Mycelium Temporal Memory Analysis Report

EXPERIMENT OVERVIEW

Date & Time: 2026-02-20 17:57:21
Report Generated: mycelium_memory_analysis_report_20260220_175721.pdf

TEST CONFIGURATION

Test Type: Step Response 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: 0.279V to 0.306V
State Voltage Mean: 0.290V ± 0.004V
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: 0.1280
Optimal Lag: 4 samples (1.2 seconds)
Memory Persistence: Weak
Interpretation: States show weak temporal structure

CROSS-CORRELATION ANALYSIS

Maximum Input-State Correlation: 0.2868
Optimal Lag: 5 samples (1.5 seconds)
Input Memory Effect: Moderate
Interpretation: Past inputs moderately influence current states

STATE PREDICTION ANALYSIS

Current Input Only R^2: 0.0355
With Input History R^2: 0.1101
Temporal Improvement: 0.0746
Temporal Benefit: Moderate
Interpretation: Input history moderately improves prediction

RESPONSE DECAY ANALYSIS

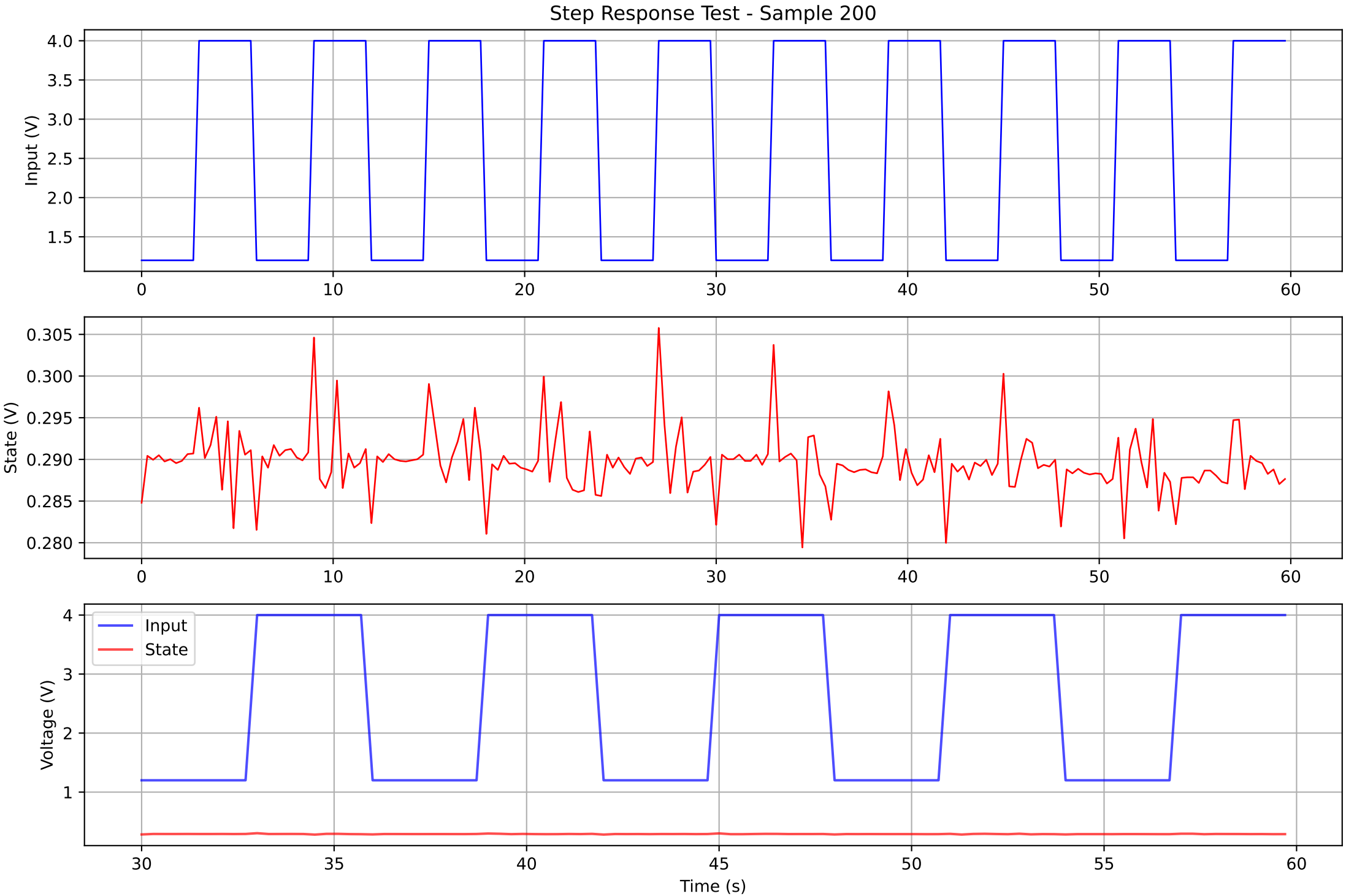
Number of Transitions: 19
Average Settling Time: 0.700 seconds
Interpretation: Fast response dynamics

