Mycelium Temporal Memory Analysis Report

EXPERIMENT OVERVIEW

Date & Time: 2026-02-20 18:05:41
Report Generated: mycelium_memory_analysis_report_20260220_180541.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: 0.275V to 0.298V
State Voltage Mean: 0.285V ± 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: 0.0722
Optimal Lag: 8 samples (2.4 seconds)
Memory Persistence: Weak
Interpretation: States show weak temporal structure

CROSS-CORRELATION ANALYSIS

Maximum Input-State Correlation: 0.2843
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: 0.0311
With Input History R^2: 0.0799
Temporal Improvement: 0.0488
Temporal Benefit: Moderate
Interpretation: Input history moderately improves prediction

RESPONSE DECAY ANALYSIS

Number of Transitions: 19
Average Settling Time: 0.650 seconds
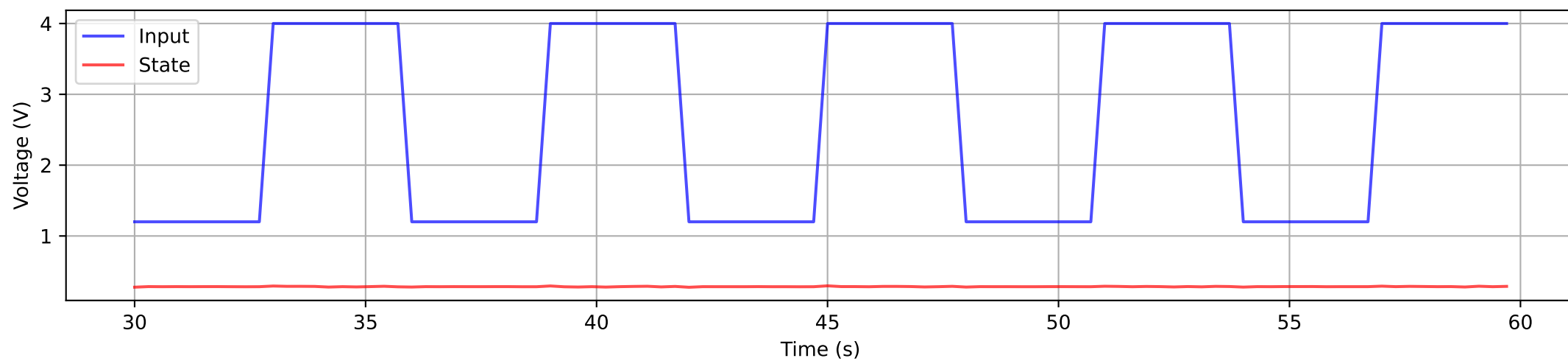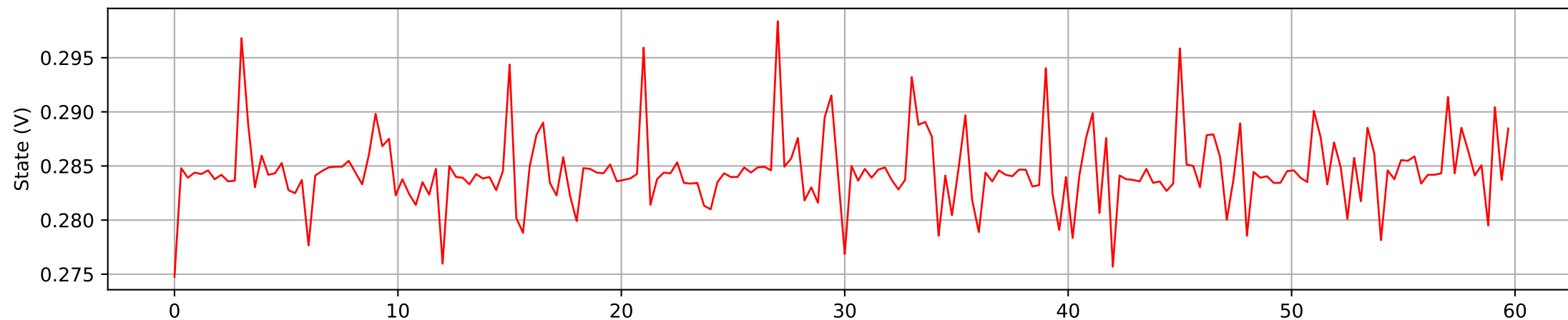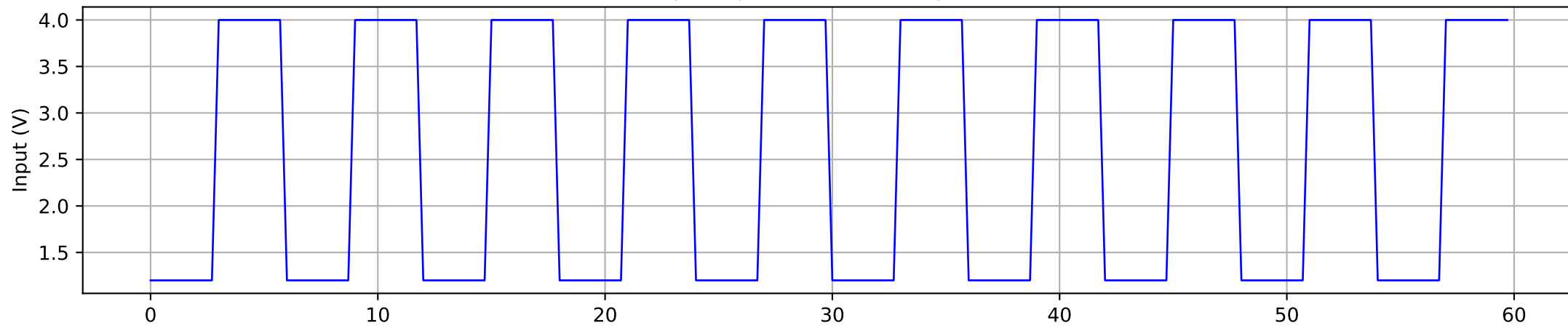Interpretation: Fast response dynamics

