Baseline (Control) for Permutation Test

Context-Dependence Classification
10/30/20

Context-Dependence

Context-dependence of a particular state

= P(prestimulation state correlated | poststimulation state correlated)

1. Post-stimulation correlation > 0.9, positive prestimulation correlation
2. Calculate corresponding pre-stimulation state correlation
3. For each given post-stimulation state,
   a. Context-dependence = Number of correlated pre-stimulation states/number of correlated post-stimulation state
4. Threshold for defining a state as context-dependent: context-dependence>0.7

Dataset

- 16 channel (4x4 array)
- 68 pairs of pre and post-stimulation states
- 22 pairs defined as context dependent (based on definition from previous slide)
- Permutation test by shuffling pre-stimulation state order
  - Null hypothesis: Pre-stimulation context does not affect calculation of context-dependence
  - Alternative hypothesis: Pre-stimulation context affects calculation of context-dependence
  - The permuted sets had less states defined as context-dependent than unshuffled set
  - P-value: 1% from 1000 permutations → indicates statistical significance of this measure?
  - Histogram: mean = 13.9, standard deviation = 3.4

Baseline/Control Tests

- Randomized LFP values
  - 16x136 array ~ Uniform Distribution with μ_{LFP}, σ_{LFP}.
- CD10-2
  - Generated values for each channel separately based on the μ, σ of the corresponding channel's post-stimulation and pre-stimulation trials respectively
  - Generated values ~ Uniform Distribution with $\mu_{m,n}$, $0.01*\sigma_{m,n}$ for m=0,1 (pre or post), n=channel
  - Results in highly similar pre-stimulation profiles, and highly similar post-stimulation profiles (though pre-stimulation may not be similar to post-stimulation)
- CD10-1
  - Similar to CD10-2 but with generated values ~ Uniform Distribution with $\mu_{m,n}$, $0.1*\sigma_{m,n}$.
- CD1
  - Similar to CD10-2 but with Generated values ~ Uniform Distribution with $\mu_{m,n}$, $*\sigma_{m,n}$.

