

# Mycelium Temporal Memory Analysis Report

## EXPERIMENT OVERVIEW

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Date & Time: 2026-02-20 17:54:26  
Report Generated: mycelium\_memory\_analysis\_report\_20260220\_175426.pdf

## TEST CONFIGURATION

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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

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Input Voltage Range: 1.20V to 4.00V  
State Voltage Range: 0.281V to 0.306V  
State Voltage Mean: 0.292V ± 0.004V  
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

### AUTOCORRELATION ANALYSIS

Maximum Correlation: 0.1582  
Optimal Lag: 2 samples (0.6 seconds)  
Memory Persistence: Weak  
Interpretation: States show weak temporal structure

### CROSS-CORRELATION ANALYSIS

Maximum Input-State Correlation: 0.4199  
Optimal Lag: 10 samples (3.0 seconds)  
Input Memory Effect: Strong  
Interpretation: Past inputs strongly influence current states

### STATE PREDICTION ANALYSIS

Current Input Only  $R^2$ : 0.0005  
With Input History  $R^2$ : 0.0629  
Temporal Improvement: 0.0624  
Temporal Benefit: Moderate  
Interpretation: Input history moderately improves prediction

### RESPONSE DECAY ANALYSIS

Number of Transitions: 19  
Average Settling Time: 1.050 seconds  
Interpretation: Moderate response dynamics

