW

Date & Time: 2026-02-20 17:49:43
Report Generated: mycelium_memory_analysis_report_20260220_174943.pdf

TEST CONFIGURATION

Test Type: Sine Wave Test
Sample Delay: 300 ms (0.3 seconds per sample)
Test Duration Setting: 60 seconds
Actual Test Duration: 60.0 seconds
Input Amplitude: 4.0 V (voltage range applied to mycelium)
Max Correlation Lag: 10 samples (3.0 seconds lookback)
Total Data Points: 200 samples

DATA COLLECTION SUMMARY

Input Voltage Range: 1.20V to 4.00V
State Voltage Range: 0.278V to 0.293V
State Voltage Mean: 0.284V ± 0.003V
Data Quality: ✓ Good

HARDWARE CONFIGURATION

Device Mode: Real Hardware
Input Device: Digilent Device 1
Measurement Device: Digilent Device 2

Temporal Memory Analysis Results

TEMPORAL MEMORY ANALYSIS RESULTS
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AUTOCORRELATION ANALYSIS
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Maximum Correlation: 0.2915
Optimal Lag: 1 samples (0.3 seconds)
Memory Persistence: Moderate
Interpretation: States show moderate self-similarity

CROSS-CORRELATION ANALYSIS
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Maximum Input-State Correlation: 0.2935
Optimal Lag: 1 samples (0.3 seconds)
Input Memory Effect: Moderate
Interpretation: Past inputs moderately influence current states

STATE PREDICTION ANALYSIS
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Current Input Only R^2: 0.0861
With Input History R^2: 0.1443
Temporal Improvement: 0.0582
Temporal Benefit: Moderate
Interpretation: Input history moderately improves prediction

RESPONSE DECAY ANALYSIS
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Status: Response decay analysis requires Step Response Test