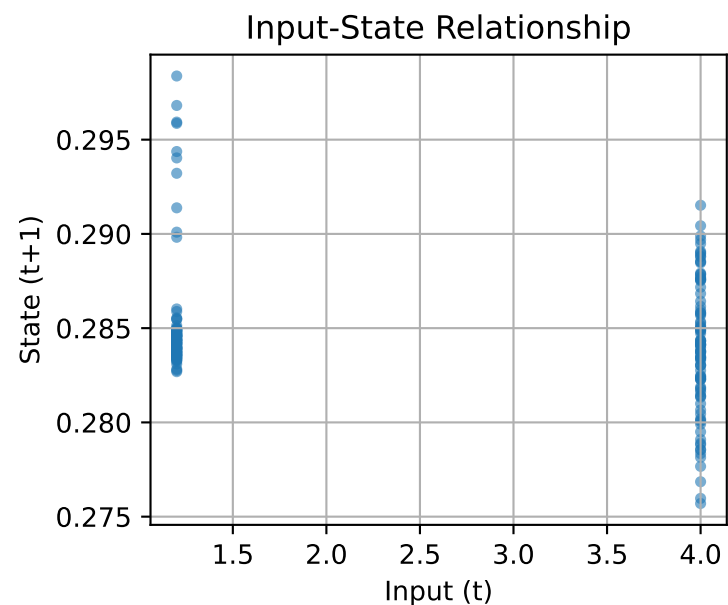OVERALL MEMORY ASSESSMENT

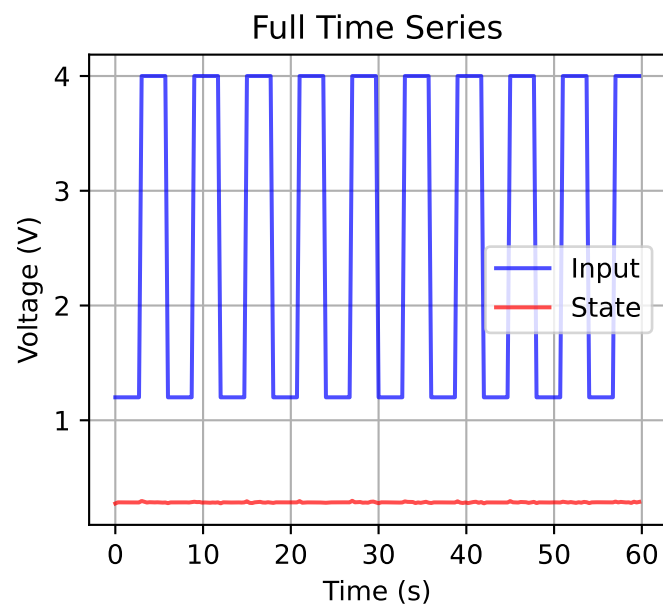