### OVERALL MEMORY ASSESSMENT

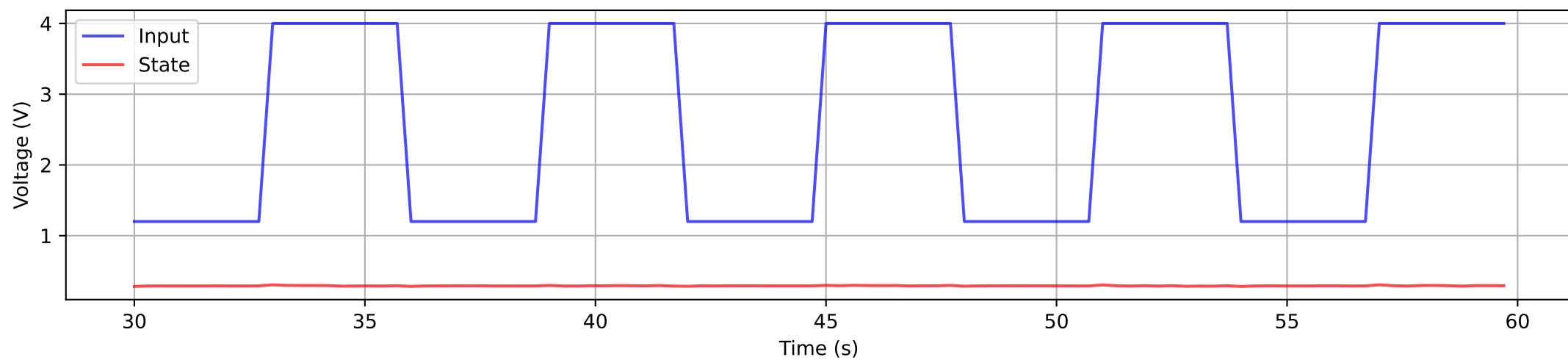
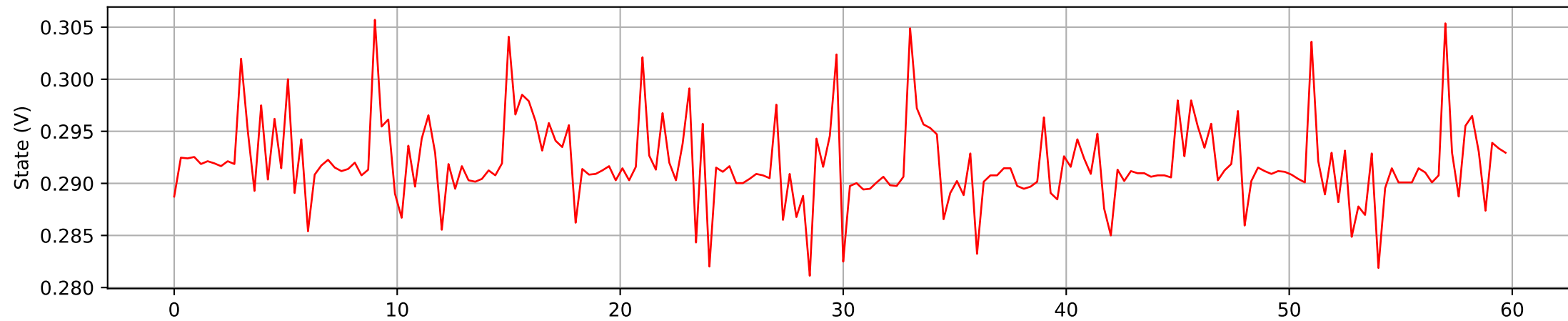
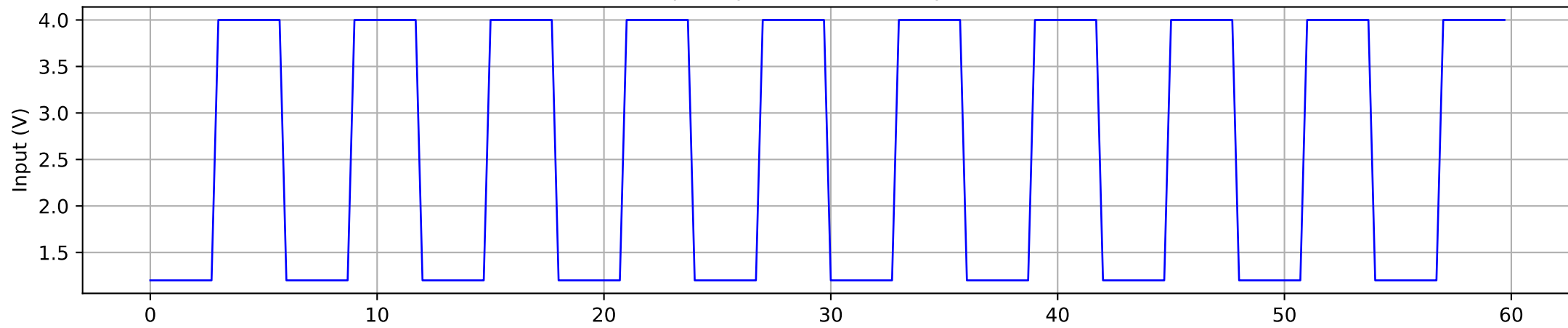
Memory Score: 2/3  
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CONCLUSION: ☐ Strong evidence of temporal memory effects

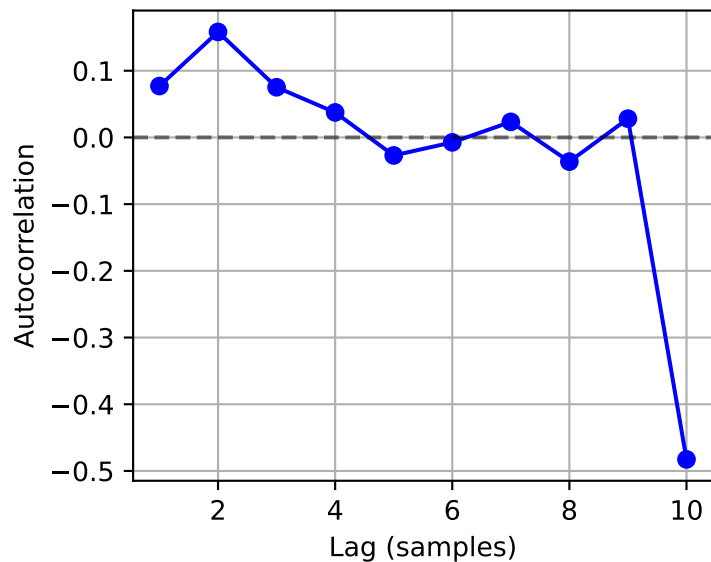
### RESERVOIR COMPUTING ASSESSMENT:

✓ This mycelium sample shows excellent reservoir computing potential

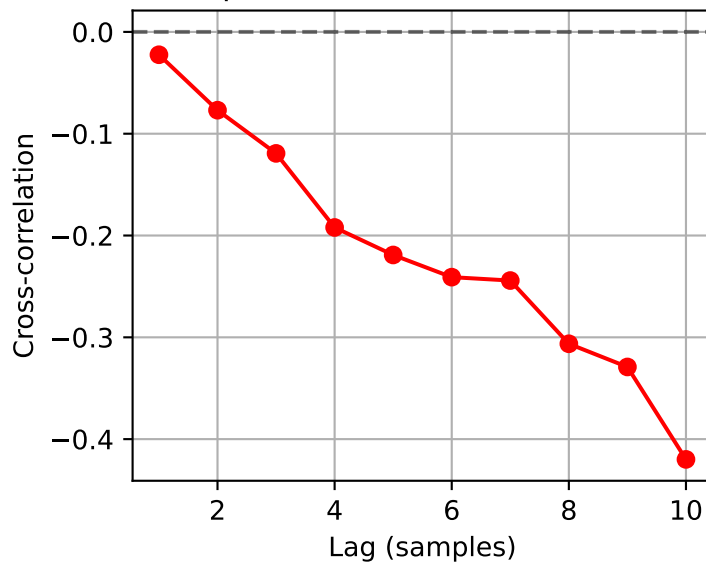
# Step Response Test - Sample 200



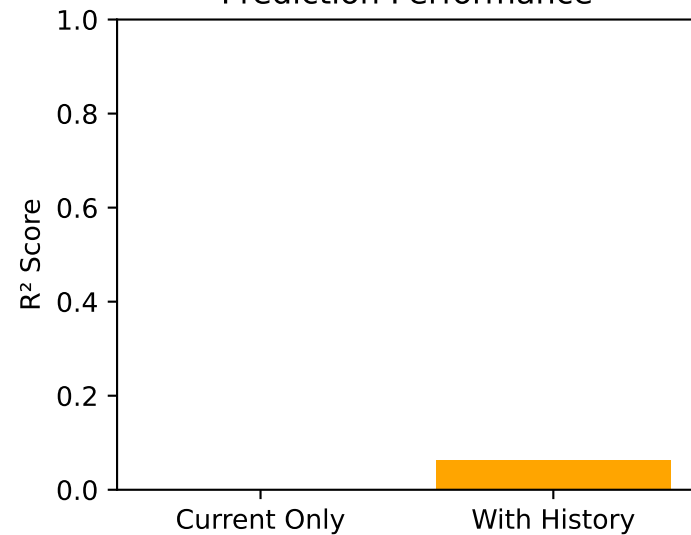
State Autocorrelation



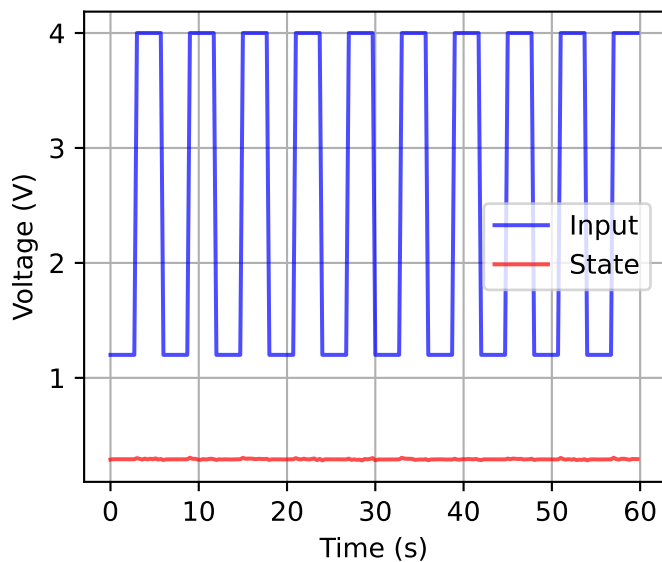
Input-State Cross-correlation



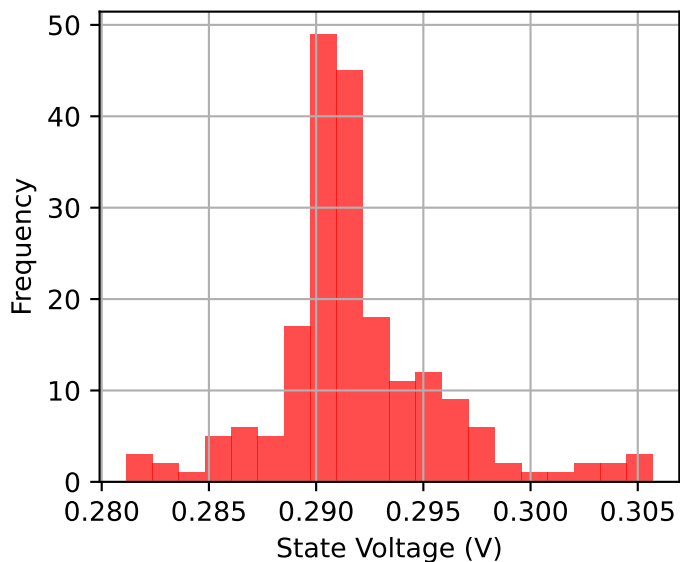
Prediction Performance



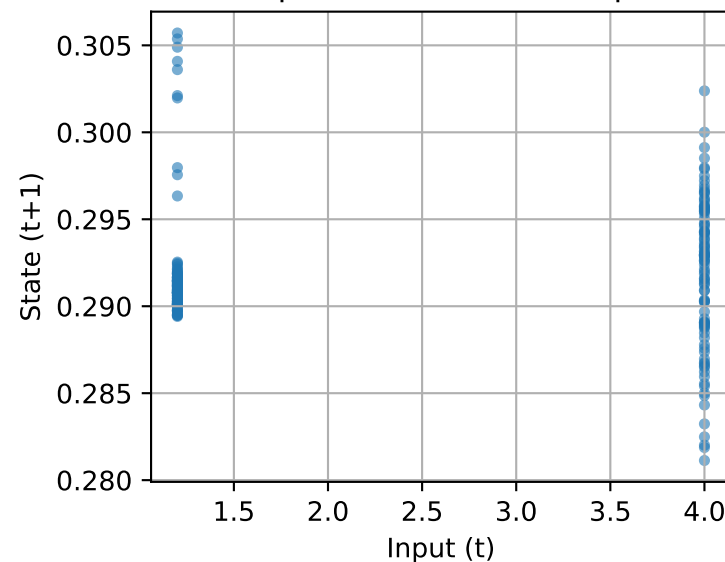
Full Time Series



State Distribution



Input-State Relationship



# Data Summary Tables

Parameter	Input (V)	State (V)
Mean	2.600	0.292
Std Dev	1.400	0.004
Min	1.200	0.281
Max	4.000	0.306
Range	2.800	0.025

Lag (samples)	Lag (seconds)	Autocorr	Cross-corr
1	0.3	0.077	-0.022
2	0.6	0.158	-0.077
3	0.9	0.075	-0.119
4	1.2	0.037	-0.192
5	1.5	-0.027	-0.219
6	1.8	-0.007	-0.241
7	2.1	0.023	-0.244
8	2.4	-0.036	-0.306
9	2.7	0.028	-0.329
10	3.0	-0.483	-0.420