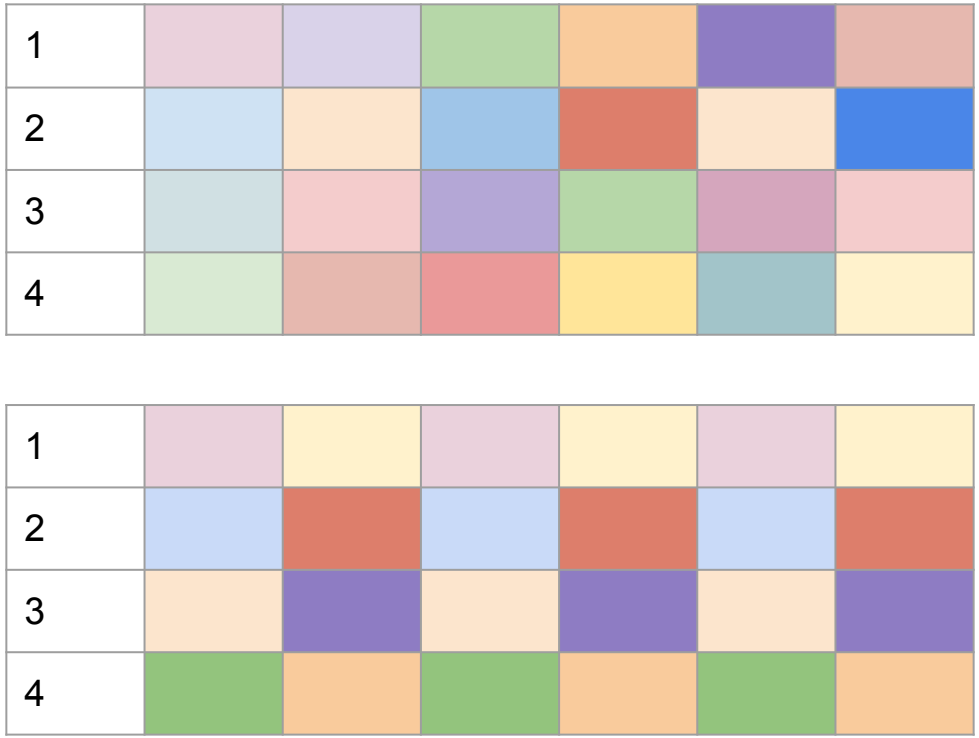
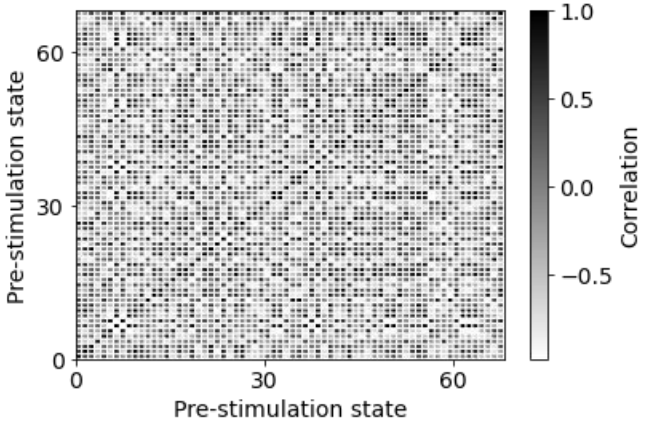
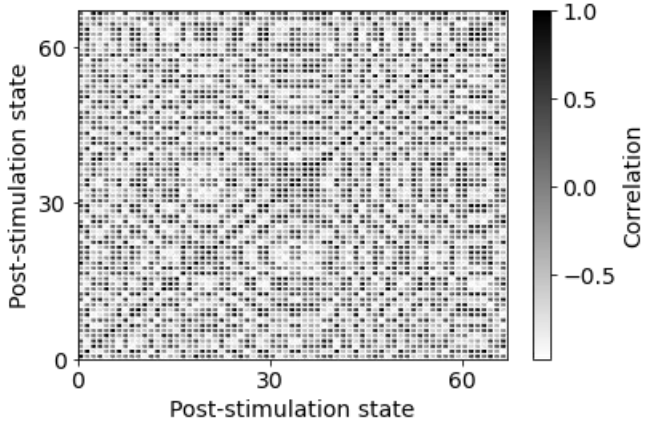
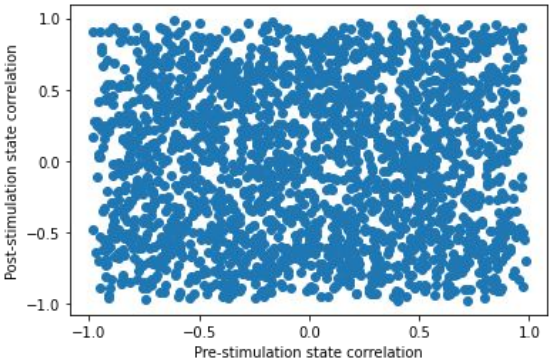
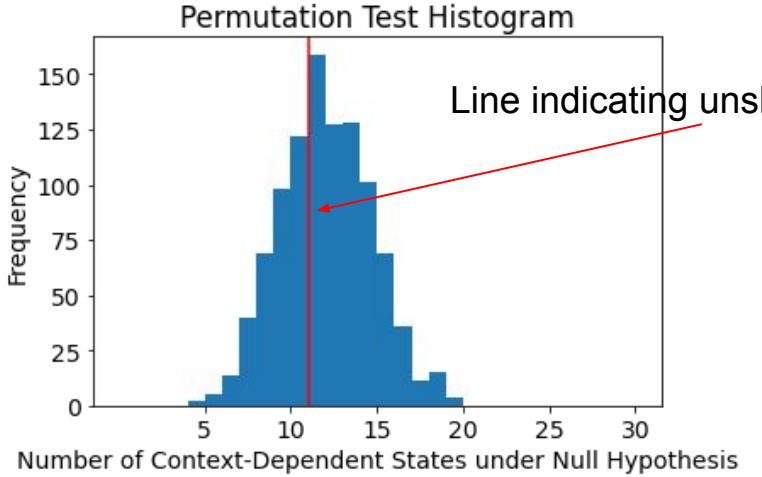