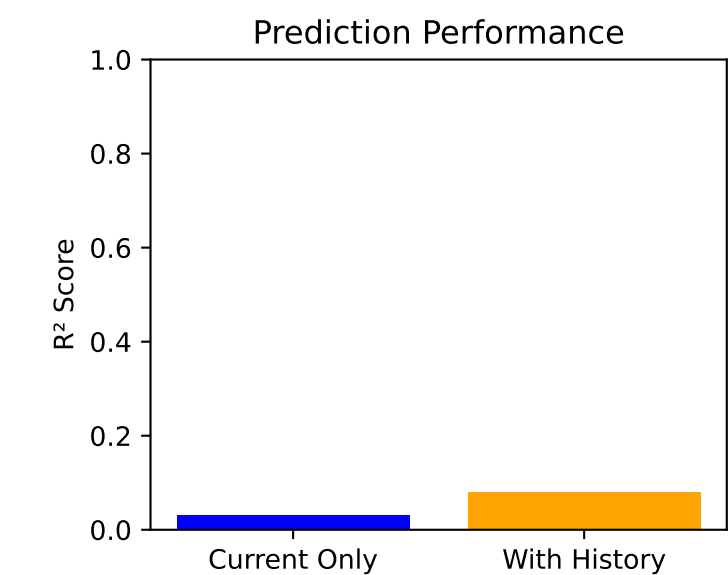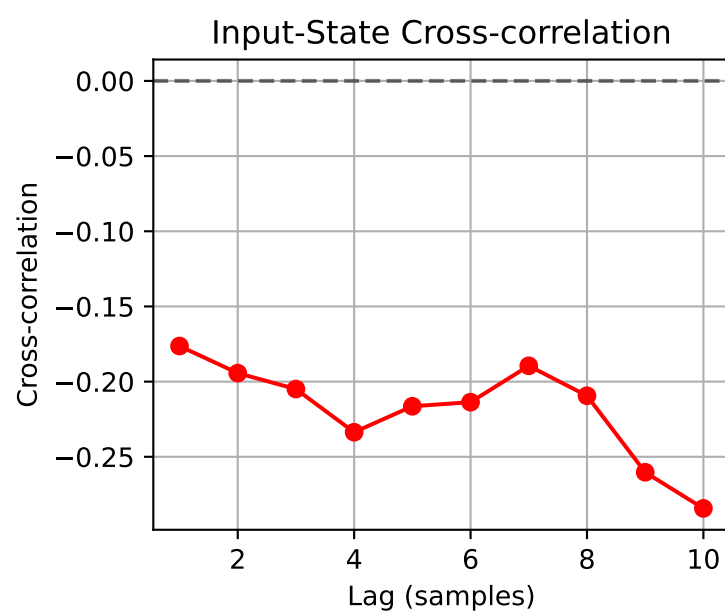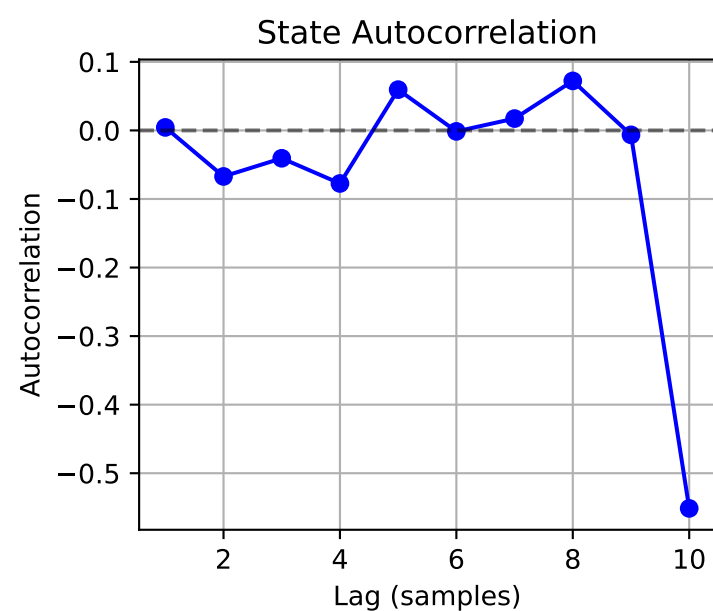Memory Score: 2/3
★★★

