Mycelium Temporal Memory Analysis Report

EXPERIMENT OVERVIEW

Date & Time: 2026-02-20 17:36:20
Report Generated: mycelium_memory_analysis_report_20260220_173620.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: 0.240V to 0.258V
State Voltage Mean: 0.248V ± 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

AUTOCORRELATION ANALYSIS

Maximum Correlation: 0.5478
Optimal Lag: 3 samples (0.9 seconds)
Memory Persistence: Strong
Interpretation: States show strong self-similarity over time

CROSS-CORRELATION ANALYSIS

Maximum Input-State Correlation: 0.2846
Optimal Lag: 10 samples (3.0 seconds)
Input Memory Effect: Moderate
Interpretation: Past inputs moderately influence current states

STATE PREDICTION ANALYSIS

Current Input Only R^2: 0.0378
With Input History R^2: 0.1378
Temporal Improvement: 0.1000
Temporal Benefit: Significant
Interpretation: Input history significantly improves state prediction

RESPONSE DECAY ANALYSIS

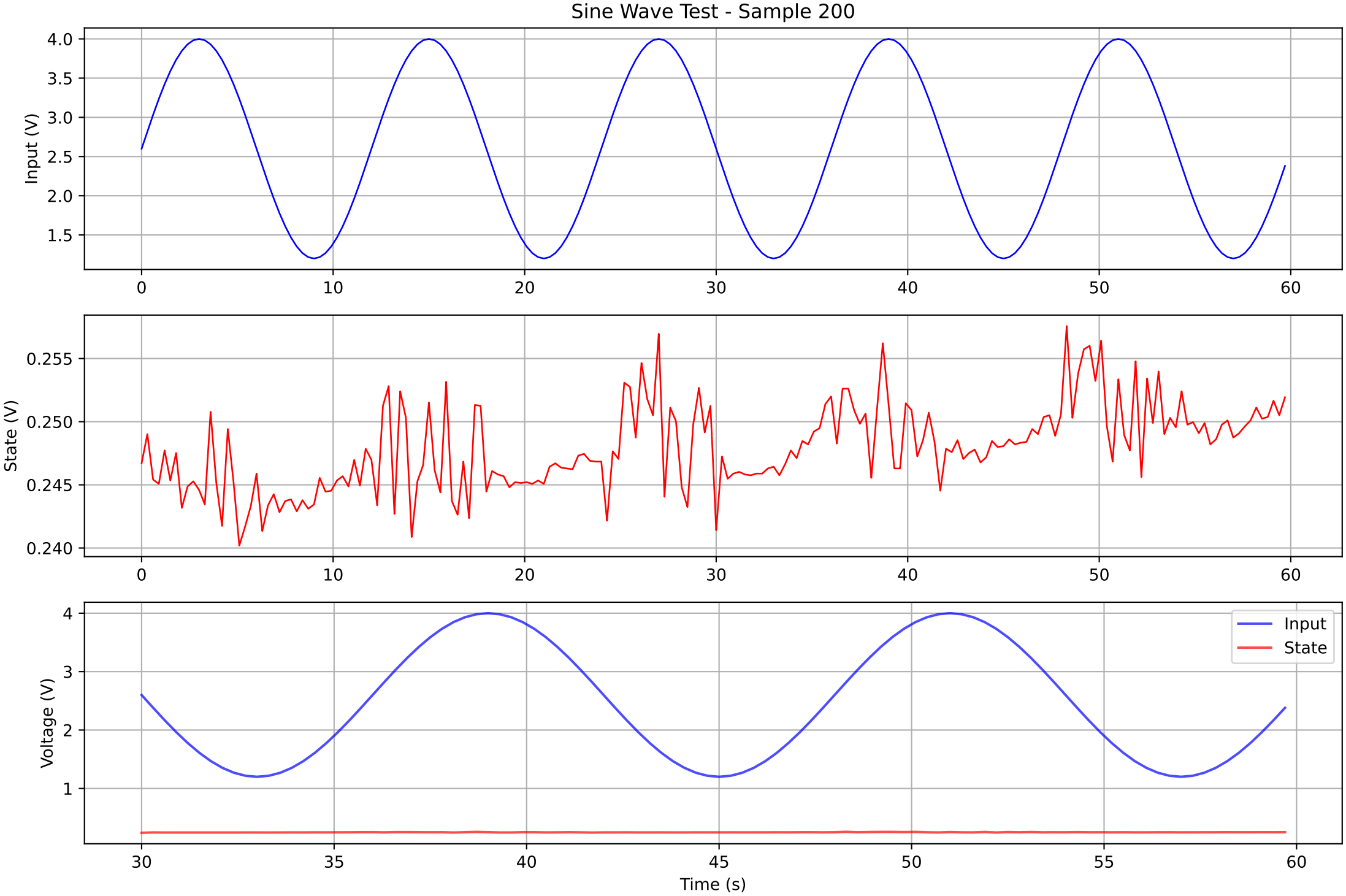
Status: Response decay analysis requires Step Response Test