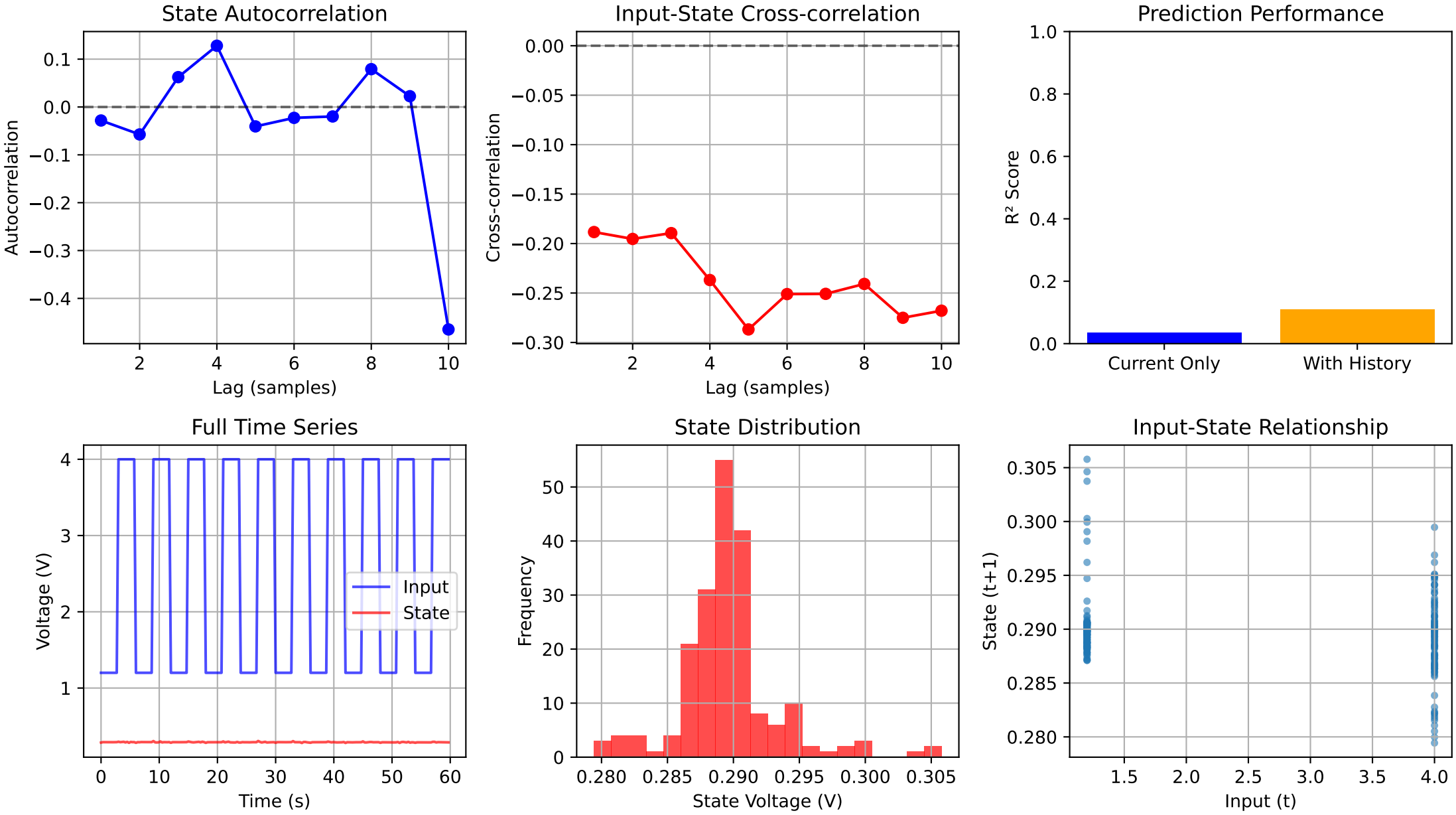
OVERALL MEMORY ASSESSMENT

Memory Score: 2/3
★★★

CONCLUSION: Strong evidence of temporal memory effects

RESERVOIR COMPUTING ASSESSMENT:
✓ This mycelium sample shows excellent reservoir computing potential


Step Response 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)
Time (s)
Input
State
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	0.290
Std Dev	1.400	0.004
Min	1.200	0.279
Max	4.000	0.306
Range	2.800	0.026

Lag (samples)	Lag (seconds)	Autocorr	Cross-corr
1	0.3	-0.028	-0.188
2	0.6	-0.057	-0.195
3	0.9	0.062	-0.189
4	1.2	0.128	-0.237
5	1.5	-0.041	-0.287
6	1.8	-0.023	-0.251
7	2.1	-0.020	-0.251
8	2.4	0.079	-0.241
9	2.7	0.023	-0.275
10	3.0	-0.465	-0.268