

# Mycelium Temporal Memory Analysis Report

## EXPERIMENT OVERVIEW

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Date & Time: 2026-02-20 17:45:16  
Report Generated: mycelium\_memory\_analysis\_report\_20260220\_174516.pdf

## TEST CONFIGURATION

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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

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Input Voltage Range: 1.20V to 4.00V  
State Voltage Range: 0.275V to 0.292V  
State Voltage Mean: 0.282V  $\pm$  0.003V  
Data Quality: ✓ Good

## HARDWARE CONFIGURATION

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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: 0.4044  
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: 0.4226  
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 R²: 0.1786  
With Input History R²: 0.2245  
Temporal Improvement: 0.0459  
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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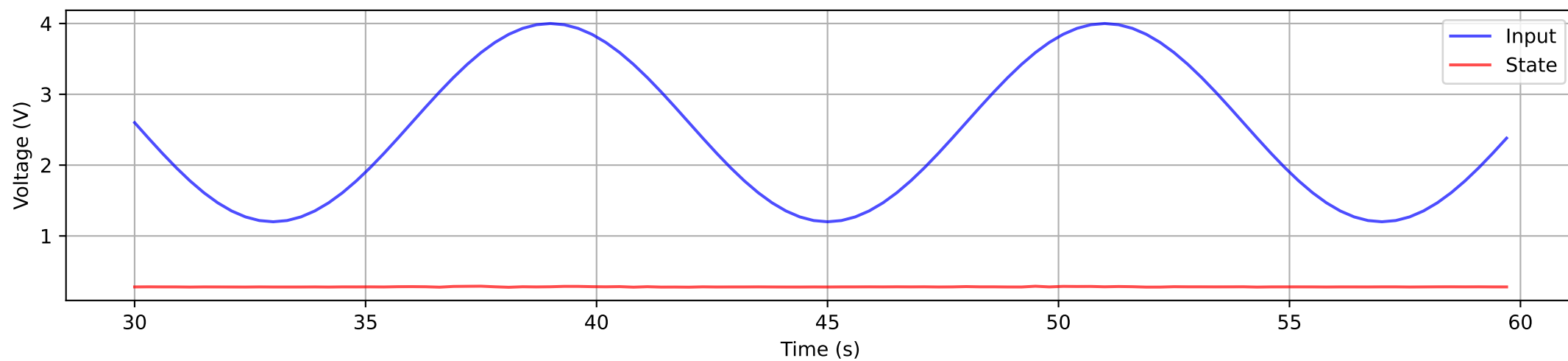
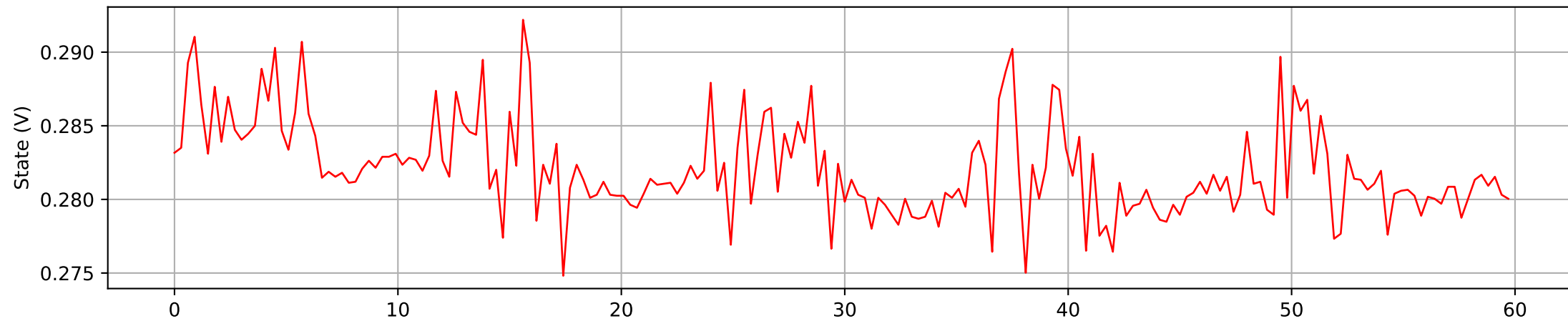
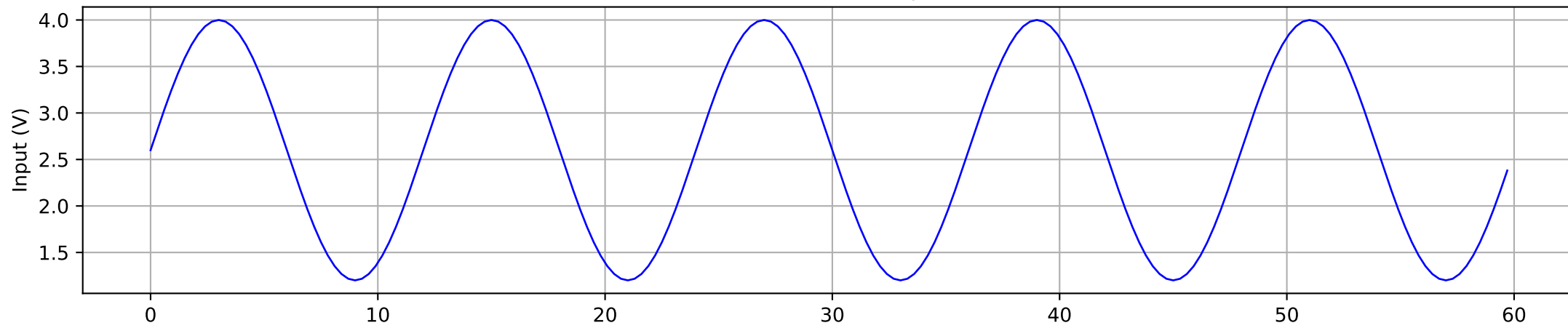
Memory Score: 3/3  
★★★