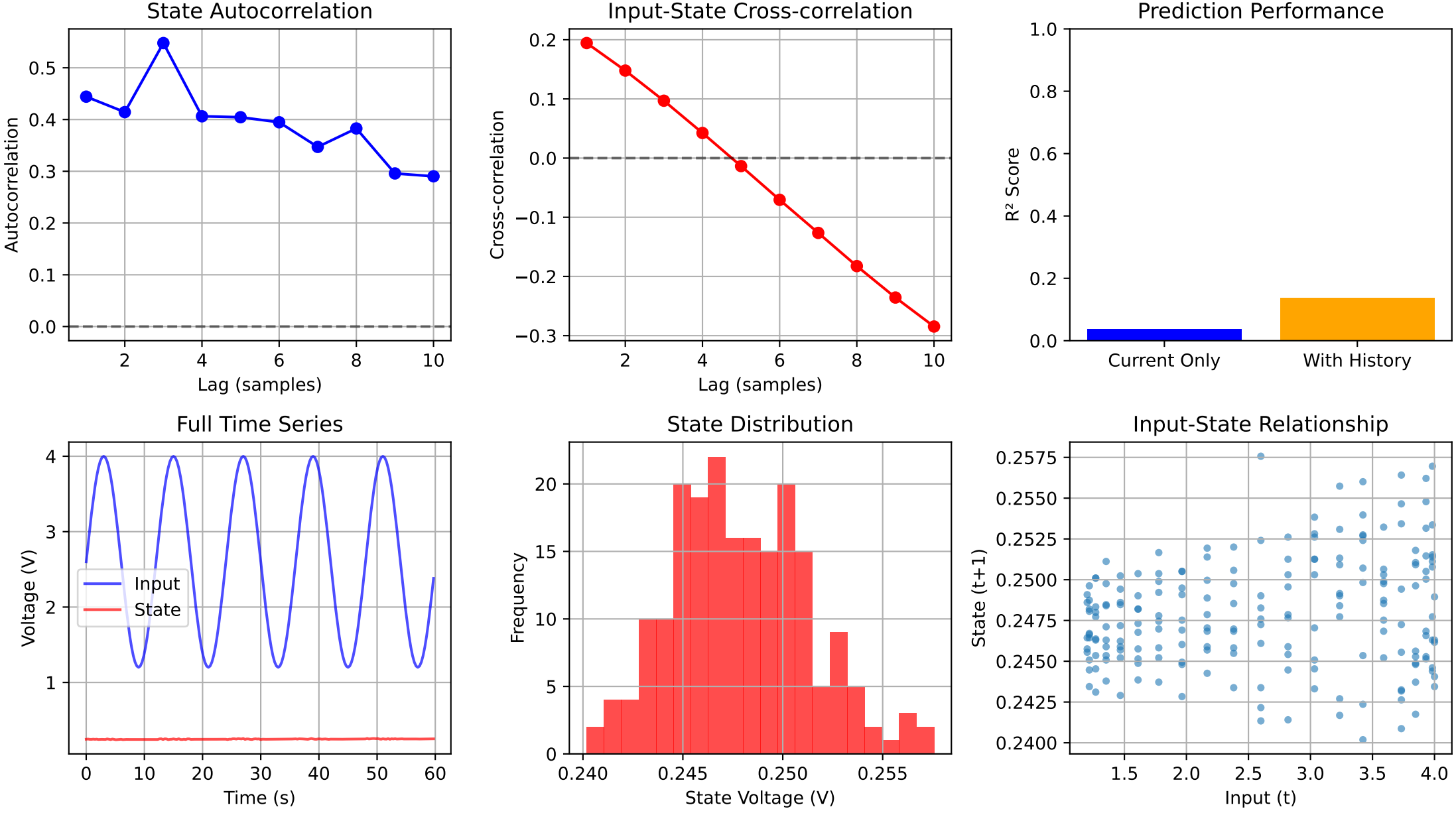
OVERALL MEMORY ASSESSMENT

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
Input (V)
State (V)
Voltage (V)
Time (s)
Input
State


State Autocorrelation
Autocorrelation
Lag (samples)
Input-State Cross-correlation
Cross-correlation
Lag (samples)
Prediction Performance
R² Score
Current Only
With History
Full Time Series
Voltage (V)
Input
State
Time (s)
State Distribution
Frequency
State Voltage (V)
Input-State Relationship
State (t+1)
Input (t)

Data Summary Tables

Parameter	Input (V)	State (V)
Mean	2.600	0.248
Std Dev	0.990	0.003
Min	1.200	0.240
Max	4.000	0.258
Range	2.800	0.017

Lag (samples)	Lag (seconds)	Autocorr	Cross-corr
1	0.3	0.444	0.194
2	0.6	0.414	0.148
3	0.9	0.548	0.097
4	1.2	0.406	0.042
5	1.5	0.404	-0.014
6	1.8	0.395	-0.071
7	2.1	0.347	-0.126
8	2.4	0.383	-0.182
9	2.7	0.296	-0.236
10	3.0	0.290	-0.285