

Mycelium Temporal Memory Analysis Report

EXPERIMENT OVERVIEW

Date & Time: 2026-02-20 17:59:57

Report Generated: mycelium_memory_analysis_report_20260220_175957.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: 0.278V to 0.302V

State Voltage Mean: 0.289V ± 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: 0.0767
Optimal Lag: 6 samples (1.8 seconds)
Memory Persistence: Weak
Interpretation: States show weak temporal structure

CROSS-CORRELATION ANALYSIS

Maximum Input-State Correlation: 0.3032
Optimal Lag: 9 samples (2.7 seconds)
Input Memory Effect: Strong
Interpretation: Past inputs strongly influence current states

STATE PREDICTION ANALYSIS

Current Input Only R²: 0.0340
With Input History R²: 0.0758
Temporal Improvement: 0.0418
Temporal Benefit: Moderate
Interpretation: Input history moderately improves prediction

RESPONSE DECAY ANALYSIS

Number of Transitions: 19
Average Settling Time: 0.467 seconds
Interpretation: Fast response dynamics

OVERALL MEMORY ASSESSMENT

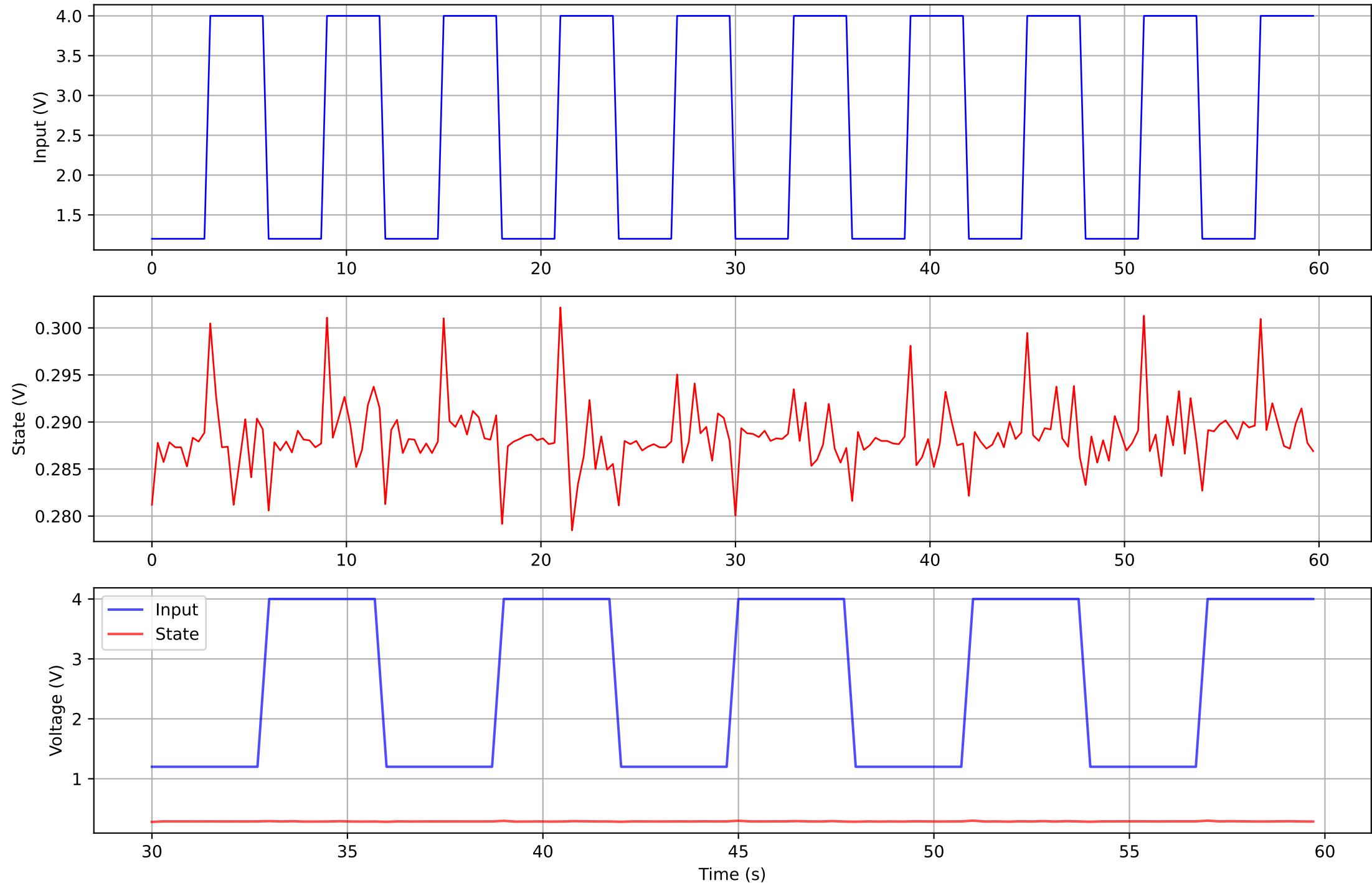
Memory Score: 2/3
★★★

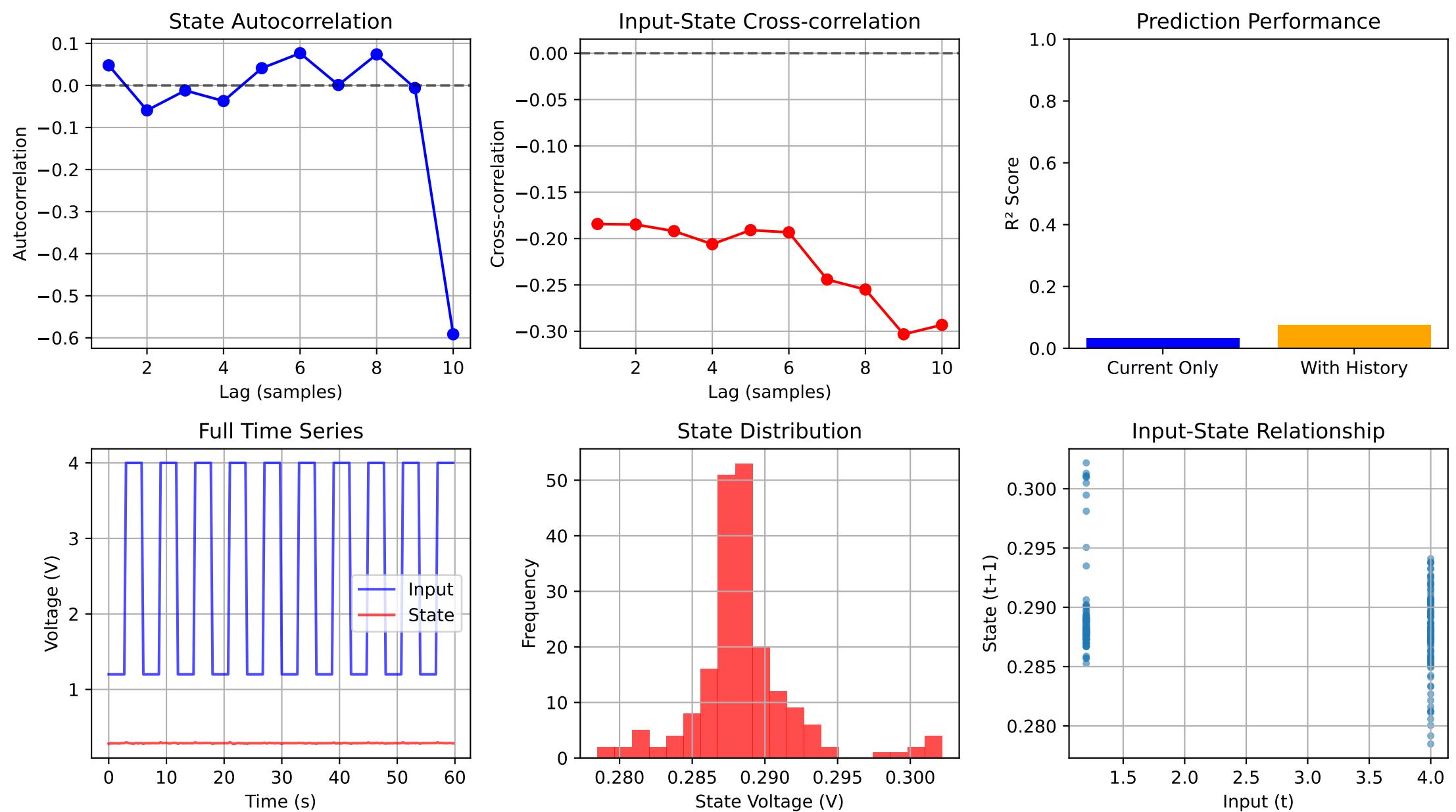
CONCLUSION: Strong evidence of temporal memory effects

RESERVOIR COMPUTING ASSESSMENT:

- ✓ This mycelium sample shows excellent reservoir computing potential

Step Response Test - Sample 200





Data Summary Tables

| Parameter | Input (V) | State (V) |
|-----------|-----------|-----------|
| Mean | 2.600 | 0.289 |
| Std Dev | 1.400 | 0.004 |
| Min | 1.200 | 0.278 |
| Max | 4.000 | 0.302 |
| Range | 2.800 | 0.024 |

| Lag (samples) | Lag (seconds) | Autocorr | Cross-corr |
|---------------|---------------|----------|------------|
| 1 | 0.3 | 0.048 | -0.184 |
| 2 | 0.6 | -0.059 | -0.185 |
| 3 | 0.9 | -0.012 | -0.192 |
| 4 | 1.2 | -0.037 | -0.206 |
| 5 | 1.5 | 0.041 | -0.191 |
| 6 | 1.8 | 0.077 | -0.193 |
| 7 | 2.1 | 0.001 | -0.244 |
| 8 | 2.4 | 0.074 | -0.255 |
| 9 | 2.7 | -0.006 | -0.303 |
| 10 | 3.0 | -0.592 | -0.293 |