Mycelium Temporal Memory Analysis Report

EXPERIMENT OVERVIEW

Date & Time: 2026-02-20 17:42:56
Report Generated: mycelium_memory_analysis_report_20260220_174256.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: 0.267V to 0.283V
State Voltage Mean: 0.274V ± 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: 0.3536
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: 0.3994
Optimal Lag: 1 samples (0.3 seconds)
Input Memory Effect: Strong
Interpretation: Past inputs strongly influence current states

STATE PREDICTION ANALYSIS
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Current Input Only R^2: 0.1596
With Input History R^2: 0.1816
Temporal Improvement: 0.0220
Temporal Benefit: Moderate
Interpretation: Input history moderately improves prediction

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

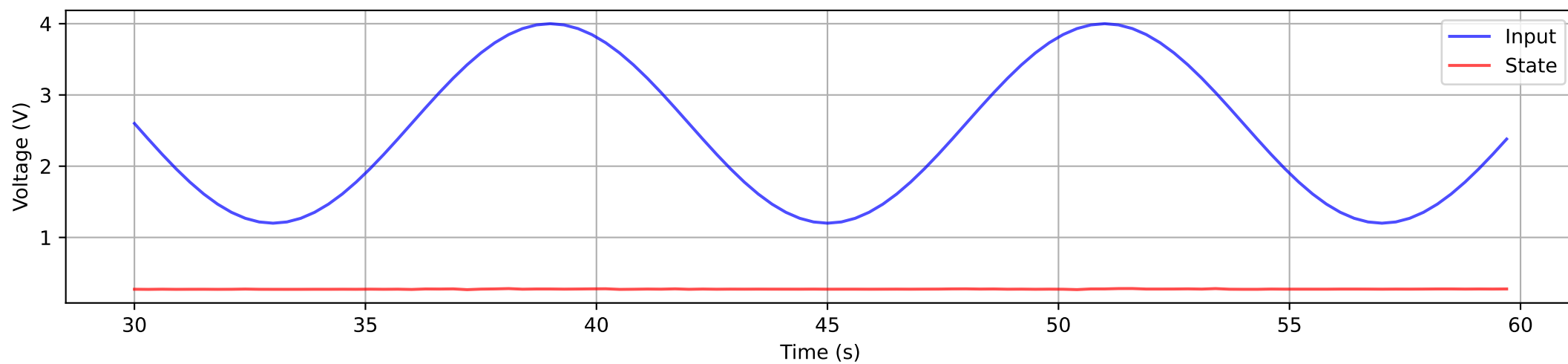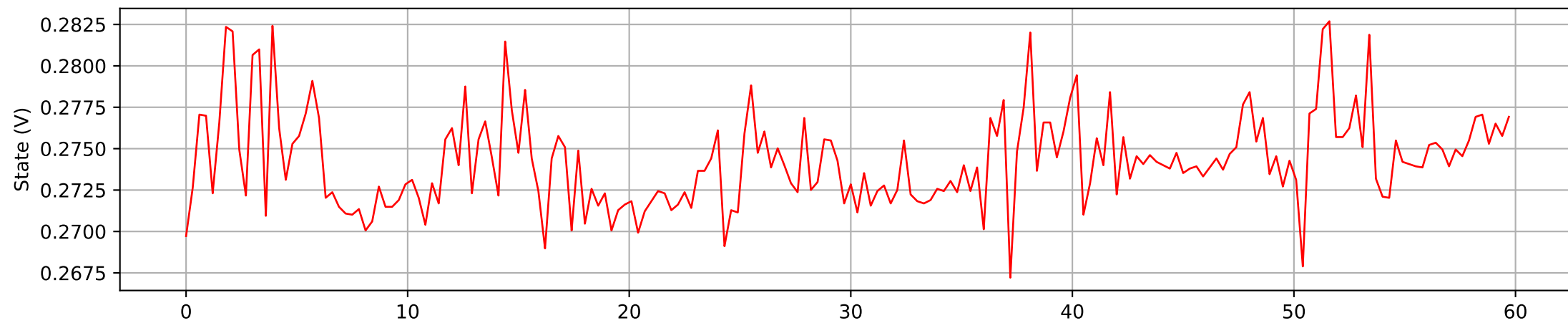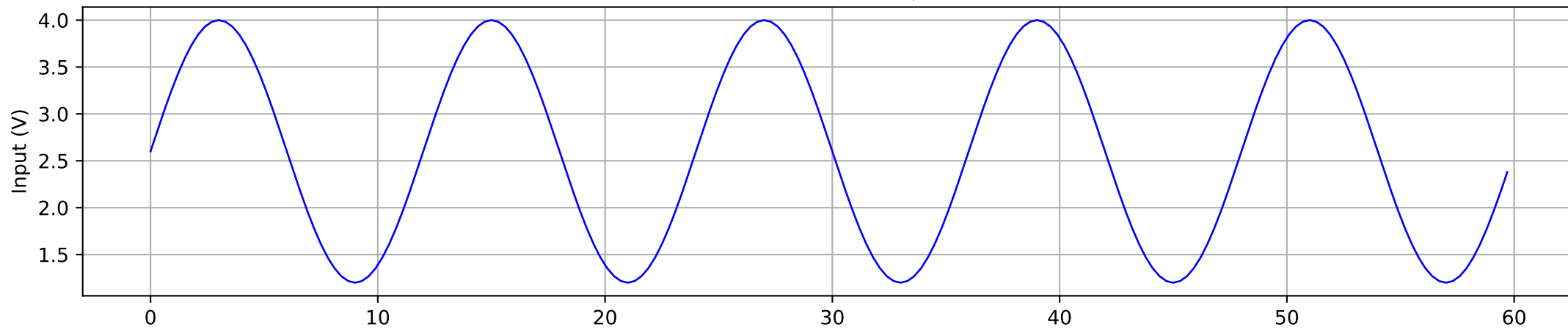OVERALL MEMORY ASSESSMENT
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Memory Score: 3/3
★★★