CONCLUSION: ⬤ Strong evidence of temporal memory effects

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

Step Response Test - Sample 200

State Autocorrelation

Input-State Cross-correlation

Prediction Performance

Full Time Series

State Distribution

Input-State Relationship
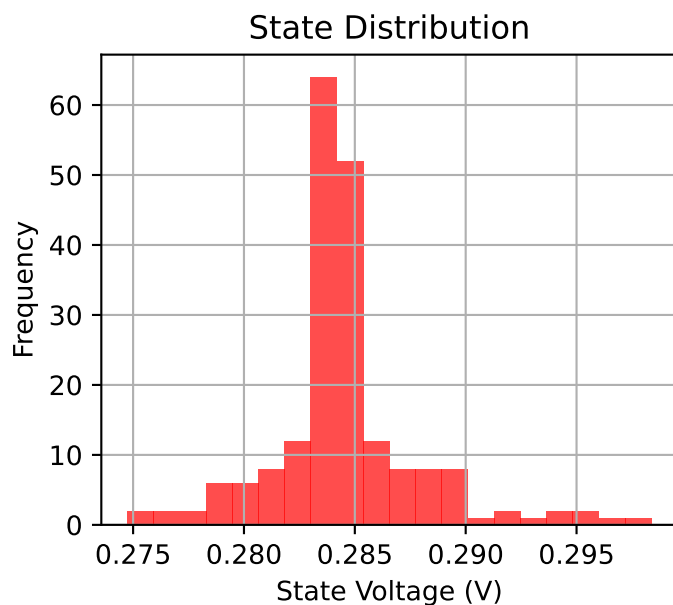
Data Summary Tables

Parameter	Input (V)	State (V)
Mean	2.600	0.285
Std Dev	1.400	0.003
Min	1.200	0.275
Max	4.000	0.298
Range	2.800	0.024

Lag (samples)	Lag (seconds)	Autocorr	Cross-corr
1	0.3	0.004	-0.176
2	0.6	-0.067	-0.194
3	0.9	-0.041	-0.205
4	1.2	-0.077	-0.234
5	1.5	0.059	-0.216
6	1.8	-0.001	-0.214
7	2.1	0.017	-0.189
8	2.4	0.072	-0.209
9	2.7	-0.006	-0.260
10	3.0	-0.551	-0.284