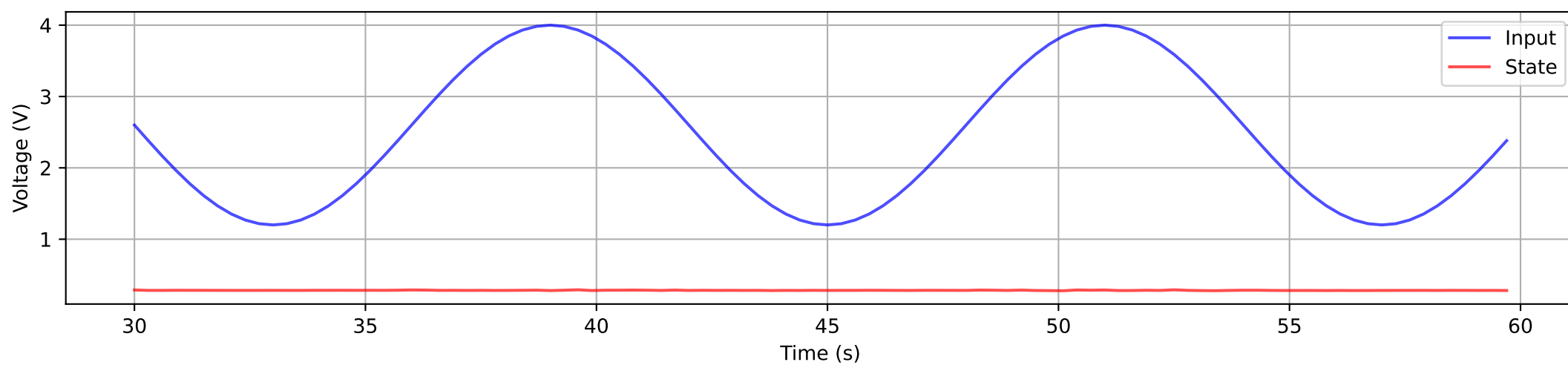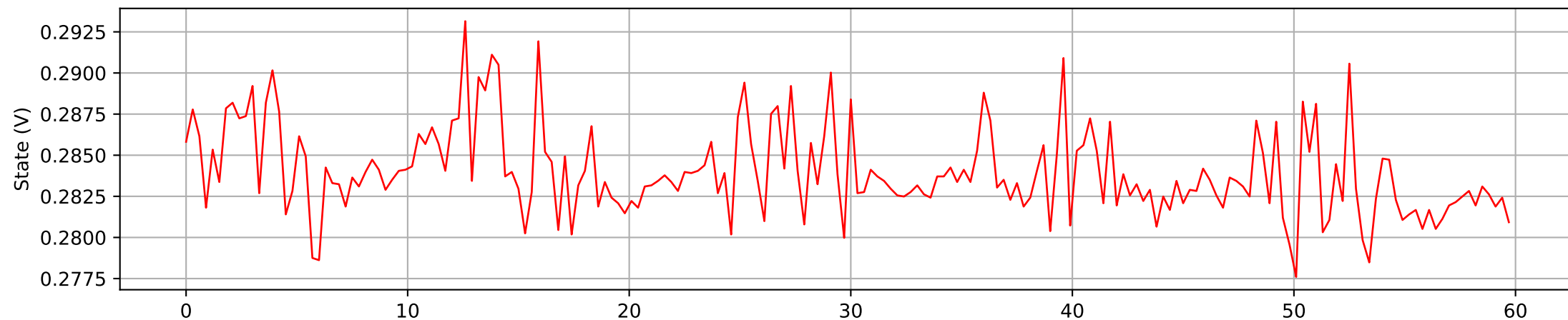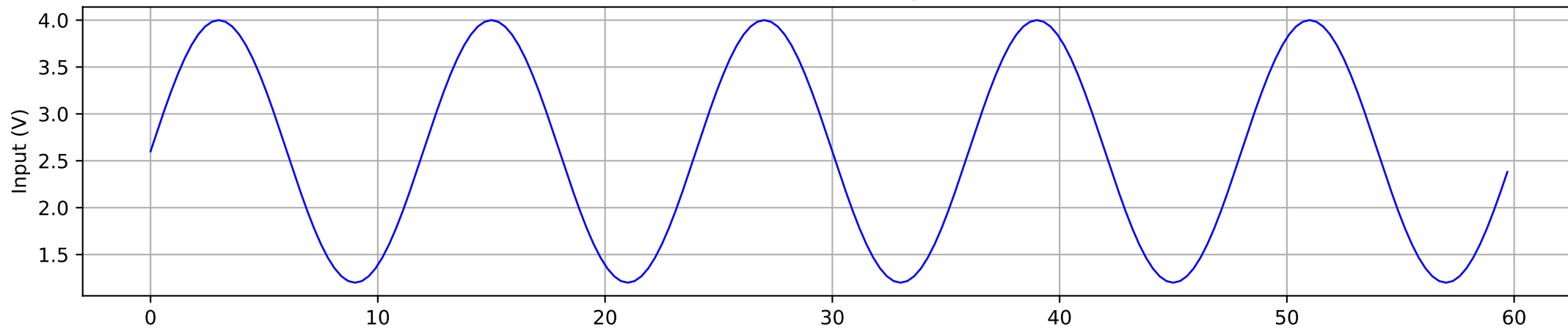OVERALL MEMORY ASSESSMENT
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Memory Score: 3/3
★★★

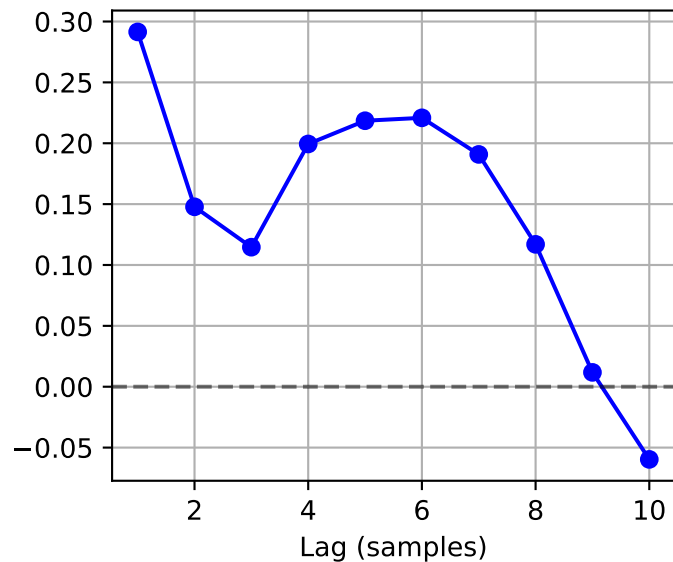CONCLUSION: ⬜ Strong evidence of temporal memory effects