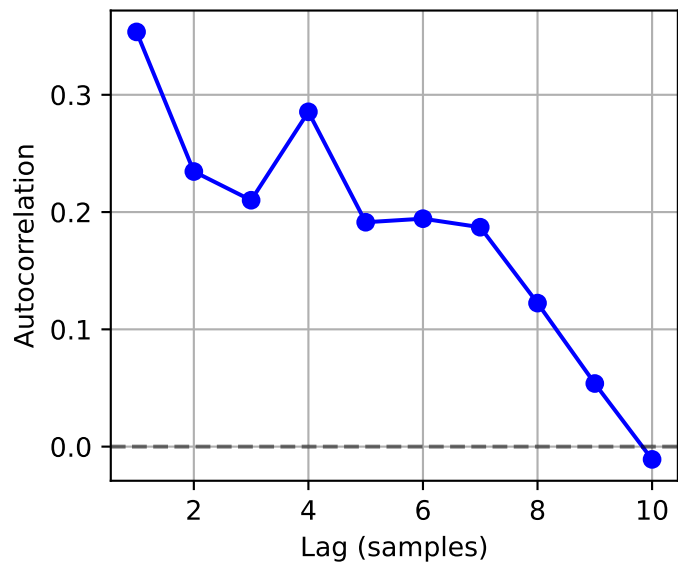CONCLUSION: ⬤ Strong evidence of temporal memory effects