Diagram Depiction of Randomized LFP vs. CD Baseline

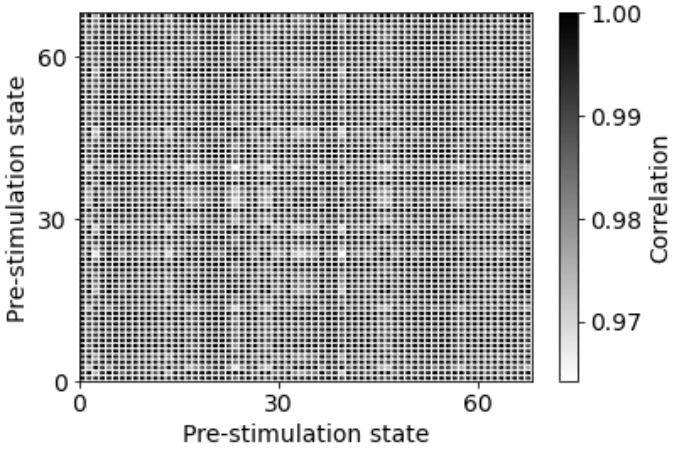


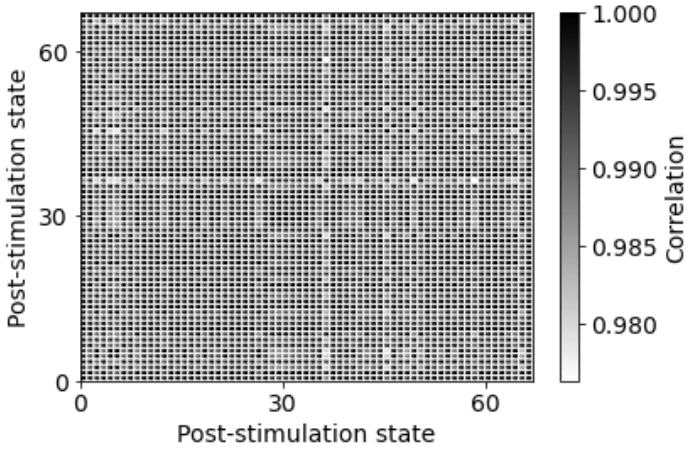


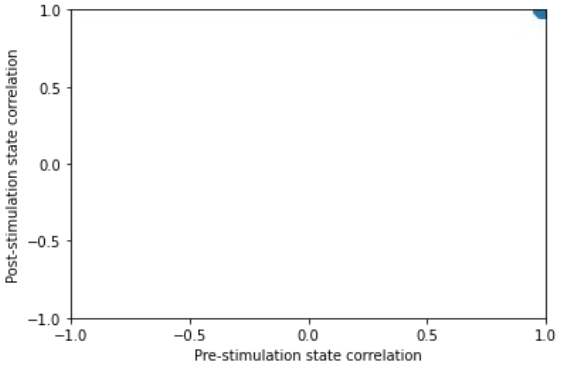


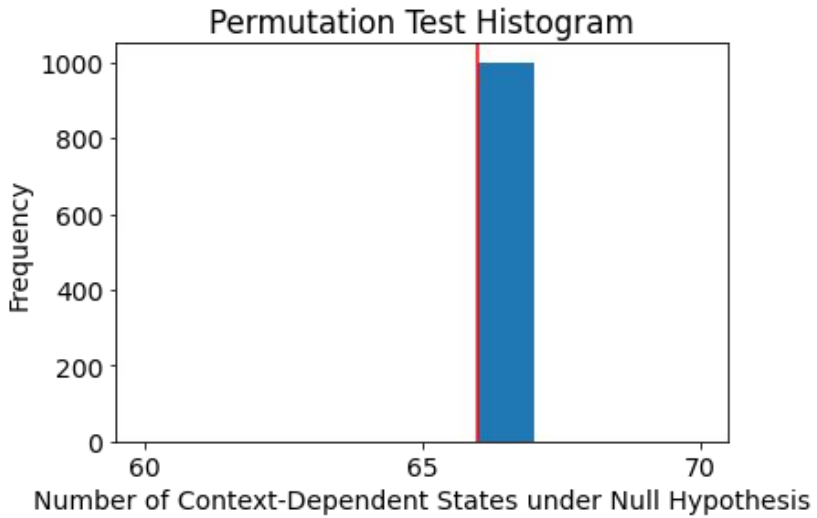


Randomized LFP Values
Context Dependent States: 11/68
Permutation (n=1000): Mean = 11.546, Std Dev = 2.65, p = 0.491