RESERVOIR COMPUTING ASSESSMENT:
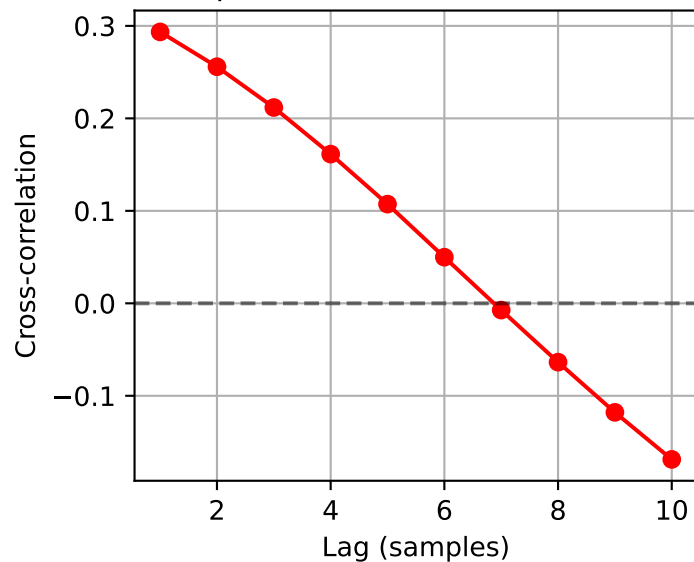✓ This mycelium sample shows excellent reservoir computing potential
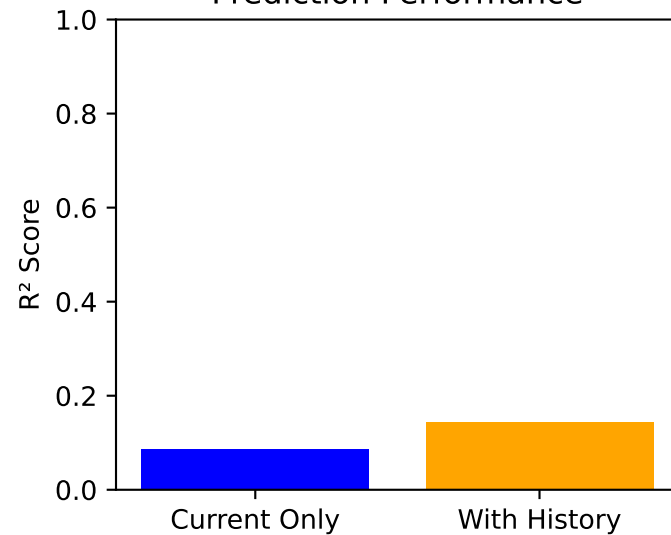
Sine Wave Test - Sample 200
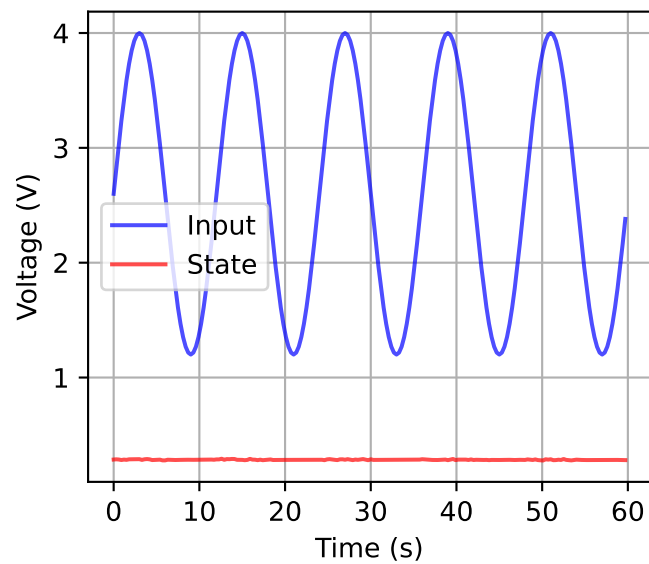
State Autocorrelation