CONCLUSION: ☒ Strong evidence of temporal memory effects

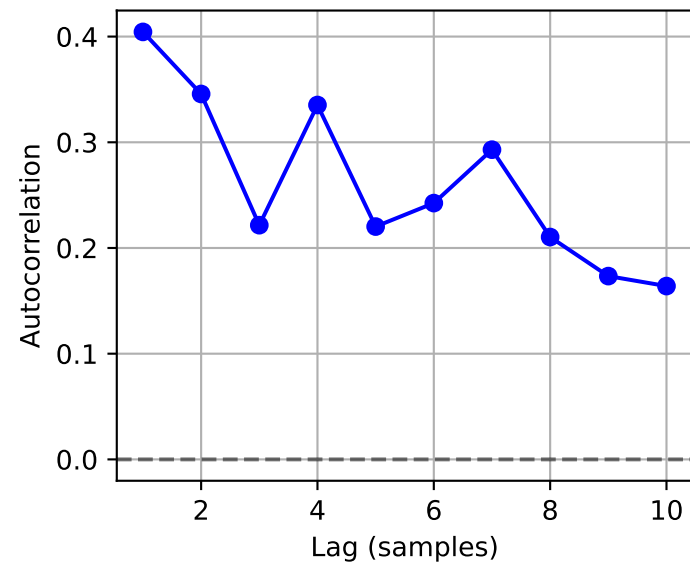
### RESERVOIR COMPUTING ASSESSMENT:

✓ This mycelium sample shows excellent reservoir computing potential

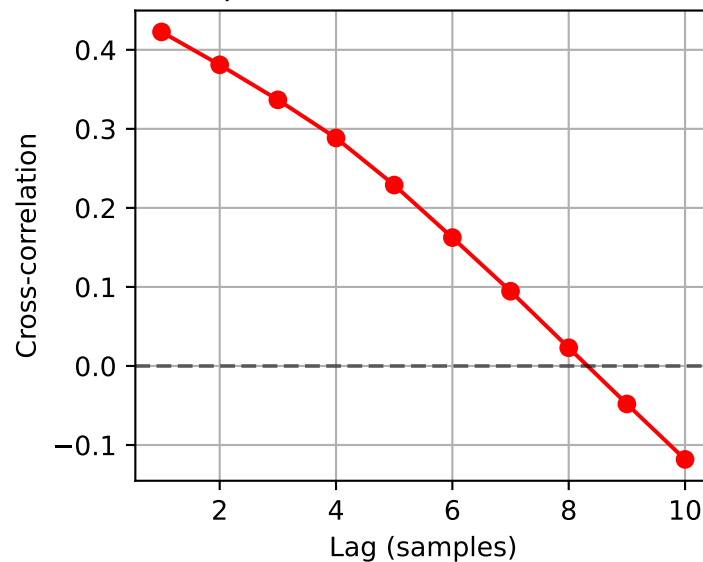
Sine Wave Test - Sample 200



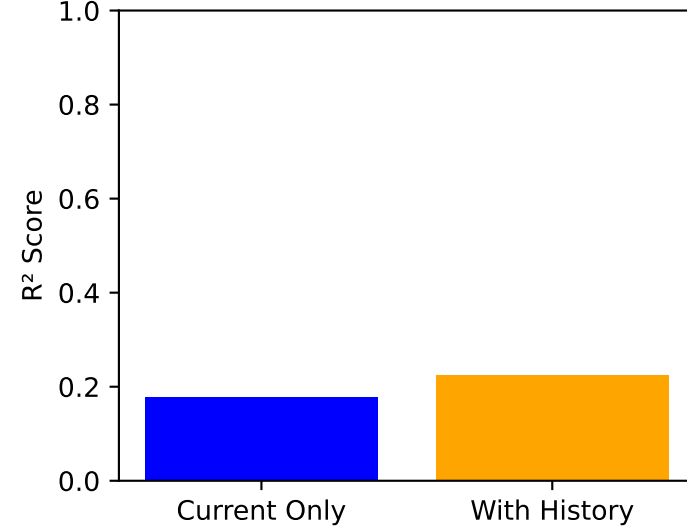
State Autocorrelation



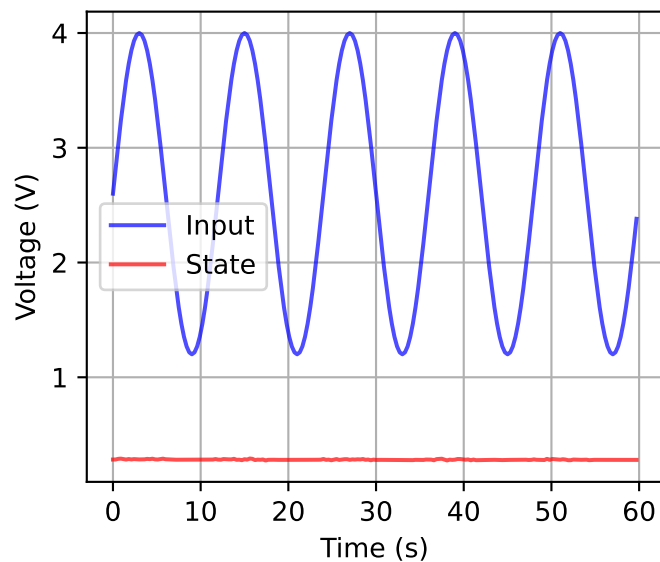
Input-State Cross-correlation



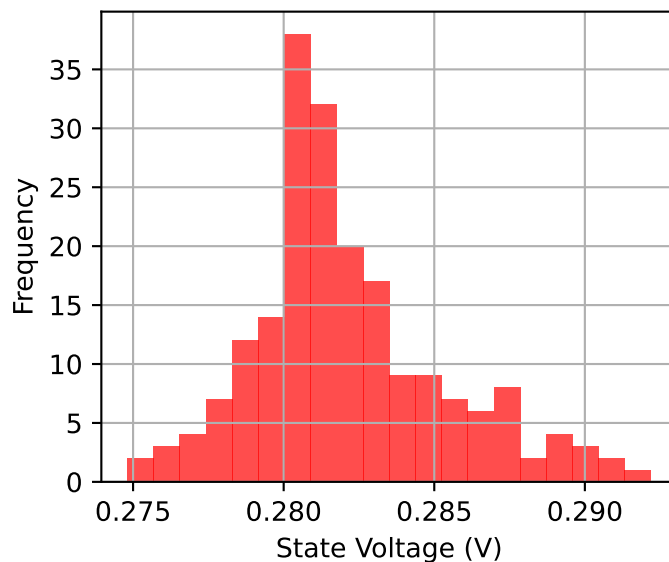
Prediction Performance



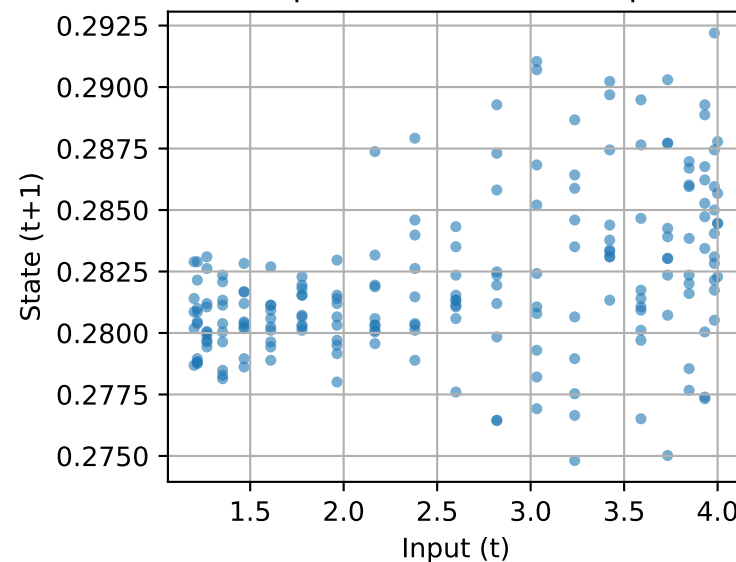
Full Time Series



State Distribution



Input-State Relationship



# Data Summary Tables

Parameter	Input (V)	State (V)
Mean	2.600	0.282
Std Dev	0.990	0.003
Min	1.200	0.275
Max	4.000	0.292
Range	2.800	0.017

Lag (samples)	Lag (seconds)	Autocorr	Cross-corr
1	0.3	0.404	0.423
2	0.6	0.346	0.381
3	0.9	0.222	0.337
4	1.2	0.335	0.288
5	1.5	0.220	0.229
6	1.8	0.242	0.162
7	2.1	0.293	0.095
8	2.4	0.210	0.023
9	2.7	0.173	-0.048
10	3.0	0.164	-0.118