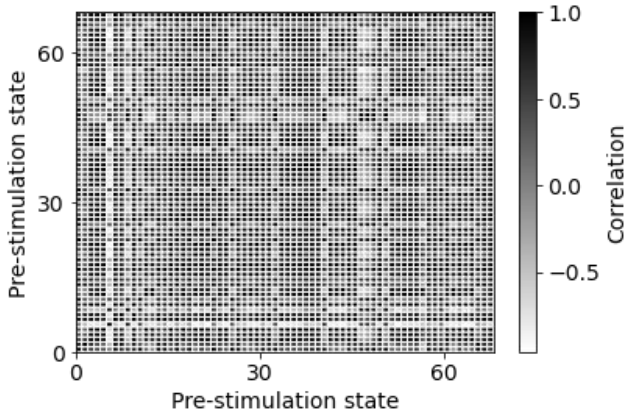


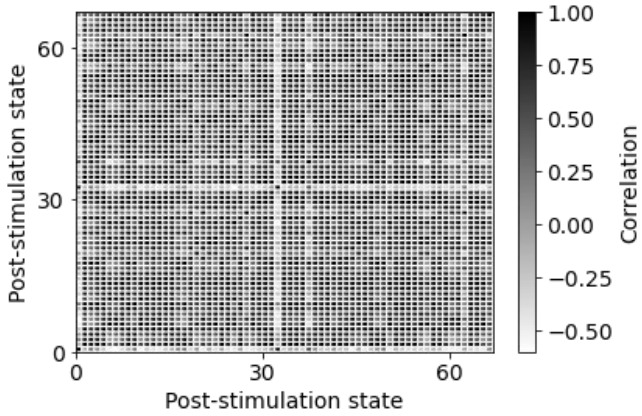


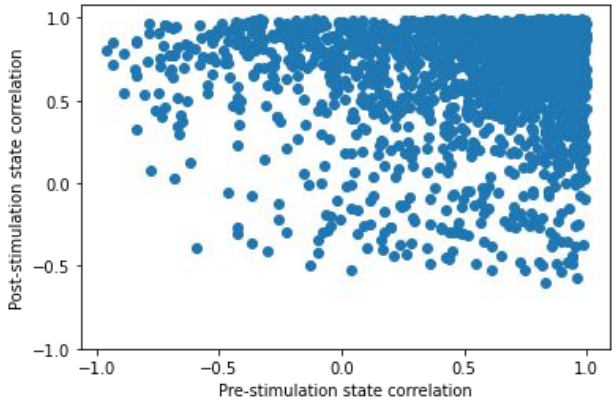


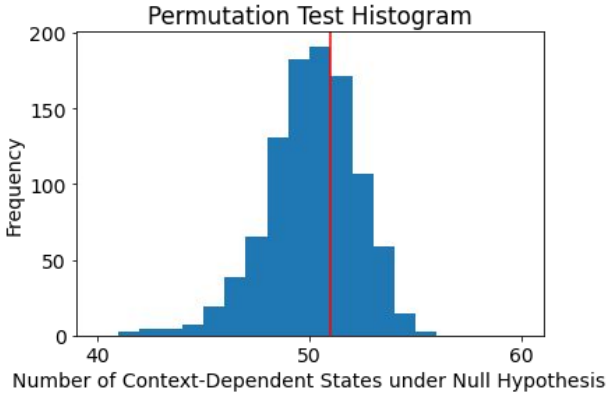


CD10-2 file ($\sigma_{new}=0.01\sigma_i$)
Context Dependent States = 66/68
Permutation (n=1000): Mean = 66, Std Dev = 0, p=0