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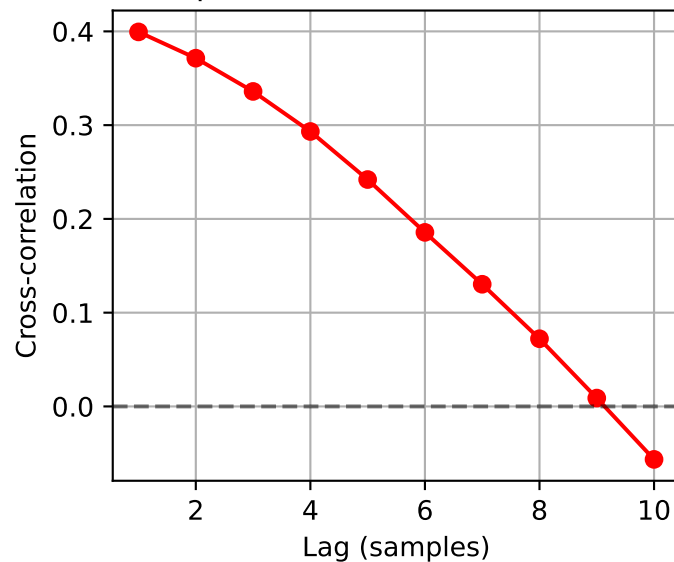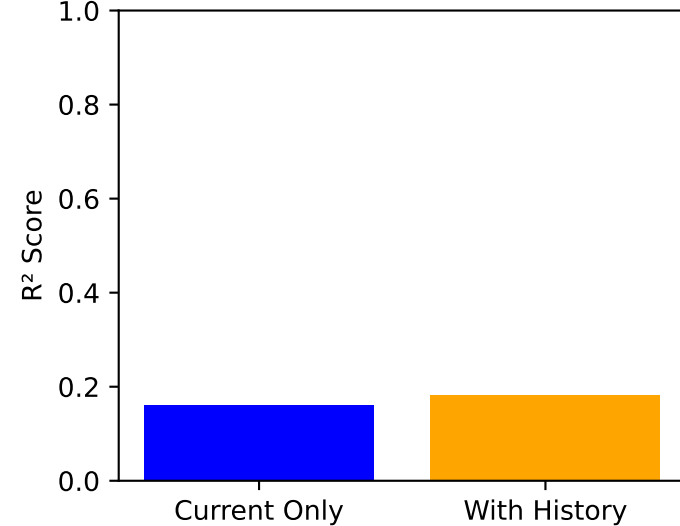
Sine Wave Test - Sample 200
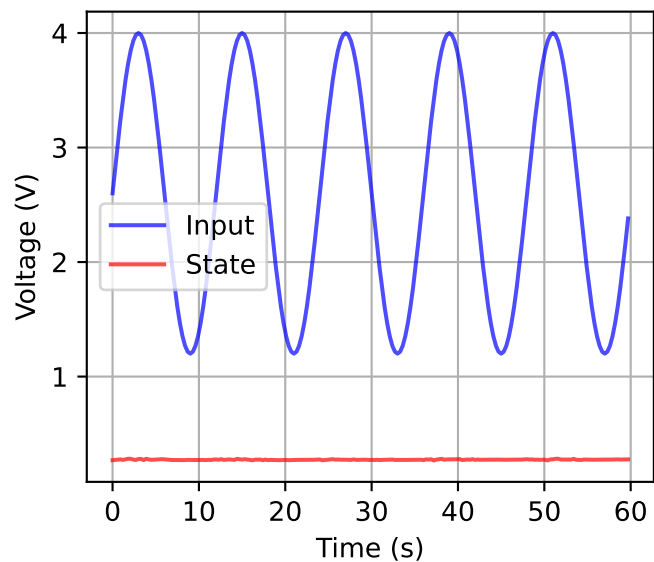
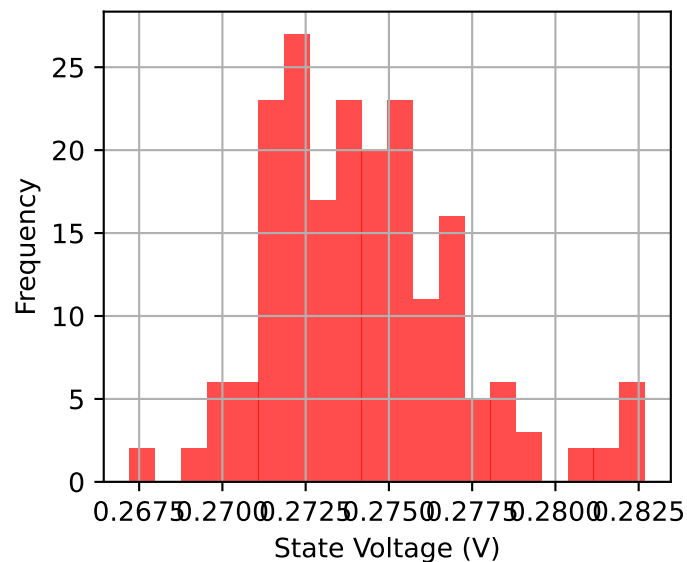**State Autocorrelation**

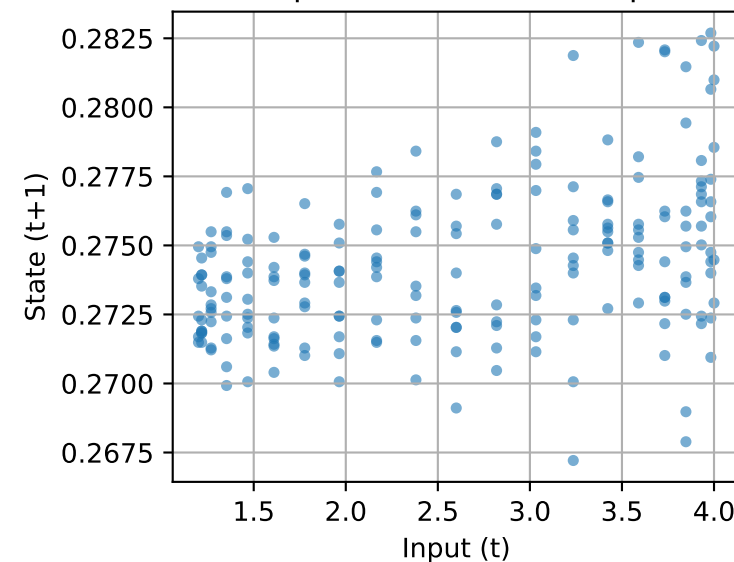**Input-State Cross-correlation**

Prediction Performance

Full Time Series

State Distribution

Input-State Relationship

Data Summary Tables

Parameter	Input (V)	State (V)
Mean	2.600	0.274
Std Dev	0.990	0.003
Min	1.200	0.267
Max	4.000	0.283
Range	2.800	0.015

Lag (samples)	Lag (seconds)	Autocorr	Cross-corr
1	0.3	0.354	0.399
2	0.6	0.235	0.371
3	0.9	0.210	0.336
4	1.2	0.285	0.293
5	1.5	0.191	0.242
6	1.8	0.194	0.186
7	2.1	0.187	0.130
8	2.4	0.122	0.072
9	2.7	0.054	0.009
10	3.0	-0.011	-0.056