Lag (samples)

Input-State Cross-correlation

Lag (samples)

Prediction Performance

R² Score — Current Only, With History

Full Time Series

Input, State

State Distribution

State Voltage (V)
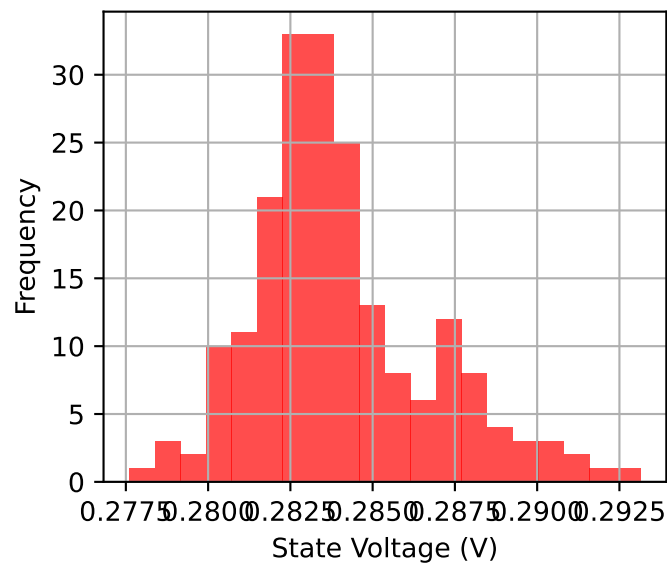
Input-State Relationship

Input (t) vs State (t+1)
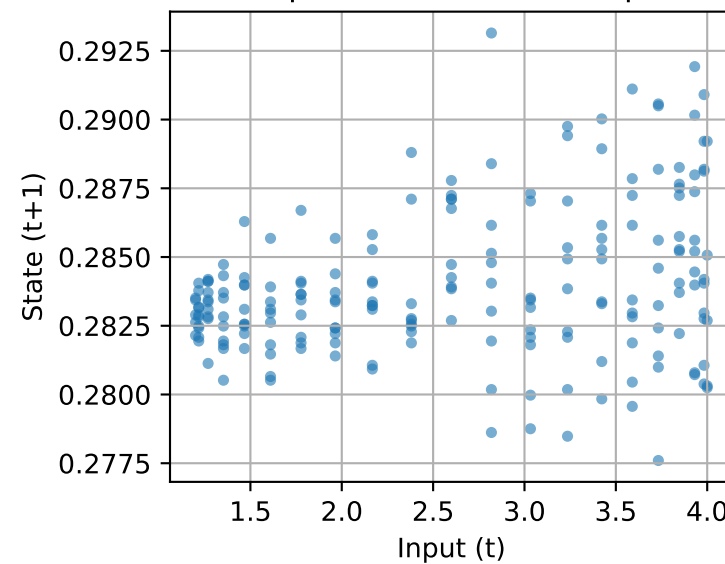
Data Summary Tables

Parameter	Input (V)	State (V)
Mean	2.600	0.284
Std Dev	0.990	0.003
Min	1.200	0.278
Max	4.000	0.293
Range	2.800	0.016

Lag (samples)	Lag (seconds)	Autocorr	Cross-corr
1	0.3	0.291	0.293
2	0.6	0.148	0.256
3	0.9	0.115	0.212
4	1.2	0.199	0.161
5	1.5	0.219	0.107
6	1.8	0.221	0.050
7	2.1	0.191	-0.007
8	2.4	0.117	-0.064
9	2.7	0.012	-0.118
10	3.0	-0.060	-0.169