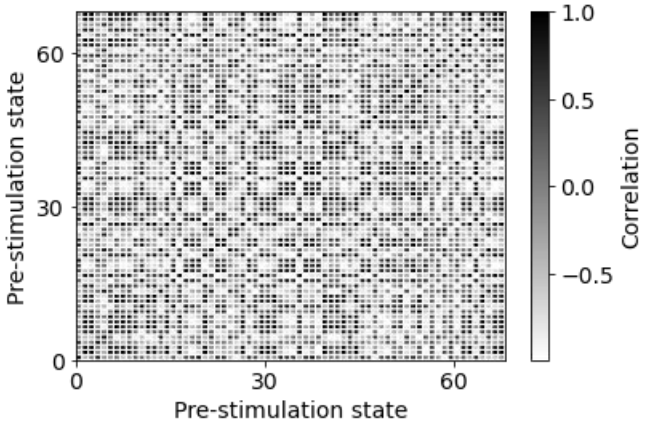


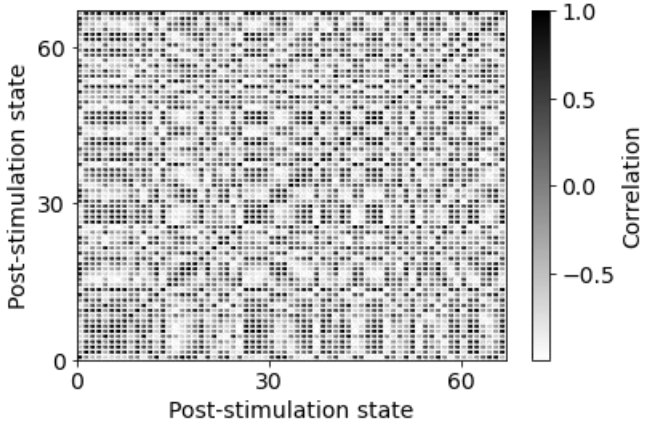


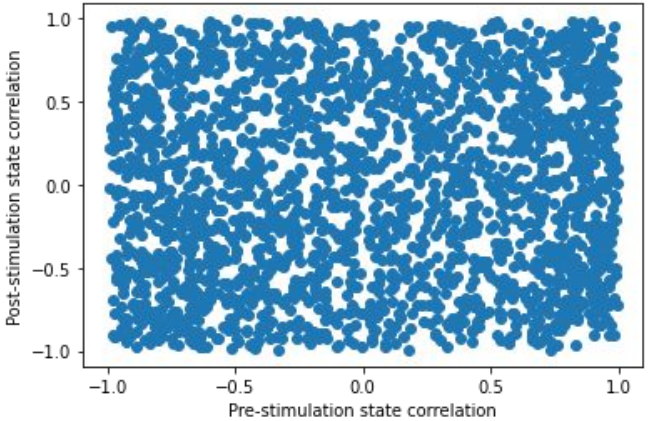


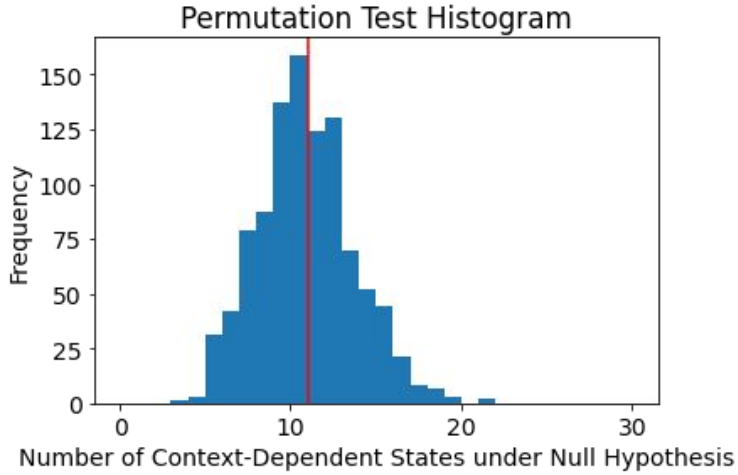


CD10-1 file ($\sigma_{new}=0.1\sigma_i$)
Context Dependent States = 51/68
Permutation (n=1000): Mean = 49.6, Std Dev = 2.15, p = 0.184

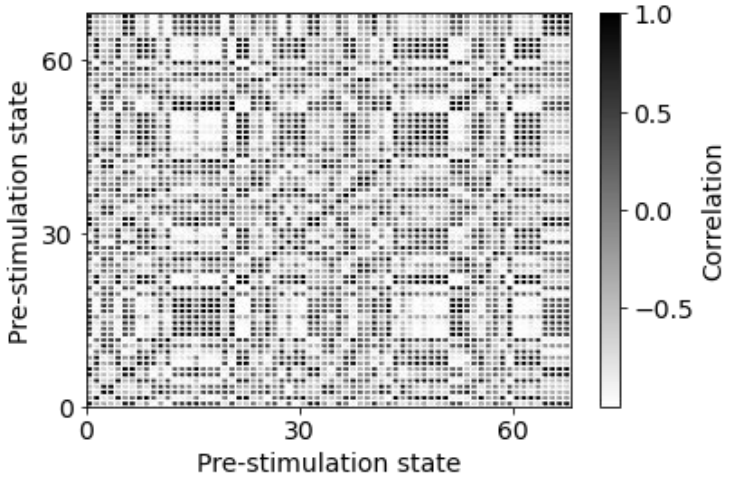


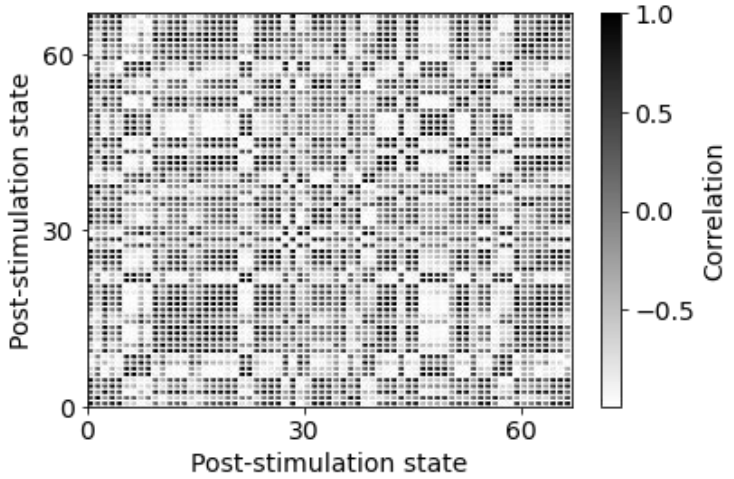


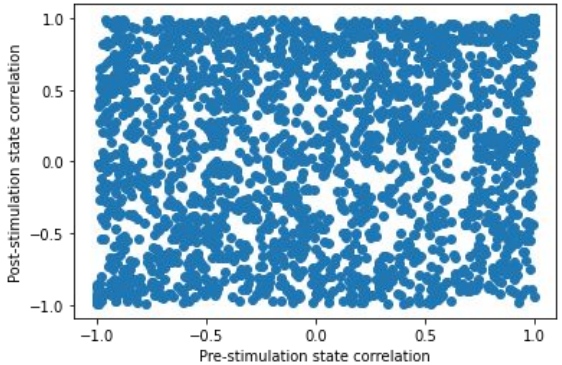


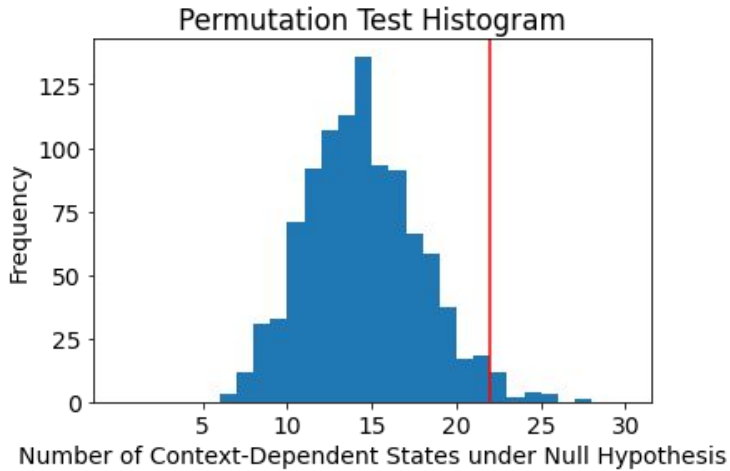


CD1 file ($\sigma_{new}=\sigma_i$)
Context Dependent States = 11/68
Permutation (n=1000): Mean = 10.4, Std Dev = 2.8, p = 0.337









Original Dataset (onehund.mat)
Context Dependent States = 22/68
Permutation (n=1000): Mean = 13.97, Std Dev = 3.39